



Australian Government

UEERA0001 Analyse the operation of HVAC air and hydronic systems

Release: 1

UEERA0001 Analyse the operation of HVAC air and hydronic 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 analyse the operating parameters of heating, ventilation and air conditioning (HVAC) air and hydronic systems.

It includes working safely, applying knowledge of operating parameters, gathering and analysing data, applying problem-solving techniques, and developing and documenting results and solutions for use in design work.

The skills and knowledge described in this unit may, in some jurisdictions, require a licence or permit to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning work. Practice in the workplace and during training is also subject to work health and safety (WHS)/occupational health and safety (OHS) regulations.

No other licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

UEERA0002 Analyse the psychrometric performance of HVAC/R systems

UEERA0003 Analyse the thermodynamic performance of HVAC/R systems

or

UEERA0094 Verify functionality and compliance of refrigeration and air conditioning installations

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

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 analyse the operation of HVAC air and hydronic systems

PERFORMANCE CRITERIA

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

- 1.1** WHS/OHS processes and procedures for a given work area are identified, obtained and applied
- 1.2** WHS/OHS risk control measures and workplace procedures are followed in preparation for the work
- 1.3** Operating analysis is determined from performance specifications, situation reports and consultations with relevant person/s
- 1.4** Activities are planned to meet scheduled timelines in accordance with workplace procedures and consultations with others involved in the work

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|--|------------|---|
| | 1.5 | Strategies are formed for solution development and implementation is carried out in accordance with workplace procedures |
| 2 Analyse the operation of systems | 2.1 | WHS/OHS risk control measures and workplace procedures for carrying out the work are followed |
| | 2.2 | Principles of HVAC air and hydronic systems operating parameters are applied to analytical solutions to refrigeration and air conditioning systems |
| | 2.3 | Parameters, specifications and performance requirements in relation to HVAC air and hydronic systems are obtained in accordance with workplace procedures |
| | 2.4 | Analysis of operating parameters is carried out to provide solution in accordance with workplace procedures |
| | 2.5 | Unplanned events are dealt with safely in accordance with relevant industry standards and workplace procedures |
| | 2.6 | Quality of work is monitored in accordance with workplace procedures and relevant industry standards |
| 3 Report on results of operation systems analysis and actions taken | 3.1 | Results of system operating analysis are evaluated to determine performance requirements in accordance with workplace procedures and performance specifications |
| | 3.2 | Analysis, findings, calculations and assumptions are documented in accordance with workplace procedures |
| | 3.3 | Analysis is reported to relevant person/s to determine relevant action in accordance with workplace procedures |
| | 3.4 | Justification for findings and actions to be undertaken in relation to equipment is documented in relevant work/project and/or development records in accordance with relevant industry standards |

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.

Analysing operating parameters must include • two different HVAC systems
at least the following:

Unit Mapping Information

This unit replaces and is equivalent to UEENEEJ164A Analyse the operation of HVAC air and hydronic 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 UEERA0001 Analyse the operation of HVAC air and hydronic 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:

- understanding the operating performance
- forming effective strategies for analysing air conditioning systems performance
- obtaining operating parameters, specifications and performance requirements appropriate to each situation
- evaluating the results of the analysis
- documenting analysis details of all findings, calculations and assumptions
- documenting justification of actions to be implemented in accordance with professional standards
- dealing with unplanned events
- analysing the operation of heating, ventilation and air conditioning (HVAC) air and hydronic systems
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including using risk control measures
- preparing to analyse the operation of HVAC air and hydronic systems.

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:

- HVAC air systems, safe working practices and relevant standards, codes and regulations, including:
 - air distribution principles:
 - air diffuser selection
 - factors affecting the design of ductwork systems
 - types of ductwork systems
 - static, velocity and total pressure
 - laminar and turbulent flow

- moody diagram
- parameters that control cost
- pressure loss:
 - friction and dynamic
 - colebrook - White formula
 - in ducts and friction charts
 - in fittings and loss co-efficient
 - fitting selection criteria
 - diffuser pressure loss
- system sizing:
 - velocity method
 - equal friction method
 - static regain method
 - balanced pressure drop method
 - circular to rectangular equivalent
 - standard duct sizes and gauges
 - balancing
- heat and leakage losses:
 - heat gain/loss calculation
 - bare vs. insulated
 - leakage
- overview of noise in duct systems:
 - noise sources in duct systems
 - attenuation
 - impact on design
 - methods of control
- fans:
 - types and characteristics
 - fan laws
 - system effect
 - fan selection
 - fan and system curves
- air systems:
 - dual and single duct constant volume
 - variable volume
 - induction units
 - multi-zone
 - diversity factors
- HVAC systems
- HVAC hydronic systems, safe working practices and relevant standards, codes and

regulations, including:

- systems operation
 - closed/open systems
 - pump head/lift and static head (high-rise building)
 - system friction losses
 - nett positive suction head
 - system curves
- pumps:
 - types
 - selection criteria
 - performance characteristics
 - bladder tanks
 - coil characteristics
 - heat exchangers: plate, shell and tube, and tube in tube
 - flow measurements: types
 - flow switchers
 - builders: types and performance characteristics
 - cooling towers: elementary cooling thermodynamics and types
- valves - flow control devices:
 - types and applications
 - throttling characteristics
 - flow measurements
 - selection and applications
- piping systems:
 - balancing and commissioning
 - air venting
 - water treatment
 - vacuum breaking and air breaks
- relevant industry standards
- relevant job safety assessments or risk mitigation processes
- relevant manufacturer specifications
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace quality, 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, facilities and equipment currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

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