



Australian Government

MEM234015 Design hydronic heat exchanger systems

Release: 1

MEM234015 Design hydronic heat exchanger systems

Modification History

Release 1. Supersedes and is equivalent to MEM234015A Design hydronic heat exchanger systems.

Application

This unit of competency defines the skills and knowledge required to design hydronic heat exchanger systems using steam or water as the heat transfer medium and includes boilers for heat generation, cooling towers and chillers for heat dissipation.

It applies to the design of hydronic heat exchanger systems across all forms of manufacturing and engineering, and design activities can also include reverse engineering, and design rectification or modifications of an existing design. It is suitable for hydronic system contractors, building heating, ventilation and air conditioning (HVACR) consultants, designers and maintenance personnel.

Individuals completing this work either already have or are developing skills and experience in the evaluation of hydronic systems, application of heating, ventilation, air conditioning and refrigeration (HVACR) principles, mathematics and computer techniques.

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

Pre-requisite Unit

Nil

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>
1. Clarify the design brief and specifications for the hydronic heat exchanger system	1.1 Establish required features and performance parameters of a hydronic heat exchanger system 1.2 Confirm technical, commercial and environmental parameters of the brief or contract 1.3 Determine stakeholders to be consulted in design process 1.4 Assess work health and safety (WHS), regulatory, sustainability or

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	environmental issues relevant to the design task 1.5 Confirm design brief, including budget and schedule, and provide preliminary advice on feasibility
2. Evaluate design analysis and prepare concept proposals	2.1 Appraise initial qualitative and quantitative analysis of the design task 2.2 Carry out required detailed modelling and calculations using appropriate software and validation techniques appropriate to the proposed system environment 2.3 Generate solutions for a hydronic heat exchange system that respond to the design brief or contract 2.4 Check feasibility and evaluate solutions against design criteria, ensuring conformity to WHS, air quality, environmental and sustainability requirements 2.5 Present concept proposals to client and select preferred solution
3. Design hydronic system	3.1 Develop the hydronic system design according to preferred solution 3.2 Provide documentation, drawings, specifications and instructions that reflect the design 3.3 Consult with client and stakeholders to obtain sign-off on design 3.4 Monitor installation and commissioning with stakeholders and make any necessary adjustments to design

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.

Hydronic heating systems	a boiler to heat water
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include:	• piping transfer heated water to panel radiators which are installed in each area requiring heating • heat transfer from the panel in each room by natural convection.
Parameters of the design brief include:	• the design of new equipment or fault analysis, rectification or modification to an existing design • 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.
WHS, regulatory, sustainability and environmental issues include:	• WHS acts, regulations and 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 WHS impact on employees, community and customer • state and territory regulatory requirements.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM234015A Design hydronic heat exchanger systems.

Links

Companion Volume Implementation Guides are available on VETNet -

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

Assessment Requirements for MEM234015 Design hydronic heat exchanger systems

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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:

- interpreting features of plant and equipment
- confirming parameters of the brief or contract and providing initial advice based on discipline knowledge, standards, work health and safety (WHS), regulatory and risk assessment requirements
- researching sustainability implications and current industrial design techniques
- investigating faults in existing designs and proposing solutions
- measuring, modelling and calculating using appropriate techniques, software and validation techniques
- innovating and creating solutions, incorporating systems thinking, continuous improvement, and constraint and contingency management
- evaluating solutions against design criteria ensuring conformity to WHS requirements
- designing hydronic heat exchange systems using current design methods on at least two occasions, selecting all required boilers, pumps, cooling towers and chillers
- applying safe working practices and procedures
- communicating, negotiating and reviewing with stakeholders and client throughout the process to obtain agreement on proposal and sign-off on design
- documenting design by producing graphics, drawings, specifications and instructions.

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:

- contemporary engineering design methods
- design brief parameters
- hydronic heat exchange system components including:
 - boilers
 - pumps
 - pipes

- pipe fittings
- cooling towers and chillers
- 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
- documenting design with drawings, specifications and instructions required
- WHS, regulatory and environmental requirements for work areas and refrigerated spaces
- standards, codes of practice, risk management and organisational procedures related to heating, ventilation and air conditioning and refrigeration (HVACR) design, installation, operation and maintenance
- concepts of thermodynamics, hydraulics, properties of substances, conservation of mass and energy principles
- heat transfer including conduction, convection and radiation
- heat exchangers
- water chillers
- pumping systems and cavitation
- practical pump installations and operation problems.

Assessment Conditions

- Assessors must:
 - have vocational competency in designing hydronic heat exchanger systems 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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