Australian Government

MEM23147A Contribute to the design of hydronic systems

Release: 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

MEM23147A Contribute to the design of hydronic systems

Modification History

Release 1 (MEM05v9).

Unit Descriptor

This unit of competency covers the knowledge and skills required to contribute to the design of hydronic systems or for less complex systems to undertake the complete design. The unit includes analysis of characteristics of water flow in a given pipework system; selection and sizing of pipes, fittings, suitable pumps, and associated fittings and valves.

Application of the Unit

The unit applies to heating, ventilation, air conditioning and refrigeration (HVAC/R) technicians in manufacturing, servicing and maintenance enterprises required to undertake design work on hydronic systems. The unit applies to design work undertaken as part of a design team comprising engineers and other technicians and to individual design tasks within the technician's skill and knowledge.

Licensing/Regulatory Information

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

Pre-Requisites

MEM23004A	Apply technical mathematics
MEM23006A	Apply fluid and thermodynamics principles in engineering
MEM23140A	Determine operational parameters for building HVAC/R hydronic systems

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.

Elements and Performance Criteria

1	Prepare design specification	1.1	Obtain and implement work health and safety (WHS) and environmental requirements for a given work area
		1.2	Identify the essential elements of a hydronic system to meet client design brief
		1.3	Consult with appropriate personnel to ensure that work is coordinated effectively with others
		1.4	Obtain equipment and resources needed for the task in accordance with enterprise procedures and check for correct operation and safety
2	Design system	2.1	Select a hydronic system design to meet the client requirements
		2.2	Plan design development work to meet scheduled timelines
		2.3	Check system design draft for compliance with the design brief, regulatory requirements and environmental standards
		2.4	Provide solutions to unplanned situations consistent with enterprise procedures
3	Analyse and adjust system performance	3.1	Apply knowledge of hydronic system operating parameters to analytical solutions to system design
		3.2	Analyse system performance under variable conditions and adjust component selection to meet performance

			criteria
		3.3	Determine fulfilment of required capacity under full and partial load conditions using appropriate resources
4	Validate system design	4.1	Verify final design using enterprise procedures for compliance and regulatory requirements
		4.2	Document final system design using appropriate equipment to industry standards for client approval

Required Skills and Knowledge

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

Required skills

Required skills include:

- interpreting client requirements and specifications
- determine performance aspects of systems
- sizing pipes
- selecting optimum pump performance
- minimising system friction losses
- selecting major system components and materials using manufacturers data
- using relevant software tools effectively
- interpreting drawings and specifications
- communicating effectively with others
- communicating technical and procedural requirements to others
- documenting technical information and designs
- dealing effectively with unexpected situations
- working in teams with others

Required knowledge

Required knowledge includes:

- principles of fluid flow
- pump performance and selection
- pipe sizes
- valve performance and selection
- pressure loss and static head calculations
- calculating system (static and dynamic) head
- optimum pump selection

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.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently: • implement WHS workplace procedures and practices, including the use of risk control measures • demonstrate essential knowledge and skills to design a hydronic system • demonstrate competence within a timeframe typically expected of the discipline, work function and industrial environment • demonstrate the design of a hydronic system consistently for different applications.
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, 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. The assessment environment should not disadvantage the candidate.
Method of assessment	• 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 correct interpretation and application. • 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 not only able 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.

WHS requirements	WHS requirements include: • legislation • protective equipment • material safety management systems • hazardous substances and dangerous goods code • local safe operation procedures
Environmental requirements	Environmental requirements include: • relevant legislation, regulations and codes • correct handling and disposal of liquid and solid waste • elimination or minimisation of gas, fume, vapour and smoke emissions, including fugitive emissions • dust elimination, minimisation and control • minimisation of energy and water use • elimination or control of excessive noise • use and recycling of refrigerants
Appropriate personnel	Appropriate personnel may include: • supervisor • leading hand • foreman • manager • engineer • technician • trainer • mentor • team member • customer

	• client
System operating parameters	System operating parameters include: • pump performance • system friction losses • pipe size
Resources	Resources may include: • manufacturer catalogues • fluids modelling software • scientific calculator • technical charts and tables • building plans • suitable software
Enterprise procedures	Enterprise procedures may include: • the use of tools and equipment • instructions, including job sheets, plans, drawings and designs • reporting and communication • manufacturer specifications and manuals • operational procedures • industry standards
Equipment	Equipment may include: • computer workstation and software, either stand alone or networked • test apparatus • appropriate tools of trade, equipment and materials

Unit Sector(s)

Competency field

Unit sector Engineering science

Custom Content Section

Not applicable.