



Australian Government

UEERA0024 Design hydronic systems and select equipment

Release: 1

UEERA0024 Design hydronic systems and select equipment

Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Application

This unit involves the skills and knowledge required to design hydronic systems and select equipment.

It includes applying processes and methods of hydronic systems, safety and relevant industry standards; developing alternative design schemes based on a design brief and customer requirements; and documenting system designs.

The skills and knowledge described in this unit may, in some jurisdictions, require a licence or permit to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in the workplace and during training is also subject to work health and safety (WHS)/occupational health and safety (OHS) regulations.

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

Pre-requisite Unit

UEERA0004 Analyse vibration and noise in refrigeration and air conditioning systems

UEERA0042 Evaluate thermodynamic and fluid parameters of refrigeration systems

UEERA0001 Analyse the operation of HVAC air and hydronic systems

UEERA0002 Analyse the psychrometric performance of HVAC/R systems
and

UEERA0003 Analyse the thermodynamic performance of HVAC/R systems

Or

UEERA0094 Verify functionality and compliance of refrigeration and air conditioning installations

UEECD0007 Apply work health and safety regulations, codes and practices in the workplace

UEECD0019 Fabricate, assemble and dismantle utilities industry components

UEECD0020 Fix and secure electrotechnology equipment

UEECD0051 Use drawings, diagrams, schedules, standards, codes and specifications

UEECD0016 Document and apply measures to control WHS risks associated with electrotechnology work

UEERA0059 Prepare and connect refrigerant tubing and fittings

UEERA0036 Establish the basic operating conditions of vapour compression systems

UEERA0035 Establish the basic operating conditions of air conditioning systems

UEERA0050 Install refrigerant pipe work, flow controls and accessories

UEERA0081 Select refrigerant piping, accessories and associated controls

UEERA0031 Diagnose and rectify faults in air conditioning and refrigeration control systems

UEERA0092 Solve problems in low voltage refrigeration and air conditioning circuits

UEERL0005 Locate and rectify faults in low voltage (LV) electrical equipment using set procedures

UEERL0004 Disconnect - reconnect electrical equipment connected to low voltage (LV) installation wiring

UEERL0001 Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEERL0002 Attach cords, cables and plugs to electrical equipment for connection to 1000 V a.c. or 1500 V d.c.

Competency Field

Refrigeration and air-conditioning

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to design hydronic systems and select equipment

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

- 1.1** WHS/OHS requirements and workplace procedures for a given work area are identified, obtained and applied
- 1.2** WHS/OHS risk control measures and workplace procedures are followed in preparation for the work
- 1.3** Scope of the proposed hydronic system is determined from the design brief and/or consultations with relevant person/s

	1.4	Design development work is planned in accordance with workplace procedure for timelines in consultation with others involved
2 Design hydronic systems and select equipment	2.1	Relevant hydronic system processes and methods are applied to the design
	2.2	Alternative concepts for design are evaluated in accordance with the design brief
	2.3	Safety, functionality and budgetary considerations are incorporated in the design specifications
	2.4	System design draft is checked for compliance in accordance with the design brief and relevant industry standards
	2.5	System design is documented for submission to relevant person/s for approval
	2.6	Unplanned events are dealt with in accordance with problem-solving techniques and workplace procedures
3 Obtain approval for hydronic system design and equipment selection	3.1	System design is presented to customer and/or relevant person/s
	3.2	Requests for alterations to the design are negotiated with relevant person/s in accordance with workplace procedures
	3.3	Final design is documented and approval obtained from relevant person/s in accordance with workplace procedures
	3.4	Quality of work is monitored in accordance with workplace procedures and relevant industry standards

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Designing hydronic systems must include at least the following:

- two different hydronic systems

Unit Mapping Information

This unit replaces and is equivalent to UEENEEJ145A Design hydronic systems and select equipment.

Links

Companion Volume implementation guides are found in VETNet - -
<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEERA0024 Design hydronic systems and select equipment

Modification History

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least one occasion and include:

- developing outlines of alternative designs
- developing the design within the safety, regulatory, functional requirements and budget limitations
- documenting and presenting design effectively
- successfully negotiating design alteration requests
- obtaining approval for final design
- dealing with unplanned events
- applying relevant work health and safety (WHS)/occupational health and safety (WHS/OHS) requirements, including using risk control measures
- designing hydronic systems and selecting equipment
- preparing to design hydronic systems and select equipment.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of:

- heating, ventilation and air conditioning/refrigeration (HVAC/R) hydronic system design, safe working practices and relevant standards, codes and regulations, including:
 - hydronic system design fundamentals:
 - principles of fluid flow
 - properties of fluids
 - flow of ideal fluids
 - fluid flow equipment
 - Bernoulli Theorem
 - fluid flow in pipes
 - pressure loss and static head – calculation:
 - flow throughout system

- pressure throughout system
- friction losses
- pressure loss charts for: copper, steel and unplasticised polyvinyl chloride (uPVC)
- dynamic losses
- fitting pressure losses
- fitting interaction
- total losses
- calculating system (static and dynamic) head
- pump performance and selection:
 - pump classification and types
 - pump performance terminology, discharge, head, power, efficiency, speed and net positive suction head required
 - pump performance curves
 - pump laws
 - system head and 'K' factor
 - balance points
 - energy considerations
 - pump cavitation
 - calculation of net positive suction head available
 - series and parallel operation
- pipe sizing:
 - maximum friction rate
 - erosion and equipment life
 - industry standards
 - recommended system water velocities
 - economic balance - first cost and operating cost
- hot water systems:
 - boilers
 - coils
 - expansion tanks
 - pumps and characteristics curves
 - control valves, types and flow diagrams
 - air purge points
 - water treatment
 - pipe anchors and expansion joints
- chilled water systems:
 - chillers
 - coils
 - expansion tanks
 - pumps and characteristics curves

- control valves, types and flow diagrams
- air purge points
- water treatment
- pipe anchors and expansion joints
- HVAC/R hydronic systems:
 - systems operation
 - closed/open systems
 - pump head/lift and static head (high-rise building)
 - system friction losses
 - nett positive suction head
 - system curves
- pumps:
 - types
 - selection criteria
 - performance characteristics
 - bladder tanks
 - coil characteristics
 - heat exchangers: plate, shell and tube, and tube in tube
 - flow measurements: types
 - flow switchers
 - builders: types and performance characteristics
 - cooling towers: elementary cooling thermodynamics and types
- valves - flow control devices:
 - types and applications
 - throttling characteristics
 - flow measurements
 - selection and applications
- hydronic system configuration and design:
 - piping configurations
 - single pipe closed circuit
 - two pipe closed circuit
 - direct return
 - three pipe closed circuit with reversed return
 - three-way diverting valves
 - risers and headers
 - component location
- evaluation of piping configurations:
 - capital cost
 - owning and operating costs

- noise vibration
- maintenance
- future expansion
- commissioning and balancing
- operating characteristics
- cavitation
- system pipe sizes:
 - pipe dynamic and friction losses for different materials
 - fitting pressure losses for different materials
 - thermal heat losses
 - bare, insulated and underground pipes
- air conditioning system design
- problem-solving techniques
- relevant job safety assessments or risk mitigation processes
- relevant manufacturer specifications
- relevant WHS/OHS legislated requirements
- relevant workplace budget, quality, policies and procedures
- relevant workplace documentation.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in suitable workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated suitable workplace operational situations that replicate workplace conditions.

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.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or simulations
- relevant and appropriate materials, tools, facilities and equipment currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals

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