



Australian Government

MEM09206 Produce drawings for mechanical services

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MEM09206A Produce drawings for mechanical services.

Application

This unit of competency defines the skills and knowledge required to produce detailed engineering drawings for mechanical services to Australian Standard (AS) 1100.101 Technical drawing - General principles and is primarily for those performing drafting work for the installation of heating, ventilation, air conditioning and refrigeration (HVAC/R) systems within the mechanical services industry.

Critical dimensions and specifications for the drawing are predetermined and drawings are carried out with or without the use of computer-aided design (CAD) systems.

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

Pre-requisite Unit

MEM09204 Produce basic engineering detail drawings

MEM09229 Read and interpret technical engineering drawings

Competency Field

Drawing, drafting and design

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>
1. Determine 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 available information 1.4 Determine purpose and scope of drawing and identify and address further information needs 1.5 Identify and prepare equipment required to complete work 1.6 Identify and apply relevant codes, standards and symbols used in the

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	mechanical services industry for installation drawings 1.7 Identify and access organisational files, templates and symbols 1.8 Identify environmental implications of inefficient systems and strategies for minimising impact
2. Identify HVAC/R measuring and control devices	2.1 Identify operating principles and specifications of temperature and pressure measurement devices 2.2 Identify operating principles and specifications of air and fluid measurement instruments 2.3 Identify operating principles and specifications of standard control devices and measurement devices 2.4 Identify location requirements of control and measurement devices
3. Produce drawings for installation of heating and cooling systems	3.1 Apply operating principles and specifications of heating and cooling systems and equipment to drawing work 3.2 Complete drawing according to mechanical services industry standard for heating and cooling systems 3.3 Ensure drawing accurately reflects specifications and is presented according to organisational requirements and contains all relevant information 3.4 Evaluate drawing for system efficiency and make or report potential improvements
4. Produce drawings for installation of air conditioning and exhaust systems	4.1 Apply operating principles and specifications of air conditioning systems and equipment to drawing work 4.2 Apply operating principles and specifications of exhaust systems to drawing work 4.3 Complete drawing according to mechanical services industry standard for air conditioning systems 4.4 Present drawing according to organisational requirements 4.5 Evaluate drawing for system efficiency and make or report potential improvements
5. Produce drawings for installation of refrigeration systems	5.1 Apply operating principles and specifications of refrigeration systems and equipment to drawing work 5.2 Complete drawing according to mechanical services industry standard for refrigeration systems

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	5.3 Present drawing according to organisational requirements 5.4 Evaluate drawing for system efficiency and make or report potential improvements
6. Consult with other disciplines	6.1 Verify the parameters of the brief and clarify specifications with appropriate personnel 6.2 Identify and consult with support services 6.3 Present and explain drawings at appropriate stages of the project

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.

Available information includes one or more of the following:	• floor plans, elevations, sections and site layout drawings • construction documents • building and coordination information • work specifications • information for plant services equipment • design brief.
Industry standards include one or more of the following:	• National Construction Code (NCC) • Australian Standards (AS) • legislation requirements from Building Practitioners Board • National Gas Act • Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) • third-party manufacturing and installation standards • organisational standards • general practices.

Codes, standards and industry regulations include one or more of the following:	• AS/NZS 1668 The use of ventilation and air conditioning in buildings • AS 1682.1 Fire smoke and air dampers Specification • AS 4254 Ductwork for air-handling systems in buildings • building codes • utilities regulations • WHS codes of practice.
Heating and cooling systems and equipment include one or more of the following:	• boilers • clarifiers • heat exchanges • coils • centrifugal chillers • cooling towers • pumps • valves • auto refill units • expansion tanks • pipe work systems.
Pressure and temperature measurement devices include one or more of the following:	• humidistat • thermostat.
Air conditioning equipment includes one or more of the following:	• fans • air filtration units • heating systems • cooling systems • ducts and grilles • diverters • diffusers • dampers • humidifier/dehumidifier • exhaust hoods.
Exhaust systems include one or more of the following:	• kitchen • fume • dust • smoke • toilet • car park.
Refrigeration equipment includes one or more of the following:	• refrigeration compressors • condensers • evaporative condensers

	• pumps.
Standard drawing conventions include one or more of the following:	• use of correct sectioning technique • identification of cutting plane • accurate line types • appropriate view positions • use of correct symbols • use of correct dimensioning technique • provision of suitable number of views • use of correct scales • neat presentation.
Other disciplines include one or more of the following:	• appropriate personnel: • designer • engineer • supervisor • contractor/consultant • builder • support services: • estimating department and personnel • engineering department and personnel • drafting department and personnel • project manager • factory manager or staff • stakeholders: • team members • cross-function support groups • experts • appropriate licensed technicians and professionals.

Unit Mapping Information

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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>

Assessment Requirements for MEM09206 Produce drawings for mechanical services

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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:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- determining purpose and scope for drawing requirements relevant to the project utilising all available information
- identifying features and location of temperature and pressure, air and fluid measuring devices and standard control devices for inclusion in drawing on at least two occasions
- producing industry standard detail drawings for mechanical services industry on at least two occasions, including installation of heating and cooling systems, air conditioning and exhaust systems and refrigeration systems
- verifying parameters of the design brief with appropriate personnel, ensuring drawing meets requirements
- consulting with appropriate support services and presenting and explaining drawing.

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:

- safe work practices and procedures
- different approaches to drawing
- copyright and intellectual property issues and legislation in relation to drawing
- where to find drawing standards, codes and industry regulations
- quality assurance procedures
- organisational standards for computer-aided drawing (CAD), duct and pipe
- order of drawing process
- SOPs for checking drawings
- layout and presentation requirements
- environmental implications of system inefficiencies
- heating and cooling systems and equipment and their operating principles

- pressure and temperature measurement devices and their operating principles
- air conditioning equipment and their operating principles
- exhaust systems and their operating principles
- refrigeration equipment and their operating principles.

Assessment Conditions

- Assessors must:
 - have vocational competency in producing mechanical services 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.
- Where possible, assessment must occur in operational workplace situations. Where this is not possible or 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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