Australian Government

UEENEEJ179A Repair and service ammonia refrigeration systems

Release 4

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

UEENEEJ179A Repair and service ammonia refrigeration systems

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEEE103A - Solve problems in ELV single path circuits	

Unit Descriptor

Unit Descriptor **1)**

1.1) Descriptor

This unit covers specialised procedures for servicing and repairs to achieve the effective and efficient operation of refrigeration equipment using Ammonia as the refrigerant. It reinforces safe working practice and encompasses applying specialised knowledge of refrigeration principles that apply to Ammonia, following service manuals, testing, locating and rectifying faults and defective components and completing the necessary service 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 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

UEENEEJ178A	Apply safety awareness and legal requirements for ammonia refrigerant
UEENEEJ111A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113A	Commission air conditioning and refrigeration systems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102	Fabricate, assemble and dismantle utilities

Prerequisite Unit(s) **2)**

A	industry components
UEENEEE103 A	Solve problems in ELV single path circuits
UEENEEE105 A	Fix and secure electrotechnology equipment
UEENEEE107 A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137 A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102 A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103 A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104 A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106 A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107 A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108 A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110 A	Select refrigerant piping, accessories and associated controls
UEENEEJ153 A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170 A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194 A	Solve problems in low voltage refrigeration circuits

Prerequisite Unit(s) **2)**

UEENEEP012A	Disconnect / reconnect composite appliances connected to low voltage installation wiring
UEENEEP017A	Locate and rectify faults in low voltage composite appliances using set procedures

Note:

UEENEEJ111A and 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.

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

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 service and repair Ammonia refrigeration systems	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	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 reported and advice on risk control measures is sought from the work supervisor.
	1.4	The nature of work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5	Advice is sought from the work supervisor to ensure the work is coordinated effectively with

ELEMENT	PERFORMANCE CRITERIA	
		others.
	1.6	Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
	1.7	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Service and repair Ammonia refrigeration systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2	Measuring system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
	2.3	Checks are carried out to ensure the system or component parts are isolated, when necessary in strict accordance OHS requirements and procedures.
	2.4	Refrigerant is removed from a system safely in accordance with regulatory requirements and industry practices.
	2.5	Precautions are taken to prevent damage to components while pressure testing the system
	2.6	Pressure testing is conducted at a pressure compatible with Ammonia and in accordance with standards
	2.7	Leaks are located and rectified using testing methods appropriate to the system and in accordance with industry practices
	2.8	Oil is removed from an operational Ammonia refrigeration system in accordance with industry practices
	2.9	System is charged safely with Ammonia and compatible lubricants in accordance with industry practices
	2.10	Established procedures are used to determine actual and specified range of operating conditions from measured and calculated values as they apply

ELEMENT	PERFORMANCE CRITERIA	
		to Ammonia vapour compression and liquid recirculation systems.
	2.11	Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented.
	2.12	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.13	Operating conditions are determined without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and report on servicing and repairing Ammonia refrigeration systems	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in accordance with established procedures.
	3.3	Contaminated refrigerant and lubricant is dealt with in accordance with legislative/regulatory requirements
	3.4	Operation conditions are documented, including identification of any parameter that is not within the specified range for the system.
	3.5	Work supervisor is notified of the completion of the work 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 determining the operating conditions of Ammonia refrigerating systems.

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

- **KS01-EJ179A Servicing and repair techniques for Ammonia refrigeration systems**
- Evidence shall show an understanding of the Ammonia refrigeration systems, their operating conditions, and servicing and repair techniques, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:
- T1. Ammonia Refrigeration Systems
- Vapour Compression Systems
  - Revision of Vapour Compression Cycle
  - Properties of Ammonia
  - Safe Handling of Ammonia
- Types of Ammonia Systems
  - Direct Expansion Systems
  - Flooded Systems
  - Liquid Recirculation Systems
- Multi Staged Systems
  - Single Staged Systems
  - Multi Staged Systems
  - Cascade Systems
- T2. Operating conditions of Ammonia Refrigeration Systems
- Compressors
  - Function of the compressor
  - Types, construction and their applications
  - Capacity control of compressors
  - Factors affecting performance
  - Economiser operation
  - Types of oil separators
  - Methods of oil cooling
  - Operation and maintenance
- Lubrication and lubricants
  - Lubrication methods

REQUIRED SKILLS AND KNOWLEDGE

- Safe handling of lubricants
- Selection of lubricants
- Oil / Ammonia separation
- Adding and removing oil from Ammonia systems
- Methods of oil recovery

- Evaporators / Cooling Units
  - Types of evaporators (air / fluid cooling)
  - Direct contact freezing
  - Secondary refrigerants
  - Evaporator defrost methods and controls
  - Operation and maintenance
- Condensers and high pressure receivers
  - Evaporative condensers
  - Water cooled condensers
  - Air cooled condensers
  - High pressure receivers
  - Operation and maintenance
- Low Pressure Receivers
  - Suction accumulators
  - Intercoolers
  - Liquid refrigerant pumps
  - Liquid level controls
  - Operation and maintenance
- Purging
  - Non condensable gases
  - Moisture: measurement and removal
  - Manual; purging of Ammonia systems
  - Automatic refrigerated purgers
  - Operation and maintenance
- Refrigerant Flow Devices
  - Expansion valves
  - Automatic liquid feed control devices
  - Pressure regulating devices
  - Operation and maintenance
  - Methods of oil recovery
- Ancillary Components
  - Strainers, isolating valves
  - Liquid level indicators

REQUIRED SKILLS AND KNOWLEDGE

- Pressure relief valves
- Ammonia leak detectors
- Safety controls
- Operation and maintenance

- T3 Servicing and repairs
- Servicing Procedures
- Leak detection methods
- Adding refrigerant
- Removing refrigerant

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, 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

EVIDENCE GUIDE

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 shall 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 to such an extent that the learner's performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment
- 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 Ammonia vapour compression and liquid recirculation refrigeration system.

A Selecting and using appropriate measuring devices correctly

B Recording measurements

C Using calculation methods accurately

D Discharging / charging refrigerant / lubricants and pressure testing the system without damage to components

E Locating and rectifying leaks

F Decontaminating and evacuating the system

G Identifying the conditions of the refrigerant (R717) at various locations in the vapour compression and liquid recirculation system.

H Documenting operating conditions correctly

I 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

Context of and specific resources **9.3)**

This unit should be assessed as it relates to normal work practice

EVIDENCE GUIDE

for assessment

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 servicing and repairing as well as determining the operating conditions of Ammonia vapour compression and liquid recirculation 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.

The critical aspects of occupational health and safety covered in unit UEENEEE001B 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 determining operating conditions using measurement and basic calculation methods of Ammonia refrigeration system. These conditions include suction and discharge pressures, ambient, evaporator and condensing temperatures, evaporator, and condenser temperature difference. Further, this unit must be demonstrated in relation to charging and discharging Ammonia (R717) system with refrigerant and lubricant in a safe and environmentally responsible manner

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

Custom Content Section

Competency Field **5)**

Refrigeration and Air Conditioning