



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

Release: 2

UEENEEJ164A Analyse the operation of HVAC air and hydronic systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers the analysis the operating parameters of heating, ventilating and air conditioning air and hydronic systems to determine whether performance requirements are being met. It encompasses working safely, apply knowledge of operating parameters, gathering and analysing data, applying problem solving techniques, developing and documenting results and solutions for use in design work.

Application of the Unit

Application of the Unit

4)

This unit is intended to augment formally acquired competencies and is suitable for institutional based delivery. It applies to any formal recognition for this standard at the aligned AQF 6 level.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety, codes of work practice and standard work procedures related to the operation of automated machinery.

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.

UEENEEJ192A: Analyse the psychrometric performance of HVAC/R systems

UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems

or

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 analyse the operation of HVAC air and hydronic systems	1.1 OHS processes and 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 The extent of operating analysis is determined from performance specifications and situation reports and in consultations with relevant persons
	1.4 Activities are planned to meet scheduled timelines in consultation with others involved in the work.
	1.5 Effective strategies are formed to ensure solution development and implementation is carried out efficiently.

ELEMENT	PERFORMANCE CRITERIA
2 Analyse the operation of HVAC air and hydronic systems	2.1 OHS risk control measures and procedures for carrying out the work are followed.
	2.2 Knowledge of HVAC air and hydronic systems operating parameters is 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 established procedures.
	2.4 Approaches to analysing operating parameters are carried out to provide the most effective solution.
	2.5 Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.
	2.6 Quality of work is monitored against personal performance agreement and/or established organizational or professional standards
3 Document and report on the results of the operation of HVAC/R systems analysis and actions taken.	3.1 Results of system operating analysis are evaluated to determine whether performance requirements are being met.
	3.2 Analysis is documented including details of all findings, calculations and assumptions.
	3.3 Analysis is reported to appropriately personnel to establish appropriate action to be taken based on findings.
	3.4 Justification for findings and any actions to be undertaken in relation to the equipment is documented for inclusion in work/project or development records in accordance with professional standards.

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 analysing the operation of HVAC air and hydronic systems.

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

KS01-EJ164A HVAC air systems

Evidence shall show an understanding of heating, ventilation and air conditioning (HVAC) air systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. 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

T2. Pressure loss

- friction and dynamic
- Colebrook - White formula
- in ducts, friction charts
- in fittings, loss co-efficient
- fitting selection criteria
- diffuser pressure loss

T3. System sizing

- velocity method
- equal friction method
- static regain method
- balanced pressure drop method
- circular to rectangular equivalent
- standard duct sizes and gauges
- balancing

REQUIRED SKILLS AND KNOWLEDGE

T4. Heat and leakage losses

- heat gain/loss calculation
- bare vs. insulated
- leakage

T5. Overview of noise in duct systems

- noise sources in duct systems
- attenuation
- impact on design
- methods of control

T6. Fans

- types and characteristics
- fan laws
- system effect
- fan selection
- fan and system curves

T7. Air systems

- dual and single duct constant volume
- variable volume
- induction units
- multi-zone
- diversity factors

KS02-EJ164A

HVAC systems

Evidence shall show an understanding of heating, ventilation and air conditioning (HVAC) hydronic systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Systems operation

- closed/open systems
- pump head/lift, static head (high rise building)
- system friction losses
- nett positive suction head
- system curves

T2. Pumps

- types
- selection criteria
- performance characteristics
- bladder tanks
- coil characteristics

REQUIRED SKILLS AND KNOWLEDGE

- heat exchangers: plate, shell and tube, tube in tube
- flow measurements: types
- flow switchers
- builders: types and performance characteristics
- cooling towers: elementary cooling thermodynamics and types

T3. Valves - flow control devices

- types and applications
- throttling characteristics
- flow measurements
- selection and applications

T4. Piping systems

- balancing and commissioning
- air venting
- water treatment
- vacuum breaking and air breaks

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

EVIDENCE GUIDE

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, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
 - Analyse the operation of HVAC/R systems as described in 8) and including:
 - A Understanding the operating performance
 - B Forming effective strategies for analysing air conditioning systems performance
 - C Obtaining operating parameters, specifications and performance requirements appropriate to each situation.
 - D Evaluating the results of the analysis
 - E Documenting analysis details of all findings, calculations and assumptions.
 - F Documenting justification of actions to be implemented in accordance with professional standards.
 - 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

EVIDENCE GUIDE

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 analysing the operation of HVAC/R 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.

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 analysing operating parameters in at least two different HVAC 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	5	Writing	5	Numeracy	5
---------	---	---------	---	----------	---

2.2) Literacy and numeracy skills

Competency Field 5)

Refrigeration and Air Conditioning