Australian Government

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

Release: 3

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

UEENEEJ107A Install air conditioning and refrigeration systems, major components and associated equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1)**

1.1) Descriptor

This unit covers the installation of refrigeration and air conditioning systems including unitary equipment, compressors, condensers, evaporators, liquid receivers, , pipework, ventilation and air handling (excluding central plant) and associated equipment. It encompasses working safely and to installation standards to match equipment with that specified for a given specification and location, connecting pipe work and components, and complete the necessary installation documentation.

Application of the Unit

Application of the Unit **4)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training and may be used to augment other electrotechnology qualifications at AQF 3 level or higher.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ170A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components

Prerequisite Unit(s) **2)**

UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103A	Establish the basic operating conditions of vapour compression systems
UEENEEJ108A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ194A	Solve problems in low voltage refrigeration circuits
UEENEEJ153A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

Employability Skills Information

Employability Skills **3)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to install refrigeration and air conditioning systems, major components and associated equipment	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented
	1.4	The nature and location of the work is determined from documentation or appropriate person(s) to establish the scope of work to be undertaken.
	1.5	Component and equipment installation is appropriately sequenced in accordance with job

ELEMENT	PERFORMANCE CRITERIA	
		schedule
	1.6	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.7	Materials needed to install components, equipment and pipe work are obtained in accordance with established procedures and checked against job requirements
	1.8	Tools, equipment and testing devices needed to install the components,equipment and pipework are obtained in accordance with established procedures and checked for correct operation and safety
	1.9	Preparatory work is checked to ensure no damage has occurred and complies with requirements
2 Install refrigeration and air conditioning systems, major components and associated equipment	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3	Components,equipment and pipework are installed to comply with technical standards, job specifications and requirements with sufficient access to affect electrical connections and maintenance.
	2.4	Components, equipment and pipework are installed straight and square in the required locations and within acceptable tolerances.
	2.5	Refrigerant tubing and fittings are silver brazed with the use of dry nitrogen to prevent contamination.
	2.6	Problematic situations that arise from the installation of components, equipment and pipework are dealt with in an appropriate manner.

ELEMENT	PERFORMANCE CRITERIA	
	2.7	Ongoing checks of the quality of pipe work are undertaken, including pressure testing and repair of leaks in accordance with the relevant technical standards and specifications and established procedures.
	2.8	Components, equipment and pipework are installed efficiently without waste of materials or damage/contamination to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete installation.	3.1	OHS risk control measures and procedures at the completion of work are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Final check of the installed components, equipment and pipework is made to verify that it complies to all requirements
	3.4	'As-installed' components, equipment and pipework is documented and an appropriate person or persons notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing refrigeration and air conditioning systems, major components and associated equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ107A Refrigeration and air conditioning refrigeration systems, major components and associated equipment installation

Evidence shall show an understanding of refrigeration and air conditioning refrigeration systems, major components and associated equipment installation, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Refrigeration equipment installation requirements and procedures

- Standards, codes and requirements applicable to installing refrigeration equipment
- Environmental and building regulations
- Major components and associated equipment including condensing units, compressors, condensers, cooling towers, liquid receivers, evaporators, fan coil units, package units, fans and air distribution equipment, pumps
  - Functions, types, operation and applications
  - Installation techniques encompassing: manufacturers specifications and installation instructions; locating and placing major components
- Accessories installation
- Connecting piping
- Maintenance of fire rating integrity.

T2 Cool room and freezer room systems installation requirements and procedures

- Food spoilage encompassing; Effects of storage conditions, Controlled atmosphere, Relative humidity, Evaporator temperature difference, Room design conditions
- Room types and construction encompassing; Pre-fabricated and permanent type walk-in cool rooms and freezer rooms, Construction, Insulation, Vapour barrier, Frost heave, Interior fittings
- Layouts and installation encompassing; Location of equipment, Equipment site arrangements and building services, Access and obstructions, Power supply and electrical services, Arrangement of piping

REQUIRED SKILLS AND KNOWLEDGE

- Components and features encompassing; Refrigerant controls, Evaporators, Solenoid valves, Crankcase pressure regulators, Defrosting method and mullions, Drain facilities and heaters, Pressured relief valves, Door hardware, Lighting and germicidal lamps
- System and defrost controls encompassing; Operating conditions, Thermostat and pressure controls, Defrost timers and controllers, Overloads and safety control, Electrical power and control circuits
- Manufacturers specifications and installation instructions
- Relevant Standards, codes and Regulation requirements
- Relevant Public Health requirements

T3 Merchandising and display cabinets installation requirements and procedures

- Types and construction encompassing: Deep freeze meat, dairy, and fruit and vegetables, Multi deck display type, Single deck, well type and island cases, Glass door/reach-in merchandiser
- Components and features encompassing: Condensing units, Refrigerant controls, Evaporators and fans, Defrosting method and mullions, Drain facilities and drain heaters, Air distribution and air-flow, curtains, Cabinet air temperature, velocity and direction, Accessories, Lighting
- Layouts and installation encompassing: Location of equipment, Equipment site arrangements and building services, Access and obstructions, Power supply and electrical services, Arrangement of piping
- System and defrost controls encompassing: Operating conditions, Alarm systems, Thermostats and pressure controls, Defrost timers and controllers, Electrical power and control circuits
- Multiple systems encompassing: Multiple compressors, Multiple evaporators, Heat reclaim systems, Multi-temperature accessories, Controls and sequencing,
- Manufacturers specifications and installation instructions
- Relevant Standards, codes and Regulation requirements
- Relevant Public Health requirements

T4 Residential air conditioning systems installation requirements and procedures

- Types, components, construction, operation and application of residential air conditioners encompassing: Types: window mounted, high wall, floor and ceiling mounted, cassette and ducted, Typical applications for various types of systems, Components, Construction and Operation of the major components within a system. air distribution, Flexible ducting and associated fittings, fans, filters, noise and vibration, Control systems, Operation of a typical system including reverse cycle
- Procedures for selecting a system for a specific application encompassing; Determining heat load sources using estimating methods and manufacturers data, unit and associated equipment selection
- Installation of unit and pipework encompassing: Respect for customers premises, Unit location and mounting, Flexible ducting and associated fittings, Fixing, securing and mounting methods, Safe lifting, use of ladders and platforms,

REQUIRED SKILLS AND KNOWLEDGE

Manufacturers installation, Refrigerant piping: layout, installation, insulation, fastening and covering, Condensate drains and pumps

- Starting up system encompassing: Manufacturers start up instructions - pressure testing, evacuation, opening outdoor unit valves, checking refrigerant charge: pressures, temperature, sweat line and evaporator superheat, adding refrigerant, leak detection, controls - operating and safety, customer familiarisation
- Relevant Standards, codes and Regulation requirements

T5 Package air conditioning systems installation requirements and procedures

- Air conditioning design conditions encompassing temperature, humidity and ventilation
- Package air conditioning systems types, construction, components, ancillary equipment, applications and operating conditions
- Layouts and installation encompassing; Location of equipment, Equipment site arrangements and building services, Access and obstructions, Power supply and electrical services, Arrangement of piping
- System controls encompassing; Thermostat and pressure controls, timers and controllers, overloads and safety control, electrical power and control circuits
- Manufacturers specifications and installation instructions
- Relevant Standards, codes and Regulation requirements
- Relevant Public Health requirements

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this Unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum,

EVIDENCE GUIDE

the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

EVIDENCE GUIDE

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Install refrigeration and air conditioning systems, major components and associated equipment as described in 8) and including:

    A Reading and interpreting drawings related to pipe work layouts and apparatus locations.

    B Placing, aligning and securing components and equipment to comply with requirements

    C Connecting components, equipment and pipe work to comply with requirements.

    D Cleaning system of contaminants.

    E Ensuring system will not leak under pressure.

    F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

EVIDENCE GUIDE

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Evidence should show demonstrated competency in installing refrigeration and air conditioning systems, major components and associated equipment.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEJ106A	Install refrigerant pipe work, flow controls and accessories

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to installing refrigeration and air conditioning systems systems including unitary equipment, major components, pipework, ventilation and air handling (excluding central plant) and associated equipment. for at least 2 different types of refrigeration and/or air conditioning systems.

Major components shall include refrigeration compressors, condensers, condensing units, evaporators, liquid receivers , cooling towers, fans and pumps.

Associated equipment shall include refrigerant flow controls, cycling controls, safety controls and isolation, monitoring and inspection accessories.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5**)

Refrigeration and Air Conditioning