



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEJ113A Commission air conditioning and refrigeration systems

Release: 2

UEENEEJ113A Commission air conditioning and refrigeration systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers commissioning of refrigeration and air conditioning systems. It encompasses working safely and to standards to commission the whole system and includes pre-commissioning tests, starting up the system, optimizing the refrigerant charge, basic air and water balancing and adjustment, checking and adjusting components and controls to ensure its efficient and balanced operation, and completing commissioning documentation.

Application of the Unit

Application of the Unit 4)

This unit is intended to augment previously acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. 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, 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.

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

UEENEEJ110A Select refrigerant piping, accessories and associated controls

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

Prerequisite Unit(s)**2)**

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

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

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

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.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA										
1 Prepare to commission refrigeration and air conditioning systems	<table><tr><td>1.1</td><td>OHS procedures for a given work area are identified, identified, obtained and understood</td></tr><tr><td>1.2</td><td>Established OHS risk control measures and procedures are followed in preparation for the work.</td></tr><tr><td>1.3</td><td>Safety hazards which have not previously been identified are noted and established risk control measures are implemented.</td></tr><tr><td>1.4</td><td>Commissioning work is appropriately sequenced in accordance with job schedule</td></tr><tr><td>1.5</td><td>Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site</td></tr></table>	1.1	OHS procedures for a given work area are identified, identified, obtained and understood	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented.	1.4	Commissioning work is appropriately sequenced in accordance with job schedule	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
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1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site										

ELEMENT	PERFORMANCE CRITERIA
	1.6 The extent of the system and location of system components is determined from site inspection and/or job specifications and diagrams
	1.7 System control setting and operating parameters are determined from job specifications and requirements.
	1.8 Tools, equipment and testing devices needed to commission the system are obtained in accordance with established procedures and checked for correct operation and safety
	1.9 Pre commissioning checks are undertaken to ensure all components are in place and secure.
	1.10 The need to test or measure a live and operating system is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
2 Commission refrigeration systems	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 Refrigeration system pressure controls, valves and regulators are adjusted to their required settings.
	2.4 Testing/measuring devices are used to observe the operation of refrigeration system and fine adjustments of controls are made as necessary.
	2.5 Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.6 Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.7 Commissioning is conducted efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

ELEMENT	PERFORMANCE CRITERIA
3 Commission air handling systems	<p>3.1 OHS risk control measures and procedures for carrying out the work are followed.</p> <p>3.2 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures</p> <p>3.3 Air distribution system dampers are adjusted to avoid air restrictions and allow maximum return volumes.</p> <p>3.4 Balancing the air distribution system is carried out methodically drawing on knowledge of air distribution requirements using measured and calculated values of system parameters.</p> <p>3.5 Air distribution system is balanced to ensure the flow rates meet the specified requirements for each outlet.</p> <p>3.6 Testing/measuring devices are used to observe the operation of air conditioning system components and fine adjustments of controls are made as necessary.</p> <p>3.7 Testing/measuring devices are used to observe the operation of refrigeration system and fine adjustments of controls are made as necessary.</p> <p>Note: Components can include fans, chillers, condensers, coils and heat exchangers, boilers and controls</p> <p>3.8 Testing/measuring devices are used to observe the operation of the hydronic system and fine adjustments of controls are made as necessary.</p> <p>Note: Components can include chillers, condensers, coils and heat exchangers, boilers, cooling towers, pumps and controls</p> <p>3.9 Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.</p> <p>3.10 Unexpected situations are dealt with safely and</p>

ELEMENT	PERFORMANCE CRITERIA
4 Complete and document commissioning work	with the approval of an authorised person.
	3.11 Commissioning is conducted efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
	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 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 commissioning refrigeration and air conditioning systems.

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

KS01-EJ113A Refrigeration and air conditioning commissioning procedures and requirements

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

T1 Refrigeration systems operation and performance including refrigeration effect; flow rate; specific volume; system capacity; discharge temperature; total heat rejection; heat of compression and refrigerant properties and effects

T2 Compressor operation and performance including:

- Compressor drive methods including belt drives; direct drives; speed vs. pulley size and alignment requirements.
- Compressor piston displacement; compressor displacement; compression ratio; compressor efficiency
- Methods of system capacity control including compressor unloading; refrigerant bypass; air flow; water flow; multiple units and compressor speed.

T3 Air conditioning testing/measuring devices applicable to air volume, air velocity, air pressure, air temperature, air relative humidity and sound levels.

T4 System design cooling/heating capacity and conditions from:

- System design specifications and drawings
- Manufacturers specifications and manuals

T5 Pre-commissioning inspections and checks

T6 Testing, measurements and adjustments of the system

- Major components
- Refrigerant flow controls and accessories
- Safety and cycling controls
- Refrigerant charge
- Air/water flow quantities

REQUIRED SKILLS AND KNOWLEDGE

T7 System operating conditions and cooling/heating capacity vs system design conditions and cooling/heating capacity

T8 Marking up “as installed” drawings

T9 Commissioning reports

T10 Commissioning refrigeration and air conditioning systems including;

- Appliance refrigerated systems
- Cool room and freezer room systems
- Merchandising and display cabinets
- Residential air conditioning systems
- Package air conditioning systems

T11 Retrofitting systems with a replacement refrigerant

- Systems and refrigerants suitable for retrofitting
- Retrofitting a refrigerant into a system
- Procedures for modify an existing system to meet the requirements of the alternative refrigerant encompassing:
 - Evaluating performance of a system prior to being retrofitted.
 - Testing refrigerant oil in accordance with industry standard.
 - Reclaiming and evacuate system.
 - Removing and replacing components.
 - Pressure testing, evacuating and charging.
- Procedures for commissioning a retrofitted system to the prescribed standard
- Evaluating key performance factors of a system before and after a retrofit.

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

EVIDENCE GUIDE

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, 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, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
 - Commission refrigeration and air conditioning systems and components as described in 8) and including:
 - A Using methodical commissioning techniques
 - B Commissioning efficiently
 - C Optimising system performance and efficiency
 - D Providing written commissioning reports
 - E 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

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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 commissioning refrigeration and air conditioning systems.

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.

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 commissioning the following refrigeration and air conditioning systems and components:

- Compressors
- Condensers
- Evaporators/cooling coils
- Refrigerant flow controls
- Refrigerant piping and accessories
- Refrigeration systems
- Cycling controls
- Safety controls
- Motors

At least one of the following apparatus:

- Water systems, which includes cooling towers, evaporative condensers, evaporative coolers, hot water systems, chilled water systems, pumps, piping and associated equipment
- Air distribution systems

At least three of the following systems

- cool rooms
- freezer rooms
- merchandising and display cabinets
- residential air conditioning systems
- packaged or commercial air conditioning systems
- industrial air conditioning systems
- domestic refrigerators and freezers

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	3	Writing	3	Numeracy	3
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2.2) Literacy and numeracy skills

Competency Field 5)

Refrigeration and Air Conditioning