



Australian Government

Department of Education, Employment and Workplace Relations

MEM09206A Produce drawings for mechanical services

Release: 1

MEM09206A Produce drawings for mechanical services

Modification History

Release 1 - New unit of competency

Unit Descriptor

This unit of competency covers the skills and knowledge required to produce detailed engineering drawings for the installation of heating, ventilation, air conditioning and refrigeration (HVAC/R) systems within the mechanical services industry.

Application of the Unit

This unit is suitable for those working within a drafting work environment in the mechanical services industry. Drawings will usually be carried out with the use of computer-aided design (CAD) systems but may also be done manually. Drawings are produced to Australian Standard (AS) 1100.101–1992 Technical drawing – General principles, from predetermined critical dimensions and specifications. If CAD systems are to be used, the unit MEM30031A Operate computer-aided design (CAD) system to produce basic drawing elements, should also be selected.

Licensing/Regulatory Information

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

Pre-Requisites

MEM09002B	Interpret technical drawing
MEM09204A	Produce basic engineering detail drawings

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	Determine drawing requirements	1.1	Check purpose, scope and information requirements for drawing
		1.2	Interpret available information relevant to project and work requirements, and identify and address further information needs
		1.3	Identify and prepare equipment required to complete work
		1.4	Identify and apply relevant codes, standards and symbols used in the mechanical services industry for installation drawings
		1.5	Identify and access organisational files, templates and symbols as required for work
		1.6	Identify environmental implications of inefficient systems and strategies for minimising impact
2	Identify HVAC/R measuring and control devices	2.1	Identify features and uses of temperature and pressure measurement devices
		2.2	Identify features and uses of air and fluid measurement instruments
		2.3	Identify features and uses of standard control devices and measurement devices
		2.4	Identify location of control and measurement devices on drawings

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| 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, is presented according to organisational requirements and contains all relevant information |
| | | 3.4 | Apply workplace occupational health and safety (OHS) and environmental procedures |
| 4 | Produce drawings for installation of air conditioning and exhaust systems | 4.1 | Apply operating principles and specifications of a range of air conditioning systems and equipment to drawing work |
| | | 4.2 | Apply operating principles and specifications of a range of exhaust systems to drawing work |
| | | 4.3 | Complete drawing according to mechanical services industry standard for air conditioning systems |
| | | 4.4 | Ensure drawing accurately reflects specifications, is presented according to organisational requirements and contains all relevant information |
| | | 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 a range of refrigeration systems and equipment to drawing work |
| | | 5.2 | Complete drawing according to mechanical services industry standard for refrigeration systems |
| | | 5.3 | Ensure drawing is presented according to organisational requirements and contains all relevant information |
| | | 5.4 | Evaluate drawing for system efficiency and make or report potential improvements |

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| 6 | Consult appropriately 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 |

Required Skills and Knowledge

Required skills

Required skills include:

- literacy skills sufficient to read and interpret instructions, relevant codes of practice and specifications for drawing work
- numeracy skills sufficient to interpret technical information and conduct mathematical problem solving as required in the scope of this unit
- using and maintaining drawing equipment
- interpersonal skills to consult with other disciplines
- applying drafting skills, drawing techniques and conventions
- applying codes, symbols and drawing protocols for mechanical services drawings
- applying spatial principles to achieve scale and proportion
- determining and applying operating principles of system equipment to drawing work
- solving problems in order to meet requirements of given specifications
- using drafting equipment appropriate to the drawing method chosen
- recording completed drawings in accordance with industry standards and practices
- handling and storing the approved drawings in accordance with standard operating procedures
- preparing drawing presentation in a manner that makes information accessible and complete
- filing drawings according to workplace procedures
- evaluating work and identifying areas for improvement

Required knowledge

Required knowledge includes:

- general knowledge of different approaches to drawing
- awareness of copyright and intellectual property issues and legislation in relation to drawing
- environmental and OHS issues associated with the tools and materials used for drawing
- quality assurance procedures
- company standards for CAD, duct and pipe
- order of drawing process
- company checking procedures for drawings
- layout and presentation
- operating principles of pressure and temperature measurement devices
- operating principles of heating and cooling system equipment
- operating principles of air conditioning equipment
- operating principles of exhaust systems
- operating principles of refrigeration equipment

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 interpret and apply drawing specifications and industry standards in the production of installation drawings for the mechanical services industry.
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. Specifically the candidate must be able to: • work within typical site/teamwork structures and methods • apply worksite communication procedures • comply with organisational policies and procedures, including quality requirements • participate in work meetings • comply with quality requirements • use industry terminology • apply appropriate safety procedures • demonstrate industry knowledge, including: • industry size, scope of work and economic issues • relevant industrial awards and enterprise agreements • relevant legislative provisions covering discrimination and equal employment opportunity • identify features and uses of componentry and system elements for mechanical services and requirements for documenting on detail drawings • produce industry standard detail drawings for mechanical services industry.
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. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with drafting 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.

Range Statement

Available information	Available information may include: • floor plans, elevations, sections and site layout drawings • construction documents • building and coordination information • work specifications • information for plant services equipment • industry codes, standards and regulations • design brief
Industry standards	Industry standards may include, but are not limited to: • Building Codes of Australia (BSA) • Australian Standards (AS) • legislation requirements from Building Practitioner's Board (RBP) • Australian Gas Codes (AGC) • Sheet Metal and Air Conditioning Contractors National Association (SMACNA) • third-party manufacturing and installation standards • company standards • guidelines • general practices
Codes, standards and industry regulations	Codes, standards and industry regulations may include: • AS/NZS 1668 Set:2005 The use of ventilation and air conditioning in building Set • AS 1682.1–1990 Fire dampers – Specification • AS 4254–2002 Ductwork for air-handling systems in buildings • building codes • gas, water and electricity regulations • OHS codes of practice
Heating and cooling systems and equipment	Heating and cooling systems and equipment may include: • boilers • clarifiers • heat exchanges • coils • centrifugal chillers

	• cooling towers • pumps • valves • auto refill units • expansion tanks • pipe work systems
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Pressure and temperature measurement devices	Pressure and temperature measurement devices may include: • humidistat • thermostat
Air conditioning equipment	Air conditioning equipment may include: • fans • air filtration units • heating systems • cooling systems • ducts, grilles • diverters • diffusers • dampers • humidifier/dehumidifier • exhaust hoods
Exhaust systems	Exhaust systems may include: • kitchen • fume • dust • smoke • toilet and car park systems
Refrigeration equipment	Refrigeration equipment may include: • refrigeration compressors • condensers • evaporative condensers • pumps
Standard drawing conventions	Standard drawing conventions may include: • 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
Appropriate personnel	Appropriate personnel may include: • designer

	• engineer • supervisor • contractor/consultant • builder
Support services	Support services may include: • estimating department and personnel • engineering department and personnel • drafting department and personnel • project manager • factory manager or staff

Unit Sector(s)

Drawing, drafting and design

Custom Content Section

Not applicable.