



Australian Government

UEERA0016 Design commercial refrigeration systems and select components

Release: 1

UEERA0016 Design commercial refrigeration systems and select components

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 commercial refrigeration systems and select components.

It includes applying processes and methods of refrigeration and food storage technology, refrigeration system components and piping, and safety and regulatory requirements. It also includes following design specifications and customer requirements, documenting system designs and obtaining approval for engineering computer applications design.

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

UEERA0034 Establish heat loads for commercial refrigeration and/or air conditioning applications

UEERA0042 Evaluate thermodynamic and fluid parameters of refrigeration systems

UEERA0038 Establish the thermodynamic parameters of refrigeration and air conditioning 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 commercial refrigeration systems

PERFORMANCE CRITERIA

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

1.1 WHS/OHS procedures are identified, obtained and implemented in accordance with workplace procedures

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|----------|--|--|
| | 1.2 | Scope of the refrigeration system is identified from design specifications |
| | 1.3 | System safety, regulatory and compliance requirements are identified and applied |
| | 1.4 | Work supervisor and/or customer/s are consulted to determine functions and parameters of the system in accordance with relevant documentation |
| | 1.5 | Design development work is planned in consultation with relevant person/s involved to meet scheduled timelines |
| 2 | Design commercial refrigeration systems | |
| | 2.1 | WHS/OHS risk control measures and procedures are followed in accordance with workplace procedures |
| | 2.2 | Relevant refrigeration, food storage, technology refrigeration system components, piping and performance standards are applied to the system design in accordance with relevant industry standards |
| | 2.3 | Safety, functionality and budgetary considerations are incorporated in the design specifications |
| | 2.4 | Equipment required is selected in accordance with design specifications and workplace procedures |
| | 2.5 | Location of components in the system is documented in accordance with workplace procedures and operation of system functions |
| | 2.6 | System design draft is checked for compliance in accordance with design brief and relevant industry standards |
| | 2.7 | System design is documented and submitted to relevant person/s for approval in accordance with workplace procedures |
| | 2.8 | Unplanned events are dealt with in accordance with problem-solving techniques and workplace procedures |
| 3 | Obtain approval for commercial refrigeration 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 commercial refrigeration systems must include at least the following:

- two different commercial refrigeration systems with one of the following:
 - condenser
 - compressor
 - evaporator
 - associated components and controls

Unit Mapping Information

This unit replaces and is equivalent to UEENEEJ132A Design commercial refrigeration systems and select components.

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 UEERA0016 Design commercial refrigeration systems and select components

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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 commercial refrigeration systems
- preparing to design commercial refrigeration 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:

- commercial refrigeration system design, safe working practices and relevant standards, codes and regulations, including:
 - food spoilage and possible causes:
 - physical damage
 - animal activity
 - chemical breakdown
 - enzyme activity
 - microorganisms
 - effects of temperature change
 - effects of humidity change
 - effects of freezing on fresh produce

- effects of slow freezing time
- effect of refreezing
- food preservation:
 - removing or taking out a reactant
 - removing or inactivating the catalyst
 - reducing temperature
 - changing the reaction system
 - irradiation
- microorganisms:
 - conditions for growth
 - potentially hazardous foods
 - cross-contamination
- identification of food spoilage:
 - recognition and suggest possible cause
 - physical damage
 - animal activity
 - chemical breakdown
 - enzyme activity
 - microorganisms
- types of heat processing techniques:
 - heat processing using steam and water
 - blanching
 - pasteurisation
 - sterilisation
 - evaporation
 - heat processing using hot air
 - dehydration
 - baking and roasting
- types of chilling processing techniques:
 - chilling and controlled atmosphere storage
 - freezing
 - freeze drying and freeze concentration
 - modified atmosphere combined with low temperature cryovac
- equipment manufactures specifications and practices
- refrigeration system components and piping selection, safe working practices and relevant standards, codes and regulations, including:
 - relevant industry practices:
 - AS/NZS 1677 Refrigerating systems SAA refrigeration code
 - AS/NZS 3666 Air-handling and water systems of buildings
 - ozone protection regulations

- IAR ammonia data book
- ANSI/IAR standards
- ANSI/ASHRAE mechanical refrigeration and IAR
- bulletins and standards
- equipment manufacturer's specifications and practices
- calculation of capacity in heat exchangers:
 - $Q = UA (LMTD)$
 - $Q = mc\Delta t$
 - $Q = m \Delta h$
- evaporators:
 - commercial types and applications
 - coil bypass factor
 - effects of evaporator TD on space humidity
 - effects of air circulation on product conditions
 - selection criteria and selection tables
- condensers:
 - commercial types and applications
 - effects of ambient conditions
 - condenser control
 - heat rejection factor
 - condenser TD
 - selection criteria and selection tables
- compressors:
 - types and applications
 - capacity
 - displacement
 - volume flow rate
 - theoretical capacity
 - total volumetric efficiency
 - effect of operating conditions, including suction
 - pressure drop and superheating
 - actual capacity
 - power
 - theoretical requirement
 - effects of operating conditions
 - actual requirements
 - post defrost loads
 - pull down torque requirements, high and medium
 - and low back pressure compressors

- selection tables, motor selection
- liquid expansion devices:
 - types, operation and applications
 - effects from sub-cooling
 - distributor types, operation and applications
 - selection tables
 - system load balance point
 - graphical representation
 - line sizing and design
 - velocity tables
 - pressure drop in lines and fittings
 - oil migration stabilisation
 - refrigerant velocity
 - effect of varying system capacity
 - oil traps
 - risers
 - double risers
 - liquid migration
 - design for parallel components and multiplex systems
- automatic controls:
 - fin spacing, suction temp to evaporator suction
 - hot-gas bypass valves
 - electronic control of valves and programmable logic controllers (PLC)
 - refrigerant regulating valves
 - solenoid valves
 - condenser pressure regulating valves
 - evaporator pressure regulating valves
 - crankcase pressure regulating valves
 - cycling controls
 - pressure-stats
 - thermostats
 - defrost controls
 - monitoring and alarm controls
 - refrigeration automation systems
 - control strategies
 - control modes
- relevant job safety assessments or risk mitigation processes
- 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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