



**Australian Government**

# **UEEEL0008 Evaluate and modify low voltage heating equipment and controls**

**Release: 2**

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## **Modification History**

Release 2. This is the second release of this unit of competency in the UEE Electrotechnology Training Package.

Performance criteria numbering error corrected in element 3.

Workplace evidence requirements updated in Performance Evidence and Assessment Conditions.

Assessor requirements updated in Assessment Conditions.

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 evaluate and modify low voltage (LV) heating equipment and controls.

It includes working safely, identifying faults in heating equipment, repairing heating equipment, ensuring all work complies with relevant Australian Standards and legislation, and completing work and documenting activities.

The skills and knowledge described in this unit require a licence or permit to practice in the workplace where work is carried out on electrical installations which are designed to operate at voltages greater than 50 volt (V) alternating current (a.c.) or 120 V direct current (d.c.).

Competency development activities in this unit are subject to regulations directly related to licensing. Where a licence or permit to practice is not held, a relevant contract of training, such as an Australian Apprenticeship, may be required.

Additional and/or 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 work health and safety (WHS)/occupational health and safety (OHS) regulations.

## **Pre-requisite Unit**

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

UEEEL0019 Solve problems in direct current (d.c.) machines

UEEEL0021 Solve problems in magnetic and electromagnetic devices

UEEEL0020 Solve problems in low voltage a.c. circuits

UEEEL0023 Terminate cables, cords and accessories for low voltage circuits

and

UEECD0043 Solve problems in direct current circuits

or

UEECD0044 Solve problems in multiple path circuits

UEECD0046 Solve problems in single path circuits

## Competency Field

Electrical

## Unit Sector

Electrotechnology

## Elements and Performance Criteria

### ELEMENTS

Elements describe the essential outcomes

#### **1 Prepare to work on heating equipment**

#### **2 Evaluate and modify**

### PERFORMANCE CRITERIA

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

- |            |                                                                                                                           |
|------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>1.1</b> | Scope of work is obtained from relevant documentation, electrical drawings or relevant person/s                           |
| <b>1.2</b> | WHS/OHS requirements and workplace procedures for a given work area are identified and applied                            |
| <b>1.3</b> | Hazards are identified, risks are assessed and control measures are implemented                                           |
| <b>1.4</b> | Advice is sought from work supervisor to ensure the work is coordinated effectively with others                           |
| <b>1.5</b> | Sources of materials required for work are determined in accordance with workplace procedures                             |
| <b>1.6</b> | Tools, equipment and testing devices required to carry out work are obtained and checked for correct operation and safety |
| <b>2.1</b> | Equipment and circuits are checked and arrangement                                                                        |

|                                                |                                                                                                                                                                      |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>heating equipment</b>                       | identified                                                                                                                                                           |
|                                                | 2.2 Circuits are checked and isolated in accordance with workplace procedures and regulatory requirements                                                            |
|                                                | 2.3 The need to test or measure live work is determined in accordance with WHS/OHS requirements and, as necessary, conducted in accordance with workplace procedures |
|                                                | 2.4 Fault/s and probable cause/s are identified from measured and calculated values as they apply to heating equipment                                               |
|                                                | 2.5 Required components are identified and replaced in accordance with manufacturer specifications and industry standards                                            |
|                                                | 2.6 Unexpected situations are dealt with safely and with the approval of relevant person/s                                                                           |
| <b>3 Complete work and document activities</b> | 3.1 WHS/OHS work completion risk control measures and workplace procedures are followed                                                                              |
|                                                | 3.2 Worksite is cleaned and made safe in accordance with workplace procedures                                                                                        |
|                                                | 3.3 Justification for solutions used to modify circuits and equipment is documented                                                                                  |
|                                                | 3.4 Work completion is documented and an appropriate person/s notified in accordance with workplace procedures                                                       |

## 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.

Evaluating and modifying LV heating

- one single phase and one multi-phase from

equipment and controls must include two of the following types of heating equipment and their controls:

the following:

- space heating
- cooking
- water heating
- industrial process heaters

## Unit Mapping Information

No equivalent unit

## 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 UEEEL0008 Evaluate and modify low voltage heating equipment and controls

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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 two separate occasions and include:

- # applying work health and safety (WHS)/occupational health and safety (OHS) workplace procedures, including identifying hazards, assessing risks and implementing control measures
- # checking circuits are isolated in accordance with workplace procedures and regulatory requirements
- determining the operating parameters of existing heating circuits and equipment
- testing the function of a thermostat
- calculating the heat energy in a simple heating process
- testing the operation of an over temperature cut-out of the safety thermostat
- altering existing heating circuits and equipment to comply with specified operating parameters
- selecting heating circuits and equipment to comply with a specified function and operating parameters
- determining the cause of low efficiency in existing heating circuit and equipment
- determining conditions causing an existing heating circuits and equipment to be unsafe
- # connecting heating equipment and appliances
- identifying faulty components in heating appliances and controls from test results
- testing heating appliances and controls for serviceability
- ensuring all work complies with relevant Australian Standards and legislation
- completing work and documenting activities
- dealing with unplanned events/situations.

## 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:

- electrical heating control devices, including:
  - methods of manual heat control
  - methods of automatic heat control
  - types and application for common thermostats
  - operation of common thermostats, thermal cut-outs and pressure relief valves, flow switches and checking sacrificial anodes
  - sensitivity and differential of thermostats
  - techniques for testing a thermostat, including differential and correct operation
  - applications and operation of simmerstats
  - electronic heat control
- fixed electrical heating appliances, including:
  - terminology: heat energy, temperature, specific heat capacity, thermal conductivity and thermal stability
  - methods to test the heat energy in a simple heating process
  - methods of heat transfer
  - connections to a two phase stove
  - operation of reverse cycle air conditioning
- electrical water heater operation, including:
  - types of water heaters (instantaneous and storage) and their methods of control
  - intrinsic safety (pressure relief and thermal cut-out)
  - techniques for testing of over temperature cut-out of a thermostat
  - switchboard requirements to supply a controlled load water heater
  - internal circuit of a twin element water heater and supply connections
  - solar heating system and its integration into an electrical installation
  - heat pump
- faults in heating equipment and controls, including:
  - circuit diagrams of common heating equipment and controls
  - single phase and three phase element resistance values
  - techniques for testing single and three phase elements for correct insulation resistance and continuity
  - equipment replacement techniques
  - techniques for identifying and locating faulty components in heating equipment/controls
  - common types of faults
  - techniques for repairing/replacing faulty heating equipment components
- relevant job safety assessments or risk mitigation processes
- relevant manufacturer specifications

- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace policies and procedures
- relevant industry standards.

## Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessors must also hold the occupational licence for the jurisdiction the assessment is occurring where the activity being assessed requires a licence to practice.

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 suitable simulated 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 other simulations
- relevant and appropriate materials, tools, facilities, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, relevant industry standards, codes of practice and operation manuals.

In addition, evidence of Performance Evidence items of this unit marked with a hash (#) must be gathered in authentic workplace operational conditions (not simulated) before final determination of competence in this unit can be made.

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