Australian Government

Assessment Requirements for UEERA0024 Design hydronic systems and select equipment

Release: 1

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Modification History

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

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

Links

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