



Australian Government

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

Release: 1

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

It includes working safely, interpreting technical data and applying knowledge of complex refrigeration/air conditioning 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.

To undertake this unit, the learner must have a Trainee Refrigerant Handling Licence as it includes work on refrigeration and air conditioning equipment that carries the risk of a fluorocarbon refrigerant being emitted.

The skills and knowledge described in this unit require a national Refrigerant Handling Licence as it includes work on refrigeration and air conditioning equipment that carries the risk of a fluorocarbon refrigerant being emitted while decanting the refrigerant or manufacturing, installing, commissioning, servicing, maintaining or decommissioning refrigeration and air conditioning equipment.

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

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.

1.1 WHS/OHS requirements and procedures are identified, obtained and implemented

- 1.2 WHS/OHS risk control measures and procedures are followed in preparation for work
 - 1.3 Hazards are monitored and any not previously identified are documented and risk control measures implemented in consultation with relevant person/s
 - 1.4 The extent of faults are determined from reports/documentation and discussions with relevant person/s
 - 1.5 Relevant person/s is consulted to ensure work is coordinated with others 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 or measure live work is determined in accordance with workplace procedures and WHS/OHS requirements
 - 2.3 Circuits/machines/plant are checked as being isolated, where necessary, in accordance with workplace procedures and WHS/OHS requirements
 - 2.4 Logical diagnostic methods, measurements and estimations are applied to diagnose complex refrigeration/air conditioning system faults in accordance with system operational parameters and requirements
 - 2.5 Suspected fault sources are tested to confirm if they are the 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 refrigeration and air conditioning system
 - 2.7 Faults in system components are rectified to return refrigeration/air conditioning system to its operational standard
 - 2.8 System is tested to verify that the system operates as

		intended and to specified requirements and industry standards
	2.9	Methods for resolving unexpected situations are discussed, as required, with appropriate person/s in accordance with job specifications and requirements
	2.10	Methods for resolving unexpected 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 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 must include at least four faults in the following complex refrigeration/air conditioning systems:

- multiple major components (i.e. compressors, condenser or evaporators)
- circuits or systems and associated components and controls

Unit Mapping Information

This unit replaces and is equivalent to UEENEEJ112A Diagnose and rectify faults in complex air conditioning/refrigeration 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 UEERA0032 Diagnose and rectify faults in complex air conditioning/refrigeration 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
- dealing with unplanned events
- applying relevant legislations, 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
- completing and reporting fault diagnosis and rectification activities
- determining need to test or measure live work
- 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 refrigeration and air conditioning system fault finding and repair, safe working practices and relevant standards, codes and regulations, including:
 - fault-finding techniques including:
 - factors to consider in clarifying the nature of a fault:
 - 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 encompassing:
 - visual inspection
 - sectional testing
 - split-half tests
 - component isolation
- dealing with intermittent faults
- causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference
- refrigeration system analysis, including:
 - pressure enthalpy definitions:
 - high pressure and low-pressure refrigerants
 - triple point of new refrigerants
 - glide of trinary blends
 - differential evaporation of refrigerant blends
 - variable refrigerant volume
- refrigeration cycle, including:
 - expansion process
 - vaporising process
 - compression process
 - condensing process
 - compression ratio
- enthalpy processes, including:
 - co-efficient of performance
 - effect of suction temperature on cycle efficiency
 - effect of condensing temperature on cycle efficiency
- actual refrigerating cycles, including:
 - design operating conditions
 - effects of superheating suction vapour
 - superheating without useful cooling
 - superheating that produces useful cooling
 - superheating in suction piping outside the refrigerated space
 - superheating the vapour inside the refrigerated space
 - effects of subcooling the liquid
 - effects liquid - suction heat exchangers
 - effects of pressure losses resulting from friction
- refrigeration cycle faults, including:
 - symptoms and causes
 - measurements and fault confirmation tests

- air conditioning system analysis, including:
 - psychrometric chart, including:
 - properties, definitions and units
 - plotting conditions:
 - RA, SA, OA and MA
 - psychometric processes, including:
 - heating
 - cooling only
 - cooling and dehumidification
 - cooling, dehumidification and reheat
 - design operating conditions, including:
 - indoor and outdoor wet and dry bulb temperatures
 - volume flow rate supply, return and outdoor air
 - air conditioning system faults, including:
 - symptoms and causes
 - measurements and fault confirmation tests
 - power and control system analysis, including:
 - power and control circuit diagrams
 - sequence of operation
 - manufacturers diagrams, specifications and instructions
 - power and control circuit faults:
 - symptoms and causes
 - measurements and fault confirmation tests
 - relevant measurements and estimations
 - relevant risk mitigation processes
 - relevant WHS/OHS legislated requirements, including:
 - environmental and sustainable energy principles and practices
 - safe working practices
 - relevant workplace policies and procedures
 - relevant workplace documentation.

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 workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated 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 other 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.

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