



Australian Government

UEEEL0028 Conduct compliance and functional verification of electrical apparatus and existing circuits

Release: 2

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Modification History

Release 2. Minor Change. Typographic error in prerequisites corrected.

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 conduct compliance and functional verification of electrical apparatus and existing circuits.

It includes inspection and testing to verify electrical apparatus and/or existing circuits are safe and comply with all requirements. It covers working safely; visual inspections and mandatory, optional and functional testing following verification procedures; identifying non-compliance defects and mandatory reporting requirements.

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 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.

Current Licence Holders:

Those holding an 'Electrical Fitter Occupational Licence' or equivalent issued in an Australian state or territory and are currently employed as an Electrical Fitter meet the requirements of this unit and its prerequisite requirements.

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

UEECD0016 Document and apply measures to control WHS risks associated with electrotechnology work

UEEEL0003 Arrange circuits, control and protection for general electrical installations

UEEEL0020 Solve problems in low voltage a.c. circuits

UEEEL0023 Terminate cables, cords and accessories for low voltage circuits

UEEEL0005 Develop and connect electrical control circuits

UEEEL0047 Identify, shut down and restart systems with alternate supplies

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

UEEEL0021 Solve problems in electromagnetic devices

UEEEL0014 Isolate, test and troubleshoot low voltage electrical circuits

UEEEL0024 Test and connect alternating current (a.c.) rotating machines

UEEEL0025 Test and connect transformers

and

UEECD0043 Solve problems in direct current circuits

or

UEECD0044 Solve problems in multipath 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 inspect and test electrical apparatus and circuits

PERFORMANCE CRITERIA

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

- | | |
|------------|---|
| 1.1 | WHS/OHS measures for the site are identified, obtained and applied |
| 1.2 | WHS/OHS risk control measures and procedures in preparation for the work are followed |
| 1.3 | WHS/OHS hazards not previously identified are noted |

and risk control measures implemented

1.4 Electrical apparatus, existing circuits documentation and relevant industry standards are reviewed and applied

1.5 Appropriate person/s is consulted to ensure the work is coordinated effectively with others

1.6 Tools, equipment and testing devices needed to verify compliance are obtained in accordance with workplace procedures and checked for correct operation and safety

1.7 Preparatory work is checked to ensure no damage has occurred and complies with requirements

2 Inspect and conduct safety testing

2.1 WHS/OHS risk control measures and procedures for carrying out the work are followed

2.2 Need to inspect, test and measure live electrical work is determined in accordance with WHS/OHS requirements and workplace procedures

2.3 Circuits/machines/plant are checked as being isolated in accordance with WHS/OHS requirements and switch-off, lock out and tagging procedures

2.4 Electrical apparatus/circuits are inspected to determine if they are compliant with industry standards, function safely and as intended

2.5 Wiring is checked for suitability for the environments in which they are installed and suitably protected from damage or overheating

2.6 Protection methods and devices are validated as meeting coordination requirements for overload and short circuit protection

2.7 Switchgear and control gear are validated as being appropriately rated and meeting functional requirements

2.8 Evidence that electrical equipment complies with safety requirements is cited

2.9 Earthing system components are checked that they are correctly located and conductors correctly sized

2.10 Mandatory tests are conducted on all connected electrical apparatus and existing circuits in accordance with industry standards

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|--|-------------|--|
| | 2.11 | Testing is conducted to verify that fault-loop impedance is sufficiently low and residual current devices operates as intended |
| 3 Report inspection and test findings | 3.1 | WHS/OHS risk control work completion measures and procedures are followed |
| | 3.2 | Worksite is cleaned and made safe in accordance with workplace procedures |
| | 3.3 | Non-compliance defects are identified and reported in accordance with workplace procedures |
| | 3.4 | Recommendations for rectifying defects are made in accordance with workplace procedures |
| | 3.5 | Mandatory documentation is completed 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.

Verification and testing must include at least the following two different types of installations:

- electrical apparatus and existing circuits comprising an apparatus and existing circuit supplied by a single phase supply
- electrical apparatus and existing circuits supplied by a three phase supply

Unit Mapping Information

This unit replaces and is not equivalent to UEENEEG199A Conduct compliance and functional verification of electrical apparatus and existing circuits.

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 UEEEL0028 Conduct compliance and functional verification of electrical apparatus and existing circuits

Modification History

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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 relevant industry standards
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including risk control measures
- selecting correct tools and testing equipment
- confirming correct isolation in accordance with workplace procedures, industry and regulatory standards
- completing visual inspection and testing of electrical apparatus and circuits, including:
 - identifying visual non-compliance defects
 - using effective methods for conducting mandatory and optional tests
 - using testing devices
- reporting inspection and recommendations, including:
 - identifying non-compliance and functional defects from test results
 - identifying causes of non-compliance and functional defects
- dealing with unplanned events.

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 safety, including:
 - safety procedures for working on electrical systems, circuits and apparatus
 - safe working practices as a normal part of carrying out electrical installation work
 - isolation and lockout procedures
 - tools and equipment needed to conduct electrical work compliance inspection and testing

- legislated regulations, including:
 - legislation and regulations that require electrical apparatus and existing circuits to be inspected and tested to ensure they are safe
 - the person/bodies responsible for the various aspects of ensuring electrical apparatus and existing circuits are safe
 - results of tests that show an electrical apparatus and existing circuits is safe for connection to the supply
 - results of periodic inspection and tests that show electrical equipment are safe to use
- visual inspection of electrical apparatus and existing circuits for compliance with relevant industry standards, including:
 - protection requirements
 - general condition
 - wiring systems
 - equipment and accessories
 - earthing
- testing electrical apparatus and existing circuits, including:
 - tests to ensure insulation resistance is adequate; earth continuity is such that it will ensure the operation of protection devices under earth fault conditions; polarity of active/s and neutral for final sub-circuits is correct; there is no transposition of earthing and neutral conductors; fault-loop impedance is sufficiently low; residual current device (RCD) use for correct operation and sensitivity
 - functional tests to ensure active/s and neutral for the same circuit are clearly identified with their circuit protection device
 - tests that show all circuits and devices operate as intended
 - tests to determine the fault level at a particular point in an installation
- documentation, including:
 - results of tests conducted on an electrical apparatus and existing circuits comply with requirements and ensure the installation is safe
 - documents of the results of testing electrical apparatus and existing circuits as required by the local supply authority
 - documents of periodic testing and inspection of electrical equipment, including tagging requirements
- effects of electric current, including:
 - physiological effects of current
 - basic principles by which an electric current can produce heat, light, motion and a chemical reaction
- single path practical circuit, including:
 - arrangement of energy source, protection device, switch and load in a circuit
 - the purpose of each component in the circuit
 - consequences of an open circuits, closed circuits and short circuits
- multiple path direct current (d.c.) circuits, including:
 - circuit configurations and connection

- relationship between parameter of voltage, current, resistance power dissipation in the whole or any part of the circuit
- safely measuring the parameters for the whole or any part of the circuit
- methods of determining circuit behaviour for variation in any of the parameters from measured and calculated values
- alternating voltage and current generation, phase relationships, energy in an alternating current (a.c.) circuit, including:
 - sinusoidal voltage generation and resulting current
 - the terms period, maximum value, peak-to-peak value, instantaneous value, average value, root-mean-square (r.m.s.) value and frequency
 - three phase generation
 - relationship between the phase voltages generated in a three phase alternator and the conventions for identifying each
 - method of determining the phase sequence or phase rotation of a three phase supply
 - methods of determining power and energy supplied by three phase circuits
- fundamental safety principles of relevant industry standards, including:
 - definition of terms
 - fundamental safety principles of protection against direct and indirect contact with live parts; thermal effects; overcurrent; earth faults; abnormal voltages; spread of fire; mechanical injury and external influences
 - fundamental principles of installation design; selection and installation of equipment; means of compliance (including alterations, additions and repairs) and verification of compliance
- electric motor selection, starting method and overload protection, including:
 - types of motor enclosures suitable for given environmental conditions
 - criteria for selecting motor starters and overload protection
 - types and connection arrangements for direct-on-line and reduced voltage starters
 - thermal, magnetic and thermistor overload protection methods
- protective and functional earthing, including:
 - relevant industry standards requirements
 - purpose of protective and functional earthing
 - parts of the protective earthing systems
 - earthing arrangements, earthing of equipment and equipotential bonding
 - methods of determining the maximum fault-loop impedance for a circuit
 - selection of protective conductor and active conductor sizes for each circuit to ensure earth fault-loop impedance is sufficiently low to operate the circuit protective device
- multiple earth neutral (MEN) system and its application, including:
 - the roles of the protective earthing (PE) and neutral (N) conductors in a consumer's installation and their relationship to the protective earth neutral (PEN) conductor in the electricity distributor system or sub-main to an outbuilding
 - the importance of the MEN link when a fault occurs
 - the likely consequences of the absence of the MEN link or high impedance in the PEN

- conductor when a fault occurs
- the requirements for installation of a MEN link in an installation and an outbuilding
- application of transformers, including:
 - transformers used in distribution and transmission systems and large consumer installations
 - transformers used in welding machines
 - applications in appliances
 - risks and safety control measures associated with connection and disconnection of instrument transformers
 - safe working procedures when connecting and testing transformers
 - relevant industry standards requirements and restriction on the installation and use of transformers
- protection of circuit against overcurrent and abnormal voltages, including:
 - relevant industry standards requirements
 - minimum fault levels specified by electricity distributors
 - methods and arrangement for protection against short-circuit currents and overload currents
 - coordination of overload and short circuit protection devices
 - coordination between conductors and overload protection device
 - causes of over and undervoltage
 - device and requirements for protection against over and undervoltage
- use of RCDs and extra-low voltage (ELV) for fault protection, including:
 - limitation of an RCD to protect against contact with live parts
 - relevant industry standards requirements for use of RCDs
 - conditions for use of ELV to provide for basic and fault protection
 - relevant industry standards requirements for installation of separated extra-low voltage (SELV) and protected extra-low voltage (PELV) systems
- control and protection of electrical apparatus and existing circuits, including:
 - relevant industry standards requirements
 - devices for functions of isolation, emergency, mechanical maintenance and functional control
 - method for assessing prospective short circuit current
 - devices and arrangement for protection against overload and short circuit current
 - additional protection by RCD
 - protection against switchboard internal arc faults
- electrical apparatus and existing circuits in hazardous areas, including:
 - relevant industry standards requirements
 - types of areas classified as a hazardous area
 - standards to which the maintenance of electrical equipment shall comply
 - additional training required to work competently with electrical equipment for hazardous areas

- verification of compliance of electrical apparatus and existing circuits, including:
 - relevant industry standards requirements
 - visual inspection to determine if electrical apparatus and existing circuits complies with requirements of relevant industry standards and relevant specific installation standards
 - mandatory tests in AS/NZS 3017 Electrical installations - Verification guidelines
 - portable tool safety testing and tagging system in accordance with AS/NZS 3760 In-service safety inspection and testing of electrical equipment
- ability to perform effective safe isolation of any equipment, including:
 - preparation of a safe work method statement (SWMS) or job safety analysis (JSA) for effective safe isolation
 - safe methods for identifying source of supply to be isolated
 - switching-off, lock-out and tagging procedures
 - safe methods for confirming effective and safe isolation
- relevant industry standards requirements to carryout repairs and terminating thermoplastic insulated cables, elastomer sheathed cables, cross-linked polyethylene (XLPE) sheathed cables, high temperature cables, armoured cables and neutral screened cables in a wide range of applications
- circuit tests required for electrical cables in a range of installations and final sub-circuit, including:
 - following safe testing procedures
 - tests to show if the earth continuity and earth fault-loop impedance are sufficiently low
 - testing to show if insulation resistance is sufficiently high
 - testing to show if the polarity and circuit connections are correct
- techniques to read, sketch and interpret electrical diagrams including:
 - purpose and characteristics of schematic, block and wiring diagrams, plans and schedules
 - conventions used in documenting electrical information
 - read and interpret schematic, block and wiring diagrams, plans and schedules
 - sketch electrical diagrams using conventional symbols
- WHS/OHS, including:
 - WHS/OHS regulations
 - legal responsibilities for employers and employees
 - employer's and employee's own duty of care
 - safety committees and their role
- requirements for personal safety in the workplace including:
 - purpose and use of SWMS or JSA
 - purpose and process of reporting WHS/OHS incidents
 - safety procedures for working with electrical circuits and equipment
 - procedures for safe and effective isolation of electrical supply
 - regulations for the supervision of apprentices and trainees
- process to rescue a person in contact with live electrical conductors or equipment and the primary importance of the safety of the rescuer

- application of emergency first aid requirements for an electric shock victim, including:
 - calling for help
 - applying cardiopulmonary resuscitation (CPR)
 - selection and use of fire extinguishers to control electrical fire at accident site
- dangers of high voltage (HV) equipment and distribution systems, including:
 - step and touch and induced voltages
 - sources of induced voltage and stored energy
 - creepage and clearance requirements
 - application of safe working procedures in the vicinity of HV equipment
- systematic method of commissioning and decommissioning electrical equipment and existing circuits, including:
 - commissioning safety procedures
 - circuit voltage testing
 - phase rotation checks
 - functional testing
 - instrument and control parameter settings
 - decommissioning safety procedures
 - identification of circuits with their control and protection devices
 - impact of isolation on other parts of an installation
 - tagging, testing and earthing
 - safe removal of equipment
- diagnosing and rectifying faults in electrical apparatus and existing circuits, including:
 - faults such as open circuit, short circuit, incorrect connections, insulation failure, unsafe condition, apparatus/component failure and related mechanical failure
 - apparatus such as control devices, fixed appliances/accessories, lighting, electrical machines motors and controls, socket outlets, transformers, protection and metering devices
 - circuits such as those supplying fixed appliances, lighting, socket outlets, motors and controls circuits, transformers, electronic or computer-based equipment.

Assessment Conditions

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

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 simulated suitable 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 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.

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