



Australian Government

Department of Education, Employment and Workplace Relations

MEM234016A Design refrigeration systems

Release: 1

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Modification History

New unit

Unit Descriptor

This unit of competency covers the design of industrial and commercial refrigeration systems and system components. It includes industrial systems with multiple evaporators and compressors, moderate and low temperature, indirect refrigeration and flooded systems, commercial refrigeration and food storage technology, and compliance with safety and regulatory requirements.

Application of the Unit

This unit applies to the design of refrigeration systems across all forms of manufacturing and engineering. Design activities may also include reverse engineering, design rectification or modifications of an existing design. It is suitable for refrigeration system contractors, heating, ventilation, air conditioning and refrigeration (HVAC/R) consultants, designers and maintenance personnel.

Prior experience in the application of HVAC/R principles, evaluation of HVAC/R systems and thermal loads, mathematics and computer techniques is required.

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

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| 1 | Clarify the design task and elaborate the specification | 1.1 | Establish, in consultation with client, required features of refrigeration system and system components |
| | | 1.2 | Determine parameters to the brief or contract |
| | | 1.3 | Determine stakeholders to be consulted in design process |
| | | 1.4 | Assess occupational health and safety (OHS), regulatory, sustainability or environmental issues relevant to design task |
| | | 1.5 | Confirm design brief, including budget and schedule, and provide preliminary advice on feasibility |
| 2 | Prepare concept proposal | 2.1 | Analyse and undertake initial investigations to define refrigeration systems and system components performance parameters |
| | | 2.2 | Carry out required modelling, simulations and calculations using appropriate techniques, software and validation techniques |
| | | 2.3 | Generate a range of refrigeration system solutions |
| | | 2.4 | Check feasibility and evaluate solutions against design criteria ensuring conformity to OHS, regulatory, sustainability and environmental requirements |
| | | 2.5 | Review concept proposals with clients and select preferred solution |

- 3 Design refrigeration system
 - 3.1 Finalise selected refrigeration system design
 - 3.2 Provide documentation, drawings, specifications and instructions
 - 3.3 Consult and negotiate with clients and stakeholders to obtain sign-off on design
 - 3.4 Monitor installation and commissioning with stakeholders, when required, and make any necessary modifications

Required Skills and Knowledge

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

Required skills

Required skills include:

- determining the features and functions of the application, including OHS, regulatory and risk management requirements
- interpreting parameters to the brief or contract
- interpreting standards
- researching latest trends and techniques in design of industrial and commercial refrigeration systems and system components
- investigating and measuring, modelling and calculating for options
- investigating faults in existing designs and arriving at solutions
- simulating and systematically programming and testing
- evaluating solutions for feasibility against design criteria, including relevant engineering and financial calculations and analysis
- communicating, negotiating and reviewing with stakeholders and client throughout process to obtain agreement on proposal and sign-off on design
- documenting design with drawings, specifications and instructions

Required knowledge

Required knowledge includes:

- contemporary refrigeration system design methods
- research and investigations methods
- techniques for:
 - continuous improvement
 - problem solving and decision making
 - root cause analysis (RCA) or failure mode and effects analysis (FMEA) or design review based on failure mode (DRBFM), and Pareto analysis
- OHS, regulatory and environmental requirements for work areas and refrigerated spaces, standards, codes of practice, risk management and organisational procedures related to HVAC/R design, installation, operation and maintenance
- general refrigeration systems and components
- commercial and industrial refrigeration systems and components
- refrigeration system analysis, arrangement and simulation software, use and validation
- principles of food storage technology
- controlling and managing risks associated with food storage
- food processing techniques (types of heat and chill processing techniques)

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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| <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"> • design refrigeration systems and system components • apply safe working practices and procedures • communicate, consult, negotiate and review with client and stakeholders • research and respond to current issues • measure and investigate site and system requirements • model and calculate • use appropriate software and validation techniques • innovate and create for a range of solutions incorporating systems thinking, continuous improvement and constraint and contingency management • evaluate solutions against design criteria • conform to OHS requirements • obtain sign-off on design • document, produce graphics and drawings, specifications and instructions. |
| <p>Context of and specific resources for assessment</p> | <ul style="list-style-type: none"> • 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. • 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. |
| <p>Method of assessment</p> | <ul style="list-style-type: none"> • Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package. • 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. • Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its |

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| | <p>correct interpretation and application.</p> <ul style="list-style-type: none"> • Assessment may be applied under project-related conditions (real or simulated) and require evidence of process. • 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. • Assessment may be in conjunction with assessment of other units of competency where required. |
| 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. |

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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| Refrigeration systems and components | <p>Refrigeration systems and system components include:</p> <ul style="list-style-type: none"> • industrial systems with multiple evaporators and compressors, moderate and low temperature, indirect refrigeration and flooded systems, commercial refrigeration and food storage technology and compliance with safety and regulatory requirements |
| Parameters to the brief | <p>The design brief may include the design of new equipment or fault analysis, rectification or modification to an existing design.</p> <p>Parameters to the design brief may include:</p> <ul style="list-style-type: none"> • determination of the degree of innovation and creativity expected by the client • design process limits and budgets • product cost limits and budgets • performance specifications • equipment availability, capacities and restrictions • specified administrative, communication and approval procedures • other special features and limits in the design brief |
| OHS, regulatory, sustainability and environmental issues | OHS, regulatory, sustainability and environmental issues may include: |

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| | <ul style="list-style-type: none"> • OHS Acts and regulations • relevant standards • industry codes of practice • risk assessments • registration requirements • safe work practices • 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 OHS impact on employees, community and customer • state and territory regulatory requirements |
| Standards and codes | Standards and codes refer to all relevant Australian and international standards and codes applicable to a particular design task |

Unit Sector(s)

Engineering practice

Custom Content Section

Not applicable.