



Australian Government

UEERA0015 Design carbon dioxide refrigerated systems

Release: 1

UEERA0015 Design carbon dioxide refrigerated 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 carbon dioxide (CO₂) refrigerated systems.

It includes applying refrigeration systems, safety and relevant industry standards; developing alternative design schemes based on a design brief and customer requirements; and documenting system 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

UEERA0016 Design commercial refrigeration systems and select components

UEERA0006 Apply safety awareness and legal requirements for carbon dioxide refrigerant

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

UEECD0042 Solve problems in ELV single path circuits

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 CO² refrigeration 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 Scope of the refrigeration system is determined from design specifications and/or consultations with relevant person/s
 - 1.3 Safety and system are identified, obtained and applied in accordance with relevant industry standards
 - 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 CO² refrigeration systems**
 - 2.1 WHS/OHS risk control measures and workplace procedures for carrying out the work are followed
 - 2.2 Relevant CO² refrigeration system analysis, components and piping 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 in the installation specifications
 - 2.4 Equipment required is selected in accordance with the design specifications and workplace procedures
 - 2.5 Location of components is documented in accordance workplace procedures and operation of system functions
 - 2.6 System design draft is checked for compliance in accordance with the design brief and relevant industry standards
 - 2.7 System design is documented for submission 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 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 CO₂ refrigeration systems must include at least the following:

- two of the following:
 - two sub-critical or
 - two trans-critical or
 - one sub-critical and one trans-critical
- major components:
 - cooler
 - condenser
 - compressor
 - evaporator
- associated components and controls

Unit Mapping Information

This unit replaces and is equivalent to UEENEEJ187A Design carbon dioxide refrigerated 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 UEERA0015 Design carbon dioxide refrigerated systems

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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
- 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 carbon dioxide (CO²) refrigeration systems
- preparing to design CO² 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, and performance criteria and range of conditions and include knowledge of:

- CO² refrigeration system design requirements, components and piping design requirements, safe working practices and relevant standards, codes and regulations, including:
 - technical standards, regulations and codes for carbon dioxide refrigeration systems:
 - standard philosophy and format
 - standards, regulations and codes that apply to CO₂ refrigeration systems
 - equipment manufacturer's specifications
 - CO² refrigeration system design requirements:
 - possible areas of applications of CO₂ refrigeration systems:
 - mobile air conditioner
 - heat pump water heater
 - commercial refrigeration

- thermodynamic properties of CO₂:
 - CO₂ phase diagram
 - CO₂ properties tables and chart
- conventional refrigeration cycle versus CO₂ refrigeration cycle:
 - T-s and p-h diagram representations
 - isentropic efficiency
 - volumetric efficiency
- types of CO₂ refrigeration system configurations:
 - sub-critical operation
 - trans-critical operation
 - cascade systems
- performance analysis of CO₂ refrigeration systems
 - sub-critical cycle
 - trans-critical cycle
 - cascade systems
- CO₂ refrigeration system components and piping:
 - design preliminaries:
 - system operating parameters
 - project specifications
 - equipment selection criteria
 - selection tables, charts and catalogues
 - heat exchanger selection:
 - selection of evaporators
 - selection of condensers
 - selection of coolers
 - compressor selection
 - liquid expansion devices selection
 - system load balance point
 - refrigeration line design and sizing
 - automatic controls
 - safety devices
- problem-solving techniques
- 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.

Links

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