Australian Government

Department of Education, Employment and Workplace Relations

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

Release: 2

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

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers diagnosing, repairing faults and replacing faulty components in refrigeration and air conditioning control systems, components, interconnecting circuits and equipment operating at voltages up to 1000 V a.c. It encompasses working safely, reading circuit diagrams, system diagrams and manufacturers reference material, sketching diagrams from traced wiring, applying logical fault finding procedures, conducting repairs, replacing components and completing the necessary service 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. or 120 V d.c. In some States/Territories a licence is required to practise this unit in the workplace subject to regulations for undertaking refrigeration and air conditioning work and in particular working with refrigerants. 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.
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 regulations, codes and practices in the workplace
UEENEEE003B Solve problems in extra-low voltage single path circuits

Prerequisite Unit(s) **2)**

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 find and rectify faults	1.1	OHS procedures for a given work area are identified, identified, obtained and understood
		1.2	OHS risk control measures and procedures in preparation for the work are followed.
		1.3	The nature of the fault is obtained from documentation and/or from work supervisor to establish the scope of work to be undertaken.
		1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
		1.5	Sources of materials that may be required for the

ELEMENT		PERFORMANCE CRITERIA	
			work are accessed in accordance with established procedures.
		1.6	Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety
2	Find faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live and operating system is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS and regulatory requirements and procedures
		2.4	Fault finding is approached methodically drawing on knowledge of refrigeration and air conditioning control systems using measured and calculated values of system and component parameters.
		2.5	Faults beyond the scope of refrigeration and air conditioning system are identified.
		2.6	Control system components are dismantled where necessary and parts stored to protect them against loss or damage
		2.7	Faulty components are rechecked and their fault status and confirmed.
		2.8	Unexpected situations are dealt with safely and with the approval of an authorised person.
		2.9	Fault finding activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

ELEMENT		PERFORMANCE CRITERIA	
3	Repair faults	3.1	OHS risk control measures and procedures for carrying out the work are followed.
		3.2	Arrangements are made for appropriately competent and authorised person to rectify faults that are beyond the scope of refrigeration and air conditioning work.
		3.3	Equipment is checked as being isolated where necessary in strict accordance OHS requirements and procedures
		3.4	Materials required to rectify faults are sourced and obtained in accordance with established procedures.
		3.5	Repairs are affected efficiently without damage to other components or apparatus and using sustainable energy principles.
		3.6	Effectiveness of the repair is tested in accordance with established procedures.
		3.7	Apparatus is reassembled, finally tested and prepared for return to customer.
4	Completion and report fault finding and rectification activities	4.1	OHS work completion risk control measures and procedures are followed.
		4.2	Work area is cleaned and made safe in accordance with established procedures.
		4.3	Written justification is made for repairs to circuits/apparatus.

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 diagnosing and rectifying faults in refrigeration and air conditioning control systems. All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EJ170A Refrigeration and air conditioning systems controls

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

T1 Power and control terminology, symbols and diagrams/drawings

T2 Control systems and components

T3 Refrigeration and air conditioning system electrical/electronic controls

- Types, applications, operation, installation/replacement, setting adjustment and testing
  - Refrigerant pressure sensing controls including low and high pressure, oil pressure controls and defrost pressure controls
  - Temperature, humidity, air/water flow and defrost controls
  - Electrical controls, including timers, relays (starting and control), contactors, three phase motor starters

T4 Refrigeration and air conditioning direct digital controls

- Types, applications, operation, installation/replacement, setting adjustment and testing

T5 Refrigeration and air conditioning pneumatic controls

- Types, applications, operation, installation/replacement, setting adjustment and testing

T6 Refrigeration and air conditioning process characteristics and control parameters

T7 System responses to parameter changes

T8 Finding and rectify control system faults

- Factors to consider in clarifying the nature of a fault including; initial fault report, confirmation of symptoms of the fault, comparison of symptoms with normal operation
- Effect to cause reasoning — assumptions of possible causes
- Methods for testing assumptions including; visual inspection, sectional testing, split-half tests, component isolation

REQUIRED SKILLS AND KNOWLEDGE

- Dealing with intermittent faults caused by vibration, shock, changes in temperature and electromagnetic interference.
- Rectifying control system faults including control adjustment, repair and replacement

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

EVIDENCE GUIDE

	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:
	  • 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:
	  • Diagnose and rectify faults in refrigeration and air conditioning control systems as described in 8) and including:
	  A Using methodical fault finding techniques,
	  B Finding faults efficiently,

EVIDENCE GUIDE

C Rectifying faults without damage

D Providing written justification for the rectifications undertaken

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.

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 diagnosing and rectifying faults in refrigeration and air conditioning control 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)

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

UEENEEJ110A	Select refrigeration and air conditioning piping, accessories and associated controls

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 diagnose and rectify the following faults in at least two refrigeration and air conditioning control systems.

- Open-circuit
- Short-circuit
- Incorrect connections
- Insulation failure
- Unsafe condition
- Control apparatus/component failure
- Related mechanical failure

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