



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEJ196A Operate Ammonia Refrigeration Plant

Release: 2

UEENEEJ196A Operate Ammonia Refrigeration Plant

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers specialised procedures for operating an industrial refrigeration plant using ammonia as the refrigerant. It encompasses applying specialised knowledge of refrigeration principles that apply to ammonia, specifying the normal operating parameters for the plant, rectifying faults and defective components within organisational guidelines and completing the necessary service documentation.

Application of the Unit

Application of the Unit 4)

This competency standard is suitable for refrigeration plant operators who need to be aware of the potential hazards associated with ammonia and the appropriate course of action that should be taken in an emergency.

Currently delivered as a stand alone unit of competency and is open to any person whose work requires them to operate ammonia refrigeration plant.

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

1.2) License to practice

such as apprenticeships.

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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

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.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to operate Ammonia refrigerant plant	<p>1.1 OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.</p> <p>1.2 Refrigeration systems and components on which the work is to be carried out are identified.</p> <p>1.3 Established OHS risk control measures and procedures are followed in preparation for the work.</p> <p>1.4 Safety hazards which have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.</p> <p>1.5 The nature of work is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.</p>

ELEMENT	PERFORMANCE CRITERIA
	1.6 Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.7 Sources of materials that may be required for the work are accessed in accordance with established routines and procedures.
	1.8 Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
	1.9 The refrigeration system's required operating conditions are established from documentation/supervisor and the application of refrigeration fundamentals
2 Operate Ammonia refrigeration plant	2.1 Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2 Refrigeration plant is started up in accordance with established procedures, standard, codes and regulations
	2.3 Measuring refrigeration system operating parameters is conducted in strict accordance with OHS requirements and established safety procedures
	2.4 Supervisor or person in charge is advised of system and components performing outside their operating parameters to facilitate remedial action.
	2.5 Remedial action is implemented within the organisation's procedures.
	2.6 Service procedures are completed according to identified organisational procedures according to SOPs.
	2.7 Daily processing requirements are ascertained to predict demand on refrigeration plant.
	2.8 Oral and written information on the performance of the

ELEMENT	PERFORMANCE CRITERIA
	plant is exchanged formally and informally between the operator and supervisor/production team.
	2.9 Equipment controls are adjusted to prepare plant to meet the load.
	2.10 Action is taken in a proactive way to maintain the performance of the plant.
	2.11 Demands on plant consumables are calculated to facilitate the ordering of replacements.
	2.12 Strategies are developed to meet demand in the event of equipment malfunction or breakdown.
3 Complete work and report on operating Ammonia refrigeration plant	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 Plant performance records are maintained and distributed to meet organisational standards.

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 refrigeration plant using ammonia as the refrigeration medium safe working practices and operation.

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

KS01-EJ196A Ammonia refrigeration system operation

Evidence shall show an understanding of refrigeration principles, Ammonia refrigeration systems, their operating conditions, and starting up and shut down procedures, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Introduction to the Vapour Compression System

- Basic Operation
- Major Components

T2 Heat

- Heat energy (definition, unit of measurement)
- Enthalpy (definition, unit of measurement)
- Heat flow (hot to cold)
- Heat transfer
 - methods (conduction, convection, radiation)
 - requirements
 - effects

T3 Temperature and relative humidity

- Temperature
 - Scale types (imperial, metric, absolute) and their units of measurement
 - Conversion to/from absolute values
 - Temperature difference/change (td, Δt , unit of measurement)
- Relative humidity
- Thermometer types and applications (digital, stem, dial, max/min, non-contact, data loggers)
- Relative Humidity measurement devices and applications (dry bulb/wet bulb, sling, digital)

REQUIRED SKILLS AND KNOWLEDGE

- Hazards and related safe working practices (working near rotating machinery - fans, pulleys, belts etc)
- Care and maintenance (bending stems, overheating, removing batteries after use, uncoiling capillary)
- Calibration (boiling water, iced water, send to a specialist etc)
- Appropriate and safe methods of use
- Typical locations on a system
- Fitting temperature and relative humidity instruments

T4 Sensible and Latent Heat

- Definition of latent heat and sensible heat (including units of measurement)
- Types of latent heat

T5 Pressure

- Pressure
 - Scale types (imperial, metric, absolute) and their units of measurement
 - Vacuum scales (Pascals, microns)
 - Conversion to/from absolute values
- The basic Gas Laws – Boyles, Charles and Daltons (excl combined or general gas law)
- Pressure gauge types and applications (pressure, compound, vacuum, manometer, magnehelic, barometer)
 - Hazards and related safe working practices (dangerous system pressures)
 - Care and maintenance (ingress of oil and contaminants (dirt), avoiding needle bounce (esp. HP) etc)
 - Calibration (atmospheric pressure, send to a specialist etc)
 - Appropriate and safe methods of use
 - Typical locations

T6 Refrigerant conditions

- Saturation temperature
- Saturated liquid / saturated vapour
- Superheated vapour
- Sub-cooled liquid
- Pressure temperature relationships
- P/T charts
- Enthalpy

T7 The vapour compression cycle

- Primary system components
- High and low pressure sides

REQUIRED SKILLS AND KNOWLEDGE

- Basic system operation
- T8 Working safely with refrigeration vapour compression systems
- Risk management principles and processes
 - Hazards and risk control measures associated with:
 - refrigeration vapour compression systems and components
 - refrigerants
 - measuring and testing equipment
- T9 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
- T10 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
 - Safe handling of lubricants
 - Selection of lubricants
 - Oil / Ammonia separation
 - Adding and removing oil from Ammonia systems

REQUIRED SKILLS AND KNOWLEDGE

- 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
 - 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
 - Pressure relief valves
 - Ammonia leak detectors
 - Safety controls
 - Operation and maintenance
 - Leak detector types and applications

REQUIRED SKILLS AND KNOWLEDGE

- Hazards and related safe working practices
- Care and maintenance
- Leak detection procedures
- Charging refrigerant into system
- Routine maintenance procedures
 - Draining and adding oil
 - Charging system
 - Purging condensable gases
 - Leak testing
 - Checking drives, bearings, couplings, pulleys, V-belts etc.
- Fault finding
 - Identify faults that affect the safe operation of the plant
- Controlling and addresses faults
 - Limiting the affect of the fault on the safe operation of the fault
 - Organising correction action to repair the fault

T11 System start up and shut down procedures

T12 Emergency procedures

T13 Maintenance and servicing procedures

- Leak Testing

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 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

9.2)

EVIDENCE GUIDE

evidence required to demonstrate competency in this unit

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:
 - 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, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
 - Operating an industrial refrigeration plant using ammonia as the refrigerant, determining plant operating conditions, rectifying faults and defective components within organisational guidelines and completing the necessary service documentation.

A Starting up Ammonia refrigerant plant

B. Selecting and using appropriate measuring devices correctly

C Recording measurements

D Using calculation methods accurately

E Identifying the conditions of the refrigerant (R717) at various

EVIDENCE GUIDE

locations in the vapour compression and liquid recirculation system.

F Taking remedial action within organisational procedures and job role

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G Documenting operating conditions correctly

H. Conducting servicing procedures according to the schedule, including the inspection of all lagging, insulation, pipe and duct mountings

I. Shutting down Ammonia refrigerant plant

J. 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 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 operating and servicing ammonia refrigeration plant in a safe manner following organisational procedures.

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)

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

UEENEEJ178A Apply safety awareness and legal requirements for ammonia refrigerant

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 Ammonia refrigeration systems and include starting up, determining operating conditions using measurement and basic calculation methods, basic repairs and shutting down the system. These conditions include suction, inter-stage and discharge pressures, ambient, evaporator, inter-stage and condensing temperatures, evaporator, and condenser temperature difference.

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.

Reading	2	Writing	2	Numeracy	2
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2.2) Literacy and numeracy skills

Competency Field 5)

Refrigeration and Air Conditioning

