



Australian Government

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

Release: 1

UEERA0021 Design control systems for refrigeration or heating, ventilation and 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 control systems for heating, ventilation and air conditioning/refrigeration (HVAC/R) systems.

It encompasses applying processes and methods of HVAC/R control systems components, safety and relevant industry standards. It also includes following design specifications 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

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 control systems for HVAC/R

PERFORMANCE CRITERIA

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

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|------------|--|
| 1.1 | WHS/OHS requirements and workplace procedures for a given work area are identified, obtained and applied |
| 1.2 | Scope of the HVAC/R system is determined from design specifications and/or in consultations with relevant person/s |
| 1.3 | Safety and systems are identified, obtained and applied in accordance with relevant industry standards |

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| | 1.4 | Work supervisor and/or customer/s are consulted to determine functions and parameters of the system required in accordance with design specifications and workplace documentation |
| | 1.5 | Design development work is planned in accordance with workplace procedures for timelines in consultation with others involved |
| 2 | Design control systems for HVAC/R | |
| | 2.1 | WHS/OHS risk control measures and workplace procedures for carrying out the work are followed |
| | 2.2 | Relevant control system components are applied to developing the system design in accordance with workplace procedures and relevant industry standards |
| | 2.3 | Safety, functionality and budgetary considerations are incorporated into the design |
| | 2.4 | Control equipment required is selected in accordance with design specifications and workplace procedures |
| | 2.5 | Location of components are documented in accordance with workplace procedures and operation of system functions |
| | 2.6 | Control system design draft is checked for compliance in accordance with the design brief and relevant industry standards |
| | 2.7 | Control system design is documented and submitted to relevant person/s for approval |
| | 2.8 | Unplanned events are dealt with in accordance with problem-solving techniques and workplace procedures |
| 3 | Obtain approval for control systems for HVAC/R systems design | |
| | 3.1 | Control system design is presented and explained 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 |
| | 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 include at least the following:
- two different HVAC/R systems, including one of the following:
 - condenser
 - compressor
 - evaporator
 - associated components and controls

Unit Mapping Information

This unit replaces and is equivalent to UEENEEJ135A Design control systems for refrigeration or heating, ventilation and 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 UEERA0021 Design control systems for refrigeration or heating, ventilation and air conditioning systems

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:

- understanding required operating functions and parameters from the design specification
- developing the design within the safety, regulatory and 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 (OHS) requirements, including using risk control measures
- designing control systems for heating ventilation and air conditioning/refrigeration (HVAC/R) systems
- preparing to design control systems for HVAC/R.

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:

- HVAC/R design control systems, system operating requirements, integration of electrical, electronic, pneumatic and digital controls, safe working practices and relevant standards, codes and regulations, including:
 - control systems:
 - control terminology
 - control system characteristics
 - control system diagrams and symbols
 - types of control equipment:
 - electrical:

- classification of circuits
 - two position control
 - floating control
 - sensors
 - controllers
 - flow control devices
 - control systems diagrams
- electronic:
 - operating principles
 - sensors
 - controllers
 - control system diagrams
- pneumatic:
 - control fundamentals:
 - pneumatic control terminology
 - definitions
 - control basics:
 - air supply
 - pilot bleed system
 - signal amplifier
 - sensing elements
 - relays and switches
 - air supply system:
 - air drying methods
 - pressure regulating valves
 - pressure reducing valves
 - system controllers:
 - thermostats
 - sensors
 - actuators
 - dampers
 - system control configuration:
 - sequence control
 - limit control
 - changeover control
 - compensated control
 - recycling control
 - pneumatic – electric control
 - control systems

- digital control systems:
 - computer-based control fundamentals
 - definitions
 - principles
- controller configuration:
 - equipment
 - zone level controllers
 - system level controllers
- controller software:
 - operating software
 - application software
- controller programming:
 - system diagrams
 - control diagrams
 - configuration
 - programming
 - initialisation
 - EMS and BMS
 - supervisory control and data acquisition (SCADA) system
 - lan and Bacnet
- applications:
 - refrigeration systems
 - HVAC systems:
 - air handling system controls
 - ventilation
 - heating
 - building airflow system control
 - airflow control
 - single and multi-zones
 - chiller boiler and distribution system
 - logic analysis
 - energy management
 - asset management
 - life cycle
 - supervisory:
 - introduction building management
 - remote building control interface and modem
- problem-solving techniques
- relevant industry standards, codes of practice, regulations and industry practices

- 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 suitable simulated 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 other simulations
- relevant and appropriate materials, tools, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

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