



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEJ194A Solve problems in low voltage refrigeration circuits

Release: 2

UEENEEJ194A Solve problems in low voltage refrigeration circuits

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers determining correct operation of low voltage d.c. and a.c. circuits and providing solutions as they apply to refrigeration work functions. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in single and multiple path circuits.

Application of the Unit

Application of the Unit 4)

This competency standard is suitable for employment-based programs under an approved contract of training at the AQF level of the qualification in which the unit is first packaged or higher.

The unit may be selected as an elective from the relevant schedule (see qualification packaging rules) provided that all prerequisite units are undertaken or addressed through recognition processes.

This unit may be included in a skill set provided that it is listed in the schedule of electives (see Qualification Framework) and all prerequisite units are undertaken or addressed through recognition processes.

Application of the Unit 4)

Delivery and assessment of this unit should be undertaken within regard to the requirements of License to Practice (1.2 above), Prerequisite Competencies and Literacy and Numeracy skills (2 above) and the recommendations for concurrent assessment and relationship with other units (9.5 below).

Practice in the 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.

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 and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting, risk safety measures etc.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V a.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the 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.

UEENEEE003B Solve problems in extra-low voltage single path circuits

and

UEENEEJ103A Establish the basic operating conditions of vapour compression systems

and

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

or

UEENEEJ195A Establish the basic operating conditions of vapour compression systems - appliances

and

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

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 of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to work on low voltage refrigeration circuits.	<p>1.1 OHS procedures for a given work area are identified, obtained and understood.</p> <p>1.2 OHS risk control work preparation measures and procedures are followed.</p> <p>1.3 The nature of the circuit(s) problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.</p> <p>1.4 Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.</p> <p>1.5 Sources of materials that may be required for the work are identified and accessed in accordance with established procedures.</p>

ELEMENT	PERFORMANCE CRITERIA
2 Solve problems in low voltage refrigeration circuits.	1.6 Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
	2.1 OHS risk control work measures and procedures are followed.
	2.2 The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3 Circuits are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4 Established methods are used to solve d.c. and a.c. circuit problems from measure and calculated values as they apply to single and multiple path electrical circuits.
	2.5 Unexpected situations are dealt with safely and with the approval of an authorised person.
3 Complete work and document problem solving activities.	2.6 Problems are solved without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
	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.
	3.3 Justification for solutions used to solve circuit problems is documented.
	3.4 Work completion is documented and appropriate person(s) notified 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 solving problems in multiple path a.c. circuits.

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

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Evidence shall show an understanding of low voltage d.c. and a.c single and multiple path applied to refrigeration systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1 Resistance Measurement

- Typical field instruments and applications
- Insulation resistance tester
- IR Tester parts and functions
- Continuity testing
- Insulation resistance testing
- IR Tester voltage ranges
- AS/NZS 3000 wiring rules
- Calibration of IR Testers
- Storage of IR Testers
- Using of testers for continuity and insulation resistance measurement
- Calculation of resistance from measured results

T2 Factors affecting resistance

- Factors
- Resistivity
- Change in length
- Change in cross sectional area (csa)
- Change in temperature
- PTC and NTC
- Influence on practical circuits

REQUIRED SKILLS AND KNOWLEDGE

- Measurement of resistance

T3 Voltage and current measurement

- Hazards
- Characteristics of instruments
- Reading scales
- Voltmeters
 - Characteristics
 - Types
 - Operation
 - Connection
 - Loading effect
 - Advantages and disadvantages
 - Selection
- Ammeters
 - Characteristics
 - Types, series-ammeter and tong-ammeter
 - Operation
 - Connection
 - Advantages and disadvantages
 - Selection

T4 Direct Current parallel circuits

- Parallel circuits
- Parallel circuit components
- Applications of parallel circuits
- Characteristics
- Calculation of parallel circuit parameters
- Circuit connections
- Measurements of R, V, I in parallel circuits
- Determine V, I, R, P

T5 Direct Current series / parallel circuits

- Series/Parallel circuits
- Series/Parallel circuit components
- Applications of series/parallel circuits
- Characteristics
- Bridge network
- Calculation of series/parallel circuit parameters

REQUIRED SKILLS AND KNOWLEDGE

- Connection of series/parallel circuits
- Measurements of R, V, I in series/parallel circuits
- Determine V, I, R, P

T6 Capacitors and Capacitance

- Capacitor construction
- Dielectric material
- Types of capacitors
- Circuit symbols
- Capacitor terms
- Units
- Factors affecting capacitance
- Capacitor charge
- RC d.c series circuit
- Time constants
- Connection of capacitors

T7 Capacitors in Series and Parallel

- Capacitor hazards
- Safe handling of capacitors
- Dangers of discharging capacitors
- Series connections
- Parallel connections
- Measuring / testing of capacitors
- Capacitor faults
- Applications of capacitors
- Calculation of total capacitance
- Series and parallel connections
- Testing capacitors for serviceability

T8 Electromagnetic induction

- Faraday's law
- Applications
- Inductance

T9 Single phase alternating current

- Generation of a sinusoidal waveform
- Sinusoidal waveform characteristics
- Measuring and calculating values of a sinusoidal waveform
- Generation of single phase alternating current

REQUIRED SKILLS AND KNOWLEDGE

- Voltage and current in resistive, inductive and capacitive circuits
- Ohms Law and Impedance
- Power
 - power in a single phase circuit
 - power factor and phase angle
 - methods used to measure single phase power, energy and power factor
 - single phase power measurement
 - effects of low power factor
 - power factor improvement requirements
 - power factor improvement methods
 - wiring rules and regulations

T10 Magnetic devices

- Relays
- Contactors
- Solenoids
- Transformers
 - Single & double wound.
 - Volts vs. Turns ratio.
 - Losses:
 - VA in vs. VA out.
- Control transformers
- Power and motor starting transformers.
- Safety.
- Magnetic sensing devices

T11 Three phase alternating current

- Advantage of three phase system
- Generation of three phase
- Relationship between generated voltages
- Phase sequence
- Three phase star-connections
 - Star connections
 - Line and phase voltages and currents
- Three phase four wire systems
 - function of the neutral conductor
- Three phase delta-connections
 - Delta connections
 - Line and phase voltages and currents

REQUIRED SKILLS AND KNOWLEDGE

T12 Circuit protection and isolation

- Harmful effects of:
 - direct contact
 - indirect contact
 - thermal effects
 - over current
 - faults
 - mechanical movement
- Earthing
 - earthing terms
 - minimum earthing conductor size
 - MEM system
 - AS/NZS 3000 requirements
- Circuit protection devices
 - purpose, types, operating principles, characteristics and applications, including rewirable fuses, HRC fuses, circuit breakers, residual current devices and overvoltage and under voltage protection devices.
 - circuit protection and load protection
 - AS/NZS 3000 requirements (including sanger tags, & switch locking)
 - discrimination of circuit protection devices.
- Isolation devices
 - requirements for provision of isolation
 - need for protection against mechanical movement
 - AS/NZS 3000 requirements

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 the 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. It is recognised that, 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 have a bearing on the decision as to how much and how detailed 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

EVIDENCE GUIDE

shall incorporate evidence that shows a candidate is able to:

- 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:
 - Solve problems in single and multiple path d.c. and a.c. circuits as described in 8) and including:
 - A Determining the operating parameters of an existing circuit.
 - B Alternating an existing circuit to comply with specified operating parameters.
 - C Developing circuits to comply with a specified function and operating parameters.
 - D Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a 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 in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving problems in multiple path a.c. circuits.

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 that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended 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)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE003B Solve problems in extra low voltage single path circuits

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 shall be demonstrated in relation to:

- Single source series, parallel and series-parallel d.c and a.c. circuits as they apply to problems related to installation, fault finding, maintenance or development work functions in Refrigeration, Air Conditioning and Appliance Servicing disciplines.
- In relation to at least two of the following types of circuit problems and on at least two occasions
 - determining the operating parameters of an existing circuit
 - alternating an existing circuit to comply with specified operating parameters
 - developing circuits to comply with a specified function and operating parameters

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	4	Writing	4	Numeracy	5
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Custom Content Section

Competency Field 5)

Refrigeration and Air Conditioning