



**Australian Government**

**UEENEEJ176A Install and commission  
hydrocarbon refrigeration systems,  
components and associated equipment**

**Release: 3**

# **UEENEEJ176A Install and commission hydrocarbon refrigeration systems, components and associated equipment**

## **Modification History**

Not Applicable

## **Unit Descriptor**

### **Unit Descriptor**

1)

#### **1.1) Descriptor**

This unit covers specialised procedures for the installation and commissioning of refrigeration equipment using Hydrocarbon as the refrigerant. It encompasses working safely and to installation standards matching equipment, location, components and piping to given specifications. After installation, to commission the complete system including: pre commissioning tests, starting the system, ensuring correct refrigerant charge, basic air or water balancing, adjusting components and controls to efficient operation. Completing all necessary installation and commissioning documentation.

## **Application of the Unit**

### **Application of the Unit** 4)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Delivery and assessment of this unit should be undertaken

## **Application of the Unit 4)**

within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the 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 and 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, risk safety measures etc.

## Licensing/Regulatory Information

### 1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a licence to practise 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.

UEENEEJ113A Commission air conditioning and refrigeration systems

UEENEEJ174A Apply safety awareness and legal requirements for hydrocarbon refrigerants

UEENEEJ175A Service and repair self contained hydrocarbon air conditioning and refrigeration systems

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

UEENEOP017A Locate and rectify faults in low voltage composite appliances using set procedures

**Prerequisite Unit(s)**

**2)**

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

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

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

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

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

and

UEENEEJ174A Apply safety awareness and legal requirements for hydrocarbon refrigerants

and

**Prerequisite Unit(s)**

**2)**

UEENEEJ155A Service refrigeration appliances

UEENEEJ054B Find and rectify faults in appliance motors and associated controls

UEENEEJ062B Find and rectify faults in appliance motors and associated controls

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

UEENEEJ195A Establish the basic operating conditions of vapour compression systems - appliances

and

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

or

UEENEEJ153A Find and rectify faults motors and associated controls in refrigeration and air conditioning systems

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEE101A Apply Occupational Health and Safety

**Prerequisite Unit(s)**

**2)**

regulations, codes and practices in the workplace

UEENEEE003B Solve problems in extra-low voltage single path circuits

or

UEENEEJ111A Diagnose and rectify faults in air conditioning and refrigeration systems and components

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

UEENEEP017A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE003B Solve problems in extra-low voltage single path circuits

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

UEENEEJ104A Establish the basic operating conditions of air conditioning systems

UEENEEJ106A Install refrigerant pipe work, flow controls and accessories

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

UEENEEJ108A Recover, pressure test, evacuate, charge and leak test refrigerants

UEENEEJ110A Select refrigerant piping, accessories and associated controls

UEENEEJ170A Diagnose and rectify faults in air conditioning and refrigeration control systems

**Prerequisite Unit(s)**

2)

UEENEEJ194A Solve problems in low voltage refrigeration circuits

UEENEEP012A Disconnect / reconnect composite appliances connected to low voltage installation wiring

Note:

UEENEEJ113A - Those holding a 'Certificate III in Refrigeration and Air Conditioning trade qualification or equivalent" meet the requirements of these units and their pre-requisite requirements.

## **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 must be consistent with the evidence guide.



## Elements and Performance Criteria

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
1 Prepare to install and commission Hydrocarbon refrigeration systems	1.1 OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2 OHS procedures for a given work area are identified, obtained and understood
	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 work is determined from documentation or appropriate person(s) to establish the scope of work to be undertaken
	1.5 Component, equipment installation and commissioning work is appropriately sequenced in accordance with job 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 pipework are obtained in accordance with established procedures and checked against job requirements
	1.8 Tools, equipment and testing devices needed to install and commission the components and equipment are obtained in accordance with established procedures and checked for correct operation and safety
	1.9 System control setting and operating parameters are determined from job specifications and requirements
	1.10 Preparatory work is scheduled to ensure no damage has occurred and complies with requirements

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
2 Install Hydrocarbon refrigeration systems.	2.1 Established 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 with OHS requirements and procedures
	2.3 Components and equipment are installed to comply with technical standards, job specifications and requirements with sufficient access to affect electrical and pipework connections and maintenance
	2.4 Components and equipment 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 and equipment are dealt with in an appropriate manner
	2.7 Ongoing checks of the quality of pipework are undertaken, including pressure testing and repair of leaks in accordance with the relevant technical standards and specifications and established procedures
	2.8 Components and equipment are installed efficiently without waste of materials or damage/contamination to apparatus and the surrounding environment or services and using sustainable energy practices
3 Commission Hydrocarbon systems	3.1 Refrigeration system pressure controls, valves and regulators are adjusted to their required settings
	3.2 Testing/measuring devices are used to observe the operation of the refrigeration system and fine adjustments of controls are made as necessary
	3.3 Unexpected situations are dealt with safely and

**ELEMENT**

**PERFORMANCE CRITERIA**

- with the approval of an authorised person
- 3.4 Commissioning is conducted efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices
- 4 Complete installation and commissioning work
- 4.1 OHS work completion risk control measures and procedures are followed.
- 4.2 Work site is cleaned and made safe in accordance with established procedures.
- 4.3 Final check of the installed components and equipment is made to verify that it complies to all requirements
- 4.4 'As installed' components and equipment is documented and an appropriate person or persons notified in accordance with established procedures
- 4.5 Results of commissioning are documented including final operating parameters 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 and commissioning refrigeration systems and associated equipment to be charged with a hydrocarbon refrigerant.

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

#### **KS01-EJ176A Installation and commissioning techniques for Hydrocarbon refrigeration Systems**

Evidence shall show an understanding of installation and commissioning techniques for hydrocarbon refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Special features for hydrocarbon system

- Compatibility Issues
  - Major components
  - Materials/substances
  - Metering devices
  - Regulating valves
  - Electrical controls
  - Tools
- Refrigerant leakage
- Enclosures

T2 Codes, regulations and standards

- EN378
- AS 1677.1
- ANZ Refrigerant Handling Code of Practice 2007- Part 1

T3 Site Arrangements

- Building services
- Piping requirements for hydrocarbons
- Suitable Equipment locations

T4 Site Safety

- Hazards
- Checklist

## REQUIRED SKILLS AND KNOWLEDGE

- Report

### T5 System diagrams

- Mechanical layouts
- Electrical circuits

### T6 Installation

- Assembly
- Pressure Testing
- Evacuation
- Charging
- Leak Detecting

### T7 Commissioning

- Pressure Temperature relationships for hydrocarbon refrigerants
- Evaporator Td's for hydrocarbon systems
- Condenser Td's for hydrocarbon systems
- Cycling control settings
- Safety control settings
- Regulator settings
- Refrigerant metering device settings

## 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 issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed 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 must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence must 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 must 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:
  - Pressure testing, charging/discharging refrigerant/lubricants and determining the operating conditions of Hydrocarbon vapour compression and liquid recirculation refrigeration system. as described in 8) and including:
    - A Reading and interpreting drawings to pipe work layouts and apparatus locations.
    - B Installing, connecting , securing and aligning components and equipment and ensuring that all equipment and pipe work is compliant with codes and regulations
    - C Pressure testing entire system at the appropriate design test pressures using dry nitrogen
    - D Removing system contaminants and evacuating
    - E Selecting and using appropriate measuring devices correctly
    - F Recording measurements
    - G Using calculation methods accurately

## EVIDENCE GUIDE

- H Discharging / charging refrigerant / lubricants and pressure testing the system without damage to components
- I Locating and rectifying leaks
- J Using methodical and efficient commissioning techniques
- K Optimizing system performance and efficiency
- L Identifying the conditions of the refrigerant at various locations in the vapour compression and liquid recirculation system.
- M Completing the necessary installation and commissioning reports and documentation
- N Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items

### 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.

The resources used for assessment should reflect current industry practices in relation to servicing and repairing as well as determining the operating conditions of Hydrocarbon vapour compression and liquid recirculation systems.



## EVIDENCE GUIDE

### 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)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEEE001B and other discipline specific occupational health and safety units shall be incorporated in relation to this unit..

## 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 and commissioning the major components and associated equipment for at least 2 different types of refrigeration and/or air conditioning systems operating with a hydrocarbon refrigerant.

Major components shall include refrigeration compressors, condensers, condensing units and evaporators.

Associated equipment shall include refrigerant flow controls, cycling controls, safety controls, on-site leak detection equipment, ventilation systems, spark isolation systems and electrical 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