



Australian Government

UEERA0019 Design complex control systems for refrigeration or heating, ventilation, air conditioning systems

Release: 1

UEERA0019 Design complex control systems for refrigeration or heating, ventilation, air conditioning systems

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 complex control systems for heating, ventilation and air conditioning/refrigeration (HVAC/R) systems.

It includes applying processes and methods of complex control systems for a HVAC/R system, safety and relevant industry standards; developing alternative design schemes based on 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

UEERA0021 Design control systems for refrigeration or heating, ventilation and air conditioning systems

UEERA0060 Produce HVAC/R control system diagrams

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 complex HVAC/R control systems

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 HVAC/R 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 complex HVAC/R control systems	2.1 Relevant complex control 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 complex HVAC/R control systems design	3.1 System design is presented to customer and/or relevant person/s in accordance with workplace procedures
	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 control systems for HVAC/R must • two different complex control systems include at least the following:

Unit Mapping Information

This unit replaces and is equivalent to UEENEEJ146A Design complex control systems for refrigeration or heating, ventilation, air conditioning systems.

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 UEERA0019 Design complex control systems for refrigeration or heating, ventilation, air conditioning systems

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
- negotiating design alteration requests successfully
- 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 complex heating, ventilation and air conditioning/refrigeration (HVAC/R) control systems
- preparing to design complex HVAC/R control systems.

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:

- complex HVAC/R control system design, safe working practices and relevant standards, codes and regulations, including:
 - advanced HVAC/R control system design:
 - control diagrams:
 - Australian standard and non-standard symbols as used in a variety of typical HVAC/R systems
 - control diagrams
 - electric/electronic control diagrams
 - electrical installation documents

- pneumatic diagrams
- direct digital control (DDC) diagrams
- controls/electrical power circuit interface
- nomographs
- extraction of specific information relating to the operation and control of plant from a variety of typical HVAC/R control diagrams
- development of control diagrams to required standards given specific system operating parameters
- control design requirements:
 - standard and statutory requirements
 - economy of operation (energy management)
 - the desired or most appropriate system operating logic for a specified HVAC/R system
 - appropriate mode of control for a specified HVAC/R system
 - control system type selection for specific applications with due regard to plant size, application, operating environment, available control power supply options, economy and computability to existing or proposed plant and control system
 - components required to assemble and operate the control system of a specified HVAC/R system
- HVAC/R system energy conservation methods:
 - HVAC/R system control:
 - night cycle
 - optimum stop/start
 - purge cycles
 - chiller/boiler/cooling tower sequencing
 - economy cycles (based on temperature or enthalpy)
 - supply air reset
 - condenser water temperature reset
 - electrical load control:
 - power demand control
 - load limiting
 - load shedding
 - set point relaxation
 - ventilation cycles
- building management systems:
 - functions of a building management system:
 - autonomous functions
 - input/output (I/O)
 - general I/O
 - installation management items
 - energy management

- risk management
- information processing
- objectives
- building running costs
- smoke control as per AS 1668.1 The use of ventilation and air conditioning in buildings - Fire and smoke control in buildings
- building management system hardware:
 - system architecture
 - communication devices
 - substations
 - personal computers
 - interfaces with other systems
- I/O functions:
 - digital - I/O
 - digital output with status feedback
 - analogue input/output
 - sensors
 - alarms
- control sequences
- 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>