



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **MEM234034A Manage heating, ventilation, air conditioning and refrigeration systems or projects**

Release: 1

## **MEM234034A Manage heating, ventilation, air conditioning and refrigeration systems or projects**

### **Modification History**

New unit

### **Unit Descriptor**

This unit of competency covers the skills and knowledge required to provide a technical leadership role in the installation, modification, commissioning or ongoing management of heating, ventilation, air conditioning and refrigeration (HVAC/R) systems.

It includes awareness of current options and trends in (HVAC/R) design, analysis of existing sites and systems, interpreting manufacturer specifications, implications of relevant regulations, internal or external client brief, liaison with designers, and ensuring that team members are aware of technical and performance requirements.

### **Application of the Unit**

This unit applies to all forms of manufacturing and engineering where a technician who is providing technical leadership in HVAC/R system projects or management. The unit assumes that the system or modification has already been designed.

The unit applies to individuals who are required to provide high level technical leadership to other members in HVAC/R installation, commissioning, modification, maintenance or management. The other members of the team will normally include engineering tradespersons and may also include technicians and production personnel.

Prior or concurrent experience in the HVAC/R control systems, hydronic and refrigeration systems and thermal loads, electrical principles, controller programming and computing is required.

The unit complements the more general technical leadership and management skills found in MEM234001A Plan and manage engineering-related projects or operations. Informal technical or engineering advice situations are covered by the unit MEM234030A Provide specialised technical and engineering guidance to other technical employees.

This unit does not supply all technical skills and knowledge required for HVAC/R related tasks. The required technical skills will depend on the particular task and will normally be covered through the combined skill and knowledge of the team. However the unit presumes engineering skill and knowledge to at least Advanced Diploma level.

## Licensing/Regulatory Information

Not applicable.

## 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	Identify scope of HVAC/R system installation	1.1	Review HVAC/R system drawings, manufacturer manuals and other technical data for system specifications
		1.2	Determine HVAC/R system performance requirements
		1.3	Determine if any commissioning or modification actions are required to ensure performance requirements are met
		1.4	Determine relevant regulatory requirements
		1.5	Inspect site and any existing HVAC/R equipment to confirm or determine suitability, availability of other services and control requirements
		1.6	Produce or review HVAC/R system management schedule, including any required installation, commissioning, modification or maintenance requirements
		1.7	Integrate building management systems (BMS) considerations into the schedule, where required

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| 2 | Brief team on HVAC/R system work requirements                           | 2.1 | Distribute and discuss drawings, schedules, and major materials and equipment with team  |
|   |   | 2.2 | Arrange for request for further information (RFIs) with designers, where required  |
|   |   | 2.3 | Brief team on key compliance and risk factors, including regulatory, occupational health and safety (OHS) and environmental requirements |
|   |   | 2.4 | Agree with team on critical control points and reporting requirements  |
| 3 | Commence installation, commissioning, modification or maintenance tasks | 3.1 | Supervise any equipment shutdowns required for task  |
|   |   | 3.2 | Confirm availability of equipment components and materials for scheduled tasks   |
|   |   | 3.3 | Check and determine that supply of services to work are adequate for task commencement   |
|   |   | 3.4 | Ensure all tradespersons have correct drawings   |
| 4 | Monitor progress and deal with contingencies                            | 4.1 | Establish procedures to ensure installation, commissioning or modification are against design specifications                             |
|   |   | 4.2 | Ensure electrical and HVAC/R control systems and circuits are consistent with specifications and regulations                             |
|   |   | 4.3 | Identify problems and contingencies and establish and rectify root cause   |
| 5 | Finalise HVAC/R system work requirements                                | 5.1 | Conduct final check to ensure completed work is consistent with drawings, manufacturer manuals and any regulatory requirements           |
|   |   | 5.2 | Conduct test run of equipment and system   |
|   |   | 5.3 | Identify and correct any malfunctions or errors in required output   |

- 6 Conduct handover and finalise documentation
  - 6.1 Brief client and operators on machine or equipment operation after installation
  - 6.2 Prepare and submit any required reports on installation, commissioning or modification

## Required Skills and Knowledge

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

### Required skills

Required skills include:

- performing responsibilities in priority order in accordance with implementation schedules
- investigating and validating performance analysis, modelling and simulation software
- interpreting HVAC/R system specifications, including design and detailed drawings
- identifying sustainability and environmental issues and implications for the HVAC/R system
- selecting and using software and validation techniques, including 2-D and 3-D modelling
- identifying situations and issues that require additional technical or professional assistance
- evaluating solutions for feasibility against the installation, commissioning, modification or maintenance criteria, including relevant engineering and financial calculations and analysis
- establishing budget and control measures for team and incorporation within installation, commissioning or modification project control plan
- delegating roles, responsibilities and levels of authority, as appropriate, to team members
- communicating, negotiating and reviewing with stakeholders and team members throughout duration of installation, commissioning or modification project

### Required knowledge

Required knowledge includes:

- current options and trends in HVAC/R system modelling and simulation software, including underpinning program techniques and software validation techniques
- research and investigations methods
- principles of HVAC/R systems
- types of control equipment
- common HVAC/R system hardware, including industrial and commercial refrigeration systems, hydronic systems and automated controls
- HVAC/R load cycles
- BMS principles
- interface principles for HVAC/R system components
- building management control system software
- dimensions, capacity and position of system components
- electrical, electronic and mechanical features of HVAC/R systems, including interface principles and techniques for electrical, electronic, pneumatic and hydraulic sensors and actuators
- OHS and regulatory requirements, codes of practice, standards, risk minimisation and

registration requirements

## 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.

<p>Critical aspects for assessment and evidence required to demonstrate competency in this unit</p>	<p>Assessors must be satisfied that the candidate can competently and consistently:</p> <ul style="list-style-type: none"> <li>• interpret plans, specifications and other documentation to determine features and performance characteristics and requirements of HVAC/R systems</li> <li>• advise other technicians, tradespersons and production personnel on HVAC/R systems installation, modification, commissioning, operation and maintenance</li> <li>• determine adequacy of standard operating procedures for HVAC/R systems and adjust, if required</li> <li>• check HVAC/R systems for safe operation</li> <li>• determine situations that require other technical and professional assistance</li> <li>• research sustainability implications and current HVAC/R systems design techniques</li> <li>• determine OHS, regulatory and risk management requirements.</li> </ul>
<p>Context of and specific resources for assessment</p>	<ul style="list-style-type: none"> <li>• 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 a simulated working environment 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.</li> <li>• Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.</li> <li>• 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.</li> </ul>
<p>Method of assessment</p>	<ul style="list-style-type: none"> <li>• Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package.</li> </ul>

	<ul style="list-style-type: none"><li>• Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge.</li><li>• Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its correct interpretation and application.</li><li>• Assessment may be applied under project-related conditions (real or simulated) and require evidence of process.</li><li>• Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.</li><li>• Assessment may be in conjunction with assessment of other units of competency where required.</li></ul>
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Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.
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## 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.

<b>HVAC/R system work requirements</b>	<p>HVAC/R system work requirements include:</p> <ul style="list-style-type: none"> <li>• specific installation, commissioning, modification and maintenance projects as well as regular scheduled operation and maintenance tasks identified in the HVAC/R system management schedule</li> </ul>
<b>Sustainability</b>	<p>Sustainability may include:</p> <ul style="list-style-type: none"> <li>• resources and energy</li> <li>• social and economic</li> <li>• life cycle design of product raw material, solids and hazardous waste, and production by-products</li> <li>• contamination of land, air and stormwater pollutants, and discharge to sewerage</li> <li>• climate change</li> </ul>
<b>Appropriate software</b>	<p>Appropriate software may include software for:</p> <ul style="list-style-type: none"> <li>• computer-aided design (CAD)</li> <li>• HVAC/R design and analysis including:                             <ul style="list-style-type: none"> <li>• animation</li> <li>• simulation</li> <li>• modelling</li> <li>• performance analysis</li> </ul> </li> </ul>
<b>Validation techniques</b>	<p>Validation techniques include:</p> <ul style="list-style-type: none"> <li>• comparison of traditional solutions for simple design problems with software solutions to the same design problems</li> <li>• review of previously implemented designs which were completed using the software</li> <li>• use of failure modes and effects analysis (FMEA)</li> </ul>
<b>HVAC/R system</b>	HVAC/R system maintenance refers to maintenance for fitness for

<b>maintenance</b>	purpose and includes: <ul style="list-style-type: none"><li>• safety and integrity of the system</li><li>• adequacy and correct operations of controls</li><li>• user performance requirements</li><li>• adequacy of standard operating procedures for users</li><li>• safe integration with other systems, including mechanical, electrical and fuel-fired equipment</li></ul>
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<p><b>Given environments</b></p>	<p>Given environments may include:</p> <ul style="list-style-type: none"> <li>• workplaces</li> <li>• food halls</li> <li>• restaurants</li> <li>• hotels</li> <li>• hospitals</li> <li>• domestic dwellings</li> <li>• industrial sites, factories, warehouses and cold storage areas</li> <li>• transport and refrigerated vehicles and trains</li> </ul>
<p><b>System specifications</b></p>	<p>System specifications may include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• ducts and duct systems: <ul style="list-style-type: none"> <li>• materials</li> <li>• supports</li> <li>• factory and field fabricated</li> <li>• sealants</li> <li>• layout and placements</li> </ul> </li> <li>• capacity</li> <li>• zoning</li> <li>• heating and cooling loads</li> <li>• air flow and pressures</li> <li>• refrigerants</li> <li>• energy efficiency</li> <li>• air intake points</li> <li>• control equipment</li> <li>• monitoring equipment</li> </ul>
<p><b>BMS</b></p>	<p>BMS include:</p> <ul style="list-style-type: none"> <li>• HVAC/R control systems and may also include fire, security, and lighting controls</li> </ul>
<p><b>OHS requirements</b></p>	<p>OHS requirements may include:</p> <ul style="list-style-type: none"> <li>• OHS Acts and regulations</li> <li>• relevant standards</li> <li>• industry codes of practice</li> <li>• risk assessments</li> <li>• registration requirements</li> <li>• safe work practices</li> <li>• state and territory regulatory requirements</li> </ul>
<p><b>Standards</b></p>	<p>Standards may include:</p> <ul style="list-style-type: none"> <li>• AS 4024.1-2006 Series Safety of machinery</li> <li>• AS/NZS ISO 31000:2009 Risk management – Principles and</li> </ul>

	<p>guidelines</p> <ul style="list-style-type: none"><li>• NOHSC:1010 National standard for plant</li><li>• NOHSC:1014 National standard for the control of major hazard facilities</li><li>• AS 61508.1-2011 Functional safety of electrical/electronic/programmable electronic safety-related systems – General requirements</li></ul>
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## **Unit Sector(s)**

Engineering practice

## **Custom Content Section**

Not applicable.