



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEJ147A Audit energy use for commercial HVAC/Refrigeration systems

Release: 2

UEENEEJ147A Audit energy use for commercial HVAC/Refrigeration systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers assessing the energy used by commercial HVAC and refrigeration systems in relation to its performance for the purpose of improving efficiency and/or certification as meeting energy efficiency standards. It encompasses safe working practices, determining efficiency requirements, setting up performance and energy tests, evaluating results and documenting test outcomes.

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.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical devices, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting

Application of the Unit 4)
and risk safety measures

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit may require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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.

UEENEEJ136A Evaluate and report on building services energy management systems

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

Prerequisite Unit(s)**2)**

control OHS risks associated with electrotechnology work

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

Prerequisite Unit(s) 2)
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 audit energy use for a commercial HVAC/R application	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
		1.2	Established OHS risk control measures and procedures are followed in preparation for the work.
		1.3	System assessment and testing area is checked for safety hazards and risk control measures implemented in strict accordance with safety policy and procedures.
		1.4	Relevant documentation is obtained and read to determine the performance/certification requirements against which the system is to be assessed.

ELEMENT	PERFORMANCE CRITERIA
	<p>Note: Examples of documentation are those specifying safety requirements, technical standard and as marketed technical energy performance</p>
	1.5 Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.6 Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2 Audit energy use for a commercial HVAC/R application	2.1 OHS risk control measures and procedures for carrying out the work are followed.
	2.2 Circuits/apparatus/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.3 In depth knowledge of the performance and energy efficiency requirements of HVAC/R system and assessment methods are applied to the audit process.
	2.4 Apparatus assessment and tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny.
	2.5 System assessment and tests are carried out methodically and results and comments systematically noted.
	2.6 Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.7 Auditing is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practices.
3 Document auditing activities and results	3.1 OHS work completion risk control measures and procedures are followed.
	3.2 Work site is cleaned and made safe in accordance with established procedures.

ELEMENT	PERFORMANCE CRITERIA
	3.3 Assessment and test results are evaluated and non-compliance issues identified.
	3.4 Assessment, test results and recommendations on non-compliance issues are documented and reported to appropriate person(s) in accordance with established procedures.

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 auditing energy use for commercial HVAC/R systems.

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

KS01-EJ147A

HVAC/R energy audits

Evidence shall show an understanding of HVAC/R energy auditing, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Identification of major energy consuming plant

- review of HVAC/R system components

T2 Methods of energy conservation

- review of energy conserving strategies
- house keeping
- time schedules
- good maintenance practices
 - filters, fans, appropriate set points, dead bands etc.
- HVAC system control
 - night cycle
 - optimum stop/start
 - purge cycles
 - chiller/boiler/cooling tower sequencing

REQUIRED SKILLS AND KNOWLEDGE

- economy cycles (based on temperature or enthalpy).
 - supply air reset
 - condenser water temperature reset
 - electrical load control
 - power demand control
 - load limiting
 - load shedding
 - set point relaxation
 - ventilation cycles
- T3 Tests and data collection procedures
- use of BMS for data collection (trending)
 - use of data recorders (loggers)
 - monitoring of building operations generally
- T4 Analyse results from test data
- compare against standards (BOMA)
 - review current practices against ideal
 - total consumption vs. peak load
 - electricity tariffs and implications
- T5 Methods of reducing energy usage
- plant retrofits
 - controls - application of strategies
 - plant - fixed OA to economy, boiler to electric reheat, and constant volume to VAV etc. cost/benefit (payback).

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

EVIDENCE GUIDE

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 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, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
 - Audit energy use for commercial HVAC/R systems as described in 8) and including:
 - A Interpreting performance/certification requirements correctly.
 - B Setting up and conducting appropriate system assessments and tests.
 - C Identifying non-compliance issues.
 - D Reporting assessment and test results and non-compliance issues and recommendations appropriately.
 - E 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

EVIDENCE GUIDE

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 auditing energy use for commercial 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 auditing energy use by at least two different commercial HVAC/R 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