



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEJ122A Diagnose faults in complex HVAC /refrigeration control systems

Release: 2

UEENEEJ122A Diagnose faults in complex HVAC /refrigeration control systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers diagnosing and rectifying faults in complex heating, ventilation and air conditioning (HVAC) or refrigeration control systems. It encompasses safe working practices, interpreting technical data, applying knowledge of complex refrigeration or heating, ventilation and air conditioning (HVAC) control systems operating parameters to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Application of the Unit

Application of the Unit 4)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training or institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 4 level.

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.

UEENEEJ112A Diagnose and rectify faults in complex air conditioning/ refrigeration systems

UEENEEJ109A Verify functionality and compliance of refrigeration and air conditioning installations

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

Prerequisite Unit(s)**2)**

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

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

UEENEEJ113A Commission air conditioning and refrigeration systems

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

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

UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

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 diagnose and rectify faults.	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 that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4 The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5 Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6 Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2 Diagnose and rectify 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 is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.

ELEMENT	PERFORMANCE CRITERIA	
	2.3 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.	
	2.4 Logical diagnostic methods are applied to diagnose control system faults employing measurements and estimations of system operating parameters referenced to system operational requirements.	
	2.5 Suspected fault scenarios are tested as being the source of system problems.	
	2.6 Causes of the faults are identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system.	
	2.7 Faults in system components of the system are rectified to raise the refrigeration or heating, ventilation air conditioning systems to its operation standard.	
	2.8 System is tested to verify that the system operates as intended and to specified requirements.	
	2.9 Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.	
	2.10 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.	
	2.11 Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.	
	3 Complete and report fault diagnosis and rectification activities.	3.1 OHS work completion risk control measures and procedures are followed.
		3.2 Work site is made safe in accordance with established safety procedures.
3.3 Rectification of faults is documented in accordance with established procedures.		

ELEMENT**PERFORMANCE CRITERIA**

- 3.4 Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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 faults in complex refrigeration or HVAC control systems.

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

KS01-EJ122A Complex HVAC/Refrigeration control systems

Evidence shall show an understanding of complex HVAC/Refrigeration control system fault finding, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Control fundamentals

- control terminology
- refrigeration system characteristics
- HVAC system characteristics
- control system characteristics
- control system components
- control system diagrams and symbols
- product knowledge

T2 Types of control equipment

- electrical:
 - classification of circuits
 - two position control
 - floating control
 - sensors
 - controllers
 - flow control devices
 - control systems diagrams
- electronic:
 - operating principles
 - sensors
 - controllers
 - control system diagrams

T3 Digital Control Systems

- Computer based control fundamentals
 - Definitions

REQUIRED SKILLS AND KNOWLEDGE

- Principles
- Controller configuration
 - Equipment
 - Zone level controllers
 - System level controllers
- Controller software
 - Operating software
 - Application software
- Controller programming
 - System diagrams
 - Control diagrams
 - Configuration
 - Programming
 - Initialisation
 - EMS, BMS
 - SCADA system
 - Lan, Bacnet

T4 Control systems applications

- refrigeration
- air conditioning
 - air handling system controls
 - ventilation
 - heating
 - building airflow system control
 - airflow control
 - singles and multi -zones
 - chiller/boiler and distribution system control (chilled water, boiler, distribution systems)

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

EVIDENCE GUIDE

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 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:
 - Diagnose faults in complex refrigeration or HVAC control systems as described in 8) and including:
 - A Applying logical diagnostic methods
 - B Using fault scenarios to test the cause of system faults
 - C Identifying faults and competency needed to rectify them
 - D Rectifying faults in system controls
 - E Verifying that the system operates correctly
 - F Documenting fault rectification
 - G 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 diagnosing faults in complex refrigeration or HVAC control 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 UEENEEE101A 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 diagnosing and rectifying at least four faults in complex refrigeration or HVAC control systems.

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
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Custom Content Section

Competency Field 5)

Refrigeration and Air Conditioning