



**Australian Government**

# **UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems**

**Release 4**

## UEENEEJ192A Analyse the psychrometric performance of HVAC/R systems

### Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update pre-requisite UEENEE103A - Solve problems in ELV single path circuits	

### Unit Descriptor

#### Unit Descriptor

1)

#### 1.1) Descriptor

This unit covers the analysis of heating, ventilating, air conditioning and refrigeration (HVAC/R) systems to provide solution to psychrometric performance issues. It encompasses working safely, apply extensive knowledge of psychrometric 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. 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 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.

UEENEEJ193    Analyse the thermodynamic performance  
A                      of HVAC/R systems

or

UEENEEJ109    Verify functionality and compliance of  
A                      refrigeration and air conditioning  
                                 installations

UEENEEE101    Apply Occupational Health and Safety  
A                      regulations, codes and practices in the  
                                 workplace

UEENEEE102    Fabricate, assemble and dismantle utilities  
A                      industry components

UEENEEE103    Solve problems in ELV single path circuits  
A

UEENEEE105    Fix and secure electrotechnology  
A                      equipment

UEENEEE107    Use drawings, diagrams, schedules,  
A                      standards, codes and specifications

<b>Prerequisite Unit(s)</b>	<b>2)</b>
UEENEEE137 A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEJ102 A	Prepare and connect refrigerant tubing and fittings
UEENEEJ103 A	Establish the basic operating conditions of vapour compression systems
UEENEEJ104 A	Establish the basic operating conditions of air conditioning systems
UEENEEJ106 A	Install refrigerant pipe work, flow controls and accessories
UEENEEJ107 A	Install air conditioning and refrigeration systems, major components and associated equipment
UEENEEJ108 A	Recover, pressure test, evacuate, charge and leak test refrigerants
UEENEEJ110 A	Select refrigerant piping, accessories and associated controls
UEENEEJ111 A	Diagnose and rectify faults in air conditioning and refrigeration systems and components
UEENEEJ113 A	Commission air conditioning and refrigeration systems
UEENEEJ153 A	Find and rectify faults motors and associated controls in refrigeration and air conditioning systems
UEENEEJ170 A	Diagnose and rectify faults in air conditioning and refrigeration control systems
UEENEEJ194 A	Solve problems in low voltage refrigeration circuits
UEENEEP012 A	Disconnect / reconnect composite appliances connected to low voltage installation wiring

**Prerequisite Unit(s)** 2)

UEENEEP017 A Locate and rectify faults in low voltage composite appliances using set procedures

UEENEEP024 A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEENEEP025 A Attach cords, cables and plugs to electrical equipment for connection to 1000 Va.c. or 1500 Vd.c. supply

**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 psychrometric performance of HVAC/R	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.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
systems	<p>1.3 The extent of the psychrometric issues are determined from performance specifications and situation reports and in consultations with relevant persons</p> <p>1.4 Activities are planned to meet scheduled timelines in consultation with others involved in the work.</p> <p>1.5 Effective strategies are formed to ensure solution development and implementation is carried out efficiently.</p>
2 Analyse the psychrometric performance of HVAC/R systems	<p>2.1 OHS risk control measures and procedures for carrying out the work are followed.</p> <p>2.2 Knowledge of psychrometric principles are applied to analytical solutions to refrigeration and air conditioning systems.</p> <p>2.3 Parameters, specifications and performance requirements in relation to refrigeration and air conditioning systems are obtained in accordance with established procedures.</p> <p>2.4 Approaches to analysing psychrometric parameters are carried out to provide the most effective solution.</p> <p>2.5 Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.</p> <p>2.6 Quality of work is monitored against personal performance agreement and/or established organizational or professional standards</p>
3 Document and report on the results of the psychrometric performance analysis and actions taken.	<p>3.1 Solutions to psychrometric issues are evaluated to determine their effectiveness and modified where necessary.</p> <p>3.2 Analysis is documented including details of all findings, calculations and assumptions.</p> <p>3.3 Analysis is reported to appropriately personnel to establish appropriate action to be taken based on findings.</p>

**ELEMENT****PERFORMANCE CRITERIA**

- 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 psychrometric performance of HVAC/R systems.

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

#### **KS01-EJ192 HVAC/R Psychometrics**

##### **A**

Evidence shall show an understanding of applied psychometrics, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

##### T1 Fundamentals and terms

- sensible heat factor (conditioned space and grand total)
- quantity of air
- effective surface temperature
- bypass factor

##### T2 Coil characteristics

- processes
- sensible cooling
- cooling, dehumidification
- sensible heating

##### T3 Spray processes

- saturation efficiency
- processes
- adiabatic/evaporative cooling
- cooling & humidification
- sensible cooling
- cooling and/or humidification
- chemical dehumidification process: dehumidification & heating
- cooling tower characteristics: humidification & cooling
- indirect evaporative cooling process



## REQUIRED SKILLS AND KNOWLEDGE

### T4 System analysis

- partial load
- reheat control
- bypass control
- volume control
- dump back systems
- low velocity coils

### T5 Psychrometric formulae and charts

- properties of air
- gas constants
- derivation of air constants
- combined gas laws
- Dalton's law of partial pressures
- Carrier's equation
- psychrometric property tables
- air mixing equations
- air quantity equations

## 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,

## EVIDENCE GUIDE

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, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Analyse the psychrometric performance of HVAC/R systems as described in 8) and including:
    - A Understanding the psychrometric performance issues
    - B Forming effective strategies for analysing refrigeration and air conditioning systems performance
    - C Obtaining psychrometric performance 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

## EVIDENCE GUIDE

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

### 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 psychrometric and thermodynamic performance 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 psychrometric parameters in at least two different refrigeration and air conditioning 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
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### 2.2) Literacy and numeracy skills

Competency Field            5)

Refrigeration and Air Conditioning