



Australian Government

UEERA0033 Diagnose faults in complex HVAC/refrigeration control systems

Release: 1

UEERA0033 Diagnose faults in complex HVAC/refrigeration control systems

Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Application

This unit involves the skills and knowledge required to diagnose and rectify faults in complex heating, ventilation and air conditioning (HVAC) or refrigeration control systems.

It includes applying safe working practices, interpreting technical data and applying knowledge of complex refrigeration or HVAC control system operating parameters to logical fault-finding processes. It also includes implementing fault rectification, safety and functional testing; and completing and reporting fault diagnosis and rectification activities and outcomes.

The skills and knowledge described in this unit require a licence or permit to practice in the workplace where work is carried out on electrical installations which are designed to operate at voltages greater than 50 volt (V) alternating current (a.c.) or 120 V direct current (d.c.).

Competency development activities in this unit are subject to regulations directly related to licensing. Where a licence or permit to practice is not held, skills and knowledge described in this unit require a relevant contract of training, such as an Australian Apprenticeship.

Additional and/or other conditions may apply in some jurisdictions subject to regulations related to refrigeration, air conditioning or electrical work. Practice in the workplace and during training is also subject to work health and safety (WHS)/occupational health and safety (OHS) regulations.

Permits may also be required for some work environments, such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

Pre-requisite Unit

UEECD0007 Apply work health and safety regulations, codes and practices in the workplace

UEECD0019 Fabricate, assemble and dismantle utilities industry components

UEECD0020 Fix and secure electrotechnology equipment

UEECD0051 Use drawings, diagrams, schedules, standards, codes and specifications

UEECD0016 Document and apply measures to control WHS risks associated with electrotechnology work

UEERA0059 Prepare and connect refrigerant tubing and fittings

UEERA0036 Establish the basic operating conditions of vapour compression systems

UEERA0035 Establish the basic operating conditions of air conditioning systems

UEERA0050 Install refrigerant pipe work, flow controls and accessories

UEERA0094 Verify functionality and compliance of refrigeration and air conditioning installations

UEERA0081 Select refrigerant piping, accessories and associated controls

UEERA0032 Diagnose and rectify faults in complex air conditioning/refrigeration systems

UEERA0031 Diagnose and rectify faults in air conditioning and refrigeration control systems

UEERA0092 Solve problems in low voltage refrigeration and air conditioning circuits

UEERL0005 Locate and rectify faults in low voltage (LV) electrical equipment using set procedures

UEERL0004 Disconnect - reconnect electrical equipment connected to low voltage (LV) installation wiring

UEERL0001 Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEERL0002 Attach cords, cables and plugs to electrical equipment for connection to 1000 V a.c. or 1500 V d.c.

Competency Field

Refrigeration and air-conditioning

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to diagnose and rectify faults

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

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|------------|---|
| 1.1 | WHS/OHS requirements and workplace procedures are identified, obtained and applied |
| 1.2 | WHS/OHS risk control measures and procedures are followed |
| 1.3 | Hazards not previously identified are documented and risk control measures devised and implemented in consultation with relevant person/s |

- 1.4 Extent of faults are determined from reports/documentation and/or discussions with relevant person/s
 - 1.5 Relevant person/s is consulted to ensure work is coordinated effectively with others involved on the worksite
 - 1.6 Tools, equipment and testing devices required to diagnose faults are obtained and checked for correct operation and safety in accordance with workplace procedures
- 2 **Diagnose and rectify faults**
 - 2.1 WHS/OHS risk control measures and workplace procedures for carrying out the work are followed
 - 2.2 Need to test and measure live work is determined in accordance with workplace procedures and WHS/OHS requirements
 - 2.3 Circuits/machines/plant are checked and isolated in accordance with workplace procedures and WHS/OHS requirements
 - 2.4 Logical diagnostic methods, measurements and estimations are applied to diagnose control system faults in accordance with system operating parameters and operational requirements
 - 2.5 Suspected fault sources are tested to confirm source of system problems
 - 2.6 Fault causes are identified and appropriately competent person/s engaged to rectify the fault where it is outside the scope of the control system
 - 2.7 Faults in system components are rectified to return the refrigeration or HVAC system to its operational standard
 - 2.8 System is tested to verify that the system operates as intended and to specified requirements and operational standards
 - 2.9 Methods for resolving unplanned events are discussed with appropriate person/s in accordance with job specifications and requirements
 - 2.10 Methods for resolving unplanned situations are selected

		on the basis of safety and specified work outcomes
	2.11	Diagnosis and rectification activities are conducted without waste of materials, damage to apparatus, the surrounding environment and/or services using sustainable energy practices
3	Complete and report fault diagnosis and rectification activities	
	3.1	WHS/OHS work completion risk control measures and workplace procedures are followed
	3.2	Worksite is made safe in accordance with workplace safety procedures
	3.3	Fault diagnosis and rectification activities are documented in accordance with workplace procedures
	3.4	Appropriate person/s is notified that system faults have been rectified in accordance with workplace procedures

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Diagnosing and rectifying faults in complex HVAC and refrigeration control systems must include at least the following:

- four faults in complex refrigeration or HVAC control systems

Unit Mapping Information

This unit replaces and is equivalent to UEENEEJ122A Diagnose faults in complex HVAC /refrigeration control systems.

Links

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEERA0033 Diagnose faults in complex HVAC/refrigeration control systems

Modification History

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least one occasion and include:

- applying logical diagnostic methods
- using fault scenarios to test the cause of system faults
- identifying faults and competency needed to rectify them
- rectifying faults in system controls
- verifying that the system operates correctly
- documenting fault rectification
- dealing with unplanned events
- applying relevant legislation, industry standards, codes of practice and regulations
- applying relevant work health and safety (WHS)/occupational health and safety (WHS/OHS) requirements, including:
 - applying safe working practices
 - hazard identification and reporting
 - implementing risk control measures
- determining need to test or measure live work
- diagnosing faults in complex refrigeration or heating, ventilation and air conditioning (HVAC) control systems
- isolating circuits/machines/plant
- using relevant tools, equipment and testing devices.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of:

- complex HVAC/refrigeration control systems, fault finding, safe working practices and relevant standards, codes and regulations, including:
 - control fundamentals, including:
 - control terminology

- refrigeration system characteristics
- HVAC system characteristics
- control system characteristics
- control system components
- control system diagrams and symbols
- product knowledge
- types of control equipment, including:
 - 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
- digital control systems, including:
 - computer-based control fundamentals:
 - definitions
 - 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 and BMS
 - supervisory control and data acquisition (SCADA) system

- lan and Bacnet
- control systems applications, including:
 - 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 and distribution systems)
- diagnostic methods, measurements and estimations
- faults within scope of work
- relevant manufacturer specifications
- relevant WHS/OHS legislated requirements, including:
 - risk control measures
- relevant workplace documentation
- relevant workplace policies and procedures.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in suitable workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated suitable workplace operational situations that replicate workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or simulations
- relevant and appropriate materials, tools, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

Links

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