Australian Government

Assessment Requirements for UEERE0064 Design renewable energy heating systems

Release: 1

Assessment Requirements for UEERE0064 Design renewable energy heating systems

Modification History

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

This unit replaces and is not equivalent to UEERE0030 Design renewable energy (RE) heating systems. Modifications include:

- Prerequisites changed
- Significant amendments made to Elements and Performance Criteria
- Range of conditions updated
- Updates to performance and knowledge evidence requirements and CVIG content developed
- Assessment conditions updated.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria on at least two occasions and include:

- applying relevant workplace procedures and practices, work health and safety (WHS)/occupational health and safety (OHS) requirements, including using risk control measures
- developing Renewable Energy (RE) system design based on site survey data and within safety and functional requirements and budget limitations and meet design brief
- documenting and presenting final design.

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 the following. Additional advice and definitions for some items is provided in the UEE Training Package Companion Volume Implementation Guide (CVIG).

- heating system technologies including:
  - types and their application
  - operating parameters of common systems
  - system component parameters and specifications
  - system performance and requirements
  - installation specifications and requirements including commissioning
- design of RE heating, including:
  - heat transfer including:

- modes of heat transfer
- conduction through a flat plate, series flat plates, thick and thin wall pipe, and composite pipes (e.g. lagged pipes and drums)
- convection at a flat surface or tube
- radiation from a flat surface or tube for black or grey bodies
- combined conduction and convection through single or multiple flat plates or thin wall tubes
- combined convection and radiation
- combined conduction, convection and radiation such as fluid in a tank (convection to wall), through wall and/or insulation (conduction) to outside air (convection and radiation)
- heat exchangers - parallel, counter flow and cross flow

- combustion and fuels including:
  - the combustion process
  - fuels - desirable and undesirable characteristics, solid, liquid and gaseous types, their relative advantages and disadvantages and common methods of combustion
- steam including:
  - importance of steam for heat transfer and power production
  - steam/water properties and the interrelationship between the various properties for unsaturated or saturated water or steam either superheated, saturated or wet
  - saturation temperature and pressure, specific enthalpy, specific volume and dryness fraction
- refrigeration/heat pump including:
  - basic principles and terminology
  - vapour compression cycle
  - performance criteria
  - types of refrigerant - designation, properties advantages and disadvantages
- daily irradiation including:
  - definition of the terms: declination angle, reflectance, sunshine hours and extra-terrestrial irradiation
  - solar radiation data tables and contour maps
- energy balance including:
  - definitions of the terms: transmittance, absorptance, emittance, specific heat, absorber, heat removal factor and stagnation temperature
  - ways to reduce heat losses from a collector
- solar collector including:
  - five major factors that affect the selection of materials for solar collectors
  - features of collectors for low, medium and high temperature applications in terms of heat transfer, optical properties and materials of construction
- solar collector performance including:
  - instantaneous efficiency of a solar collector for different inlet temperatures and flow

rates
    - effect of varying inlet temperature and flow rate on the performance of a solar collector
- hydraulic circuits including:
    - definition of the terms: equivalent length, static head, dynamic head and heat exchanger
    - function of the components in the circuit
    - effects of water quality on the life and performance of components in the hydraulic circuit
    - suitable type and size components to minimise hydraulic and energy losses, including pipes, pumps, heat exchangers, expansion tanks, valves and filters for a hydraulic circuit with a given flow rate and head
    - safety requirements of the hydraulic circuit in terms of temperature, pressure and hydrogen gas release
    - requirements to balance flow through parallel/series combinations of collector arrays
    - suitable types and level of insulation for system components to minimise heat losses
- domestic solar water heaters including:
    - definition of the terms: thermosiphon system, pumped storage system and sacrificial anode
    - function of the components in a domestic solar water heater, including the collector, storage tank, valves, piping, differential controllers, pumps, insulation and support frames
    - schematic diagram of different types of system configurations showing collectors, storage tank, piping, pumps, filters, valves, heat exchangers and expansion tanks
    - factors which affect system performance, including storage tank and collector design, system location and collector orientation, water quality, hot water demand and usage pattern
    - safety requirements that prevent injury from high temperature water and hydrogen gas explosions during installation, maintenance and use of solar water heaters
    - demand for hot water and irradiation for a given location and collector tilt angle, orientation and shading
    - selection a suitably sized system for a given demand and location
    - consequences of under/oversizing of solar water heating systems in terms of the effect on system performance,
    - installation, commissioning and maintenance requirements for a given situation including location and mounting of collectors, storage tanks, valves, pumps, pipes and ancillary fittings
    - the capital cost, simple pay back and life cycle cost of solar and electric or gas hot water heaters according to Industry Standards
- commercial solar hot water heaters including:
    - schematic diagrams for different types of system configurations showing collectors, storage tank, piping, pumps, filters, valves, heat exchangers and expansion tanks
    - steps involved in the design of a commercial solar water heating system

    - assessment of the demand for hot water and irradiation for a given location and collector tilt angle, orientation and shading
    - selection of a suitably sized system for a given demand and location
    - consequences of under/oversizing of a solar water heating system in terms of system performance,
    - installation, commissioning and maintenance requirements for a given situation, including location and mounting of collectors, storage tanks, valves, pumps, pipes and ancillary fittings
    - the capital cost, simple payback time and life cycle cost of solar and electric or gas hot water heaters according to Industry Standards
- pool solar hot water heaters including:
    - function of the components of solar pool heating systems
    - typical system configuration
    - two factors which affect system performance
    - installation specifications and requirements
- WHS/OHS policy, workplace procedures and instructions
- relevant manufacturer specifications
- relevant Industry Standards.

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
- resources that reflect current industry practices in relation to designing RE heating systems.

Links

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