



Australian Government

MEM23111 Select electrical equipment and components for engineering applications

Release: 1

MEM23111 Select electrical equipment and components for engineering applications

Modification History

Release 1. Supersedes and is equivalent to MEM23111A Select electrical equipment and components for engineering applications.

Application

This unit of competency defines the skills and knowledge required to identify and match electrical supply and electrical system equipment and components to mechanical, manufacturing and mechatronic engineering applications. It includes electrical principles and laws, inductive and capacitive effects on alternating current (AC) supplies, control system power supply fundamentals, electrical safety and earthing systems, and electrical motors and motor controls.

It applies to people working as technicians in engineering or related fields where electrical power supply, equipment and systems must be considered and applies to mechanical, manufacturing and mechatronic engineering applications which include electrical equipment. This includes domestic, commercial or industrial situations. Electrical equipment and component identification covered by this unit is from manufacturer catalogues or other standard specifications. The unit does not cover one-off design or modification to electrical equipment.

The unit does not cover the undertaking of licensed electrical work but will often apply to individuals working as part of a team that includes licensed electricians.

This unit includes knowledge of electrical dangers and safety procedures and the need to comply with work health and safety (WHS) and electrical regulatory requirements.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

MEM23004 Apply technical mathematics

Competency Field

Engineering science

Elements and Performance Criteria

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>

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1. Investigate context of electrical equipment and supply	1.1 Review functions and features of devices 1.2 Identify safe machine 1.3 Identify WHS and regulatory requirements 1.4 Determine available sources for any required licensed electrical work 1.5 Review sustainability implications of energy source options
2. Determine electrical supply, equipment and components required for engineering-related tasks	2.1 Assess electrical supply specifications for engineering application 2.2 Analyse electrical motors and their control options for suitability 2.3 Estimate power factor requirements for engineering applications 2.4 Examine engineering application control and communication requirements 2.5 Appraise isolation, shutdown and emergency equipment options 2.6 Analyse maintenance, life cycle and sustainability requirements of electrical systems and equipment options 2.7 Apply specification, documentation and graphical techniques, modelling, mock-up or prototyping techniques, where required, to achieve or test options 2.8 Identify preferred electrical supply system, equipment and components
3. Report results	3.1 Record results of investigation, evaluation and application 3.2 Provide documentation including calculations, diagrams, programs and files in accordance with workplace procedures

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.

Electrically powered equipment and systems include:	- motors - electrical supply equipment, including transformers, switchboards, and power circuit components - sensors, programmable logic controllers (PLCs) and control circuits - isolation, shutdown and emergency cut-offs - lighting - heating, cooling and ventilation - average and maximum load, power factor, switch board layout, earthing and protection systems and power consumption and cost.
Electrical-related engineering tasks include:	- determining WHS, regulatory and risk management requirements - evaluating electrical supply options - technical evaluation of options for electrical equipment and components against performance, cost and reliability requirements - determining methods for start, stop, speed control and reversing of electric motors - matching of electrical equipment to other systems.
Automation safety refers to use of general and specific safety features and includes:	- emergency stop - failsafe design - redundancy - interlocks - guarding data integrity - general plant design and use - functional safety of safety-related electrical, electronic and programmable electronic control systems.
Appropriate licensed technical and professional assistance include:	- technical support and advice relating to elements which have intrinsic dangers - professional support for technologies.
WHS, regulatory requirements and organisational procedures include:	- WHS acts and regulations and relevant standards - codes of practice from Australian and overseas engineering and technical associations and societies - risk assessments - registration requirements - safe work practices - state and territory regulatory requirements applying to electrical work.
Life cycle assessment	all aspects of manufacture of a single product

includes:	• the entire operations of an organisation • aspects of operations including environmental implications.
Sustainability implications include:	• meeting all regulatory requirements • conforming to all industry covenants, protocols and best practice guides • minimising ecological and environmental footprint of process, plant and product • maximising economic benefit of process plant and product to the organisation and the community • minimising the negative WHS impact on employees, community and customer.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM23111A Select electrical equipment and components for engineering applications

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

Assessment Requirements for MEM23111 Select electrical equipment and components for engineering applications

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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:

- identifying effects and dangers of electricity including evaluating relevance of work health and safety (WHS), regulatory requirements, standards and codes of practice
- applying life cycle design and sustainability parameters to identification of task
- reviewing sustainability implications, functions and features of electrical devices, machines and systems
- integrating electrical evaluation techniques with overall engineering application requirements including:
 - mechanical
 - fluid power
 - electronic
 - • heating
 - ventilation
 - air conditioning and refrigeration (HVACR) and controller and networking
- assessing and applying basic electrical principles and techniques, software basic analysis and graphic skills and techniques to engineering tasks on at least two occasions
- evaluating suitability of electric power supply for applications on at least two occasions
- applying appropriate calculations and methods for electric motor control
- ensuring safe electrical working practice and compatibility of units in calculations on at least two occasions
- reporting and documenting results of investigation and evaluation including calculations, diagrams, programs and files.

Note: Where a volume and/or frequency is not specified, demonstration must be provided at least once.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- energy source options and sustainability implications of electricity generation, distribution and use
- sustainable sources of energy

- electrically-powered equipment and systems
- electrical-related engineering tasks
- features and function of electrical systems in engineering applications including:
 - sources and reliability of supply including mains, generators and batteries
 - fault and other protection requirements
 - electrical system control and interfacing with other systems
 - maintainability
 - efficiency
 - fitness for purpose
- WHS and regulatory requirements with emphasis on automation safety, codes of practice, standards, risk management and registration requirements
- effects of electricity on humans including dangerous high currents and voltages related to extra low, low and high voltage applications and how these relate to engineering applications
- licensed technical and professional assistance
- electrical laws and theorems
- electrical circuit components
- alternating current (AC) and direct current (DC) electrical supply systems:
 - single and three-phase power
 - power factor
 - distribution systems including transformers, cables and switchboards
 - local area distribution considerations and supply authority requirements
 - typical and possible faults and dangerous situations
 - earthing systems including multiple earth neutral (MEN) system
- circuit protection devices including fuses, thermal relays, circuit breakers and residual current devices
- basic electrical circuits and applications for lighting, motors, controllers, heaters and coolers
- graphical symbols and diagrammatic representation of basic circuits and power supply fundamentals
- electrical power consumption
- electrical measurements and techniques
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Assessment Conditions

- Assessors must:
 - have vocational competency in selecting electrical equipment and components for engineering applications at least to the level being assessed with relevant industry knowledge and experience

- satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or 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 manufacturing specifications.
- Assessment 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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