



Australian Government

UETTD RIS58 Locate faults in power system underground power cables

Release: 1

UETTDRI58 Locate faults in power system underground power cables

Modification History

Release 1. This is the first release of this unit of competency in the UET Transmission, Distribution and Rail Sector Training Package.

Application

This unit involves the skills and knowledge required to locate faults in power system underground power cables in the electricity supply industry (ESI).

It includes diagnosis and detecting the location of faults in underground power cables. It includes obtaining the required access to test or equivalent permit, setting up the fault location test equipment and following the procedure to carry out the cable fault location test plan.

It also includes interpreting test results, documenting the fault location and likely cause, and listing recommendations for correcting the cable fault to meet client requirements.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Common Unit Group

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

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE105A Fix and secure electrotechnology equipment

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UETTDRCJ21 Lay ESI electrical cables

UETTDRCJ26 Install and maintain de-energised low voltage underground polymeric cables

UETTDRCJ27 Install and maintain de-energised high voltage underground polymeric cables

UETTDREL11 Apply sustainable energy and environmental procedures

UETTDREL12 Operate plant and equipment near live electrical conductors and apparatus

UETTDREL16 Working safely near live electrical apparatus

UETTDRI541 Install network infrastructure electrical equipment

UETTDRIS42 Maintain network infrastructure electrical equipment

UETTDRIS55 Install and maintain low voltage underground services

Competency Field

Industry Specific Cross Discipline

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to locate faults in underground power cables

PERFORMANCE CRITERIA

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

- 1.1** Work schedules, including cable specifications and standards, cable route data, history, characteristics, drawings, plans, requirements, workplace procedures and material lists, are received and confirmed
- 1.2** Job requirements and workplace procedures are identified and communicated with relevant personnel
- 1.3** Work health and safety (WHS)/occupational health and safety (OHS) workplace procedures for locating faults in underground power cables are obtained and confirmed for the purposes of the work to be performed
- 1.4** Work is prioritised and sequenced for completion within acceptable timeframes following consultation with relevant personnel and in accordance with workplace procedures
- 1.5** Hazards are identified, WHS/OHS risks assessed and control measures identified in accordance with workplace procedures
- 1.6** Relevant work permits are obtained, understood and signed in accordance with workplace procedures
- 1.7** Equipment, tools and personal protective equipment required (PPE) for work are identified, obtained and confirmed in working order

- 1.8 Test equipment is assembled and checked for calibration status in accordance with workplace procedures
 - 1.9 Cable fault location test procedures/plans are prepared and range of tests required is determined in accordance with job requirements and workplace procedures
 - 1.10 Worksite is prepared to minimise risk, damage to property, commerce and individuals in accordance with workplace procedures
 - 1.11 Traffic management plan is confirmed as being applied in accordance with workplace procedures
- 2 Carry out location of faults in underground power cables**
 - 2.1 WHS/OHS, sustainable energy and environmental principles and practices are monitored and followed to reduce incidents of accidents in accordance with workplace procedures
 - 2.2 Requirements for lifting, climbing, working at heights and use of power tools/equipment are followed in accordance with workplace procedures
 - 2.3 Locating faults in underground power cables is performed in agreed timeframes, to quality standards and with a minimum of waste in accordance with workplace procedures
 - 2.4 Cable is tested to determine location relevant faults in accordance with job requirements and workplace procedures
 - 2.5 Unplanned events in the location of faults in underground power cables are responded to in accordance with workplace procedures
 - 2.6 Quality checks of work are undertaken in accordance with workplace procedures
- 3 Complete location of faults in underground power cables**
 - 3.1 Completed work is checked against work schedule, construction plans and drawings for compliance and anomalies are reported in accordance with workplace procedures
 - 3.2 WHS/OHS and environmental incidents are reported in accordance with workplace procedures, as required
 - 3.3 Worksite is cleaned and made safe in accordance with workplace procedures

- 3.4 Tools, equipment and surplus resources and materials are cleaned, checked and returned to storage in accordance with workplace procedures
- 3.5 Relevant work permits are signed off and cable/site is returned to service in accordance with workplace procedures
- 3.6 Work records, reports and/or documentation are 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 Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to UETTDRI58A Locate faults in power system underground power cables.

Links

UET Training Package Companion Volume Implementation Guide is found in VETNet - <https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=229bace1-b7bc-4653-9300-dffb13ecfad7>

Assessment Requirements for UETTDRIS58 Locate faults in power system underground power cables

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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 and performance criteria on at least two separate occasions and include:

- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including the use of risk control measures
- applying sustainable energy principles and practices
- locating faults in power system underground power cables using at least three (3) of the following:
 - time domain reflectometry (TDR)
 - pool of potential in earth (POPIE)
 - differential TDR radar
 - current impulse
 - Murray loop
 - Varley loop
 - radio detection
 - capacitance/inductance
 - continuity tests
 - insulation tests
 - voltage detection
- dealing with unplanned events on at least one (1) occasion.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- installation of underground cable, including:
 - requirements for the use of enterprise construction manuals, system diagrams/plans and drawings
 - safety precautions specific to the installation of underground cable - excavation and trench safety regulations, gas detection procedures, working in confined spaces, personal protective equipment (PPE), hazards for the use of liquid petroleum gas (LPG),

- equipment for jointing of underground cable, gas bottle testing procedures, permit to work systems and isolation procedures
- trench excavation and reinstatement procedures
 - installation of underground cable procedures - types of tools and equipment, methods of installing conduits, methods of installing cables and sealing cable ends (direct buried, ducts cleated and racked)
 - procedures for the safe use of LPG equipment for cable jointing
 - location of cable faults in underground power cables, including:
 - standards, codes, legislation, supply authority regulations and/or enterprise requirements
 - types of faults
 - methods of locating faults - Murray loop test, Fisher connection of Murray loop, modified Fisher connection, Varley loop test, TDR, differential TDR radar, digital arc reflection, differential digital arc reflection, current impulse test, differential current impulse, decay, differential decay, POPIE, radio detection, capacitance inductance test, pending faults (thermography and cable/joint temperature measurement), cable location devices/equipment and methods (signal generator/receiver, phasing methods using 'megger', current injection and cable stabbing techniques), and cable identification
 - low voltage (LV) energised working practices - regulations, working methods, insulating glove, bare hand, work procedures and specialist equipment
 - safety precautions specific to working near conductors - safe working practices and procedures, working in confined spaces, permit to work systems and isolation procedures
 - jointing and termination of LV polymeric cable, including:
 - standards, codes, legislation, supply authority regulations and/or enterprise requirements pertaining to the jointing of LV polymeric cables
 - types of cables - single core, multi-core and cross-linked polyethylene (XLPE) insulation
 - methods of cable handling - direct laid cables, duct laid cables, solid laid cables, cables supported in cleats or hangers, corrosion protection and minimum bending radius of cables
 - methods of cable sealing - shorting of cables cores, core of un-terminated cables, methods of protection from corrosion, polymeric sheathed cables sealing with mastic lined, and heat shrink caps buried sealed ends
 - types of jointing tools - general hand tools and compression tools
 - techniques in the use of LPG - safety precautions, PPE, and general maintenance and repair
 - safety precautions when cable jointing - working in confined spaces; permit to work systems and isolation procedures; and emergency rescue/response, including first aid
 - LV polymeric cable jointing principles; including:
 - techniques in jointing LV XLPE cables - straight through joint, jointing different types of cable and service and street light cable joints
 - techniques in terminating LV XLPE - pole top terminations, substation terminations, distribution pillar/column/cubicle terminations and service and street light cable terminations
 - techniques in repairing LV XLPE cable - different types of damage, repairs to sheath and

- repairs to cores
- methods of testing cable after jointing
- standards, codes, legislation, supply authority regulations and/or enterprise requirements pertaining to the jointing of high voltage (HV) underground polymeric cables
- HV underground polymeric cables requirements for the use of enterprise construction manuals, system diagrams/plans and drawings, including:
 - characteristics of different types of cables and components
 - purpose of stress control
 - applications of various tools and equipment for HV jointing
- procedure for isolating HV underground polymeric cables, including:
 - method for proving safe to work
 - earthing procedures
- techniques in jointing HV underground polymeric cables, including:
 - short circuit cores and seal cable
 - straight through
 - trifurcating
- techniques in HV underground polymeric cable terminations, including:
 - pole top termination
 - substation/switchgear termination
 - aerial bundled cable (ABC) termination
 - telcon termination
- procedures for repairing HV underground polymeric cables, including:
 - location of faults
 - types of damage
 - techniques to repairs to sheath
 - techniques to repairs to core
- jointing LV paper lead/lead type cables, including:
 - requirements for the use of enterprise manuals, system diagrams/plans and drawings
 - types of tools and equipment
 - types of LV cables
 - structure of LV PLY cables
 - techniques for lead wiping
 - technique for preparing and jointing LV lead sheathed paper insulated cables
 - installation methods of LV straight joint
 - inspection and repair procedures to outer sheath of lead sheathed LV cable
 - techniques in terminating LV lead sheathed paper insulated cables
 - methods of testing cable after jointing
- HV paper lead cable jointing principles, including:
 - requirements for the use of enterprise manuals, system diagrams/plans and drawings
 - types of tools and equipment

- types of HV cables
- structure of HV cables
- technique for the installation of transition joint between XLPE and lead sheathed paper insulated cables
- technique for the jointing, terminating and repairing of HV paper lead insulated cables
- methods of testing cable after jointing
- underground cables construction and types, including:
 - safety precautions specific to handling underground cables
 - requirements for the use of enterprise manuals, system diagrams/plans and drawings
 - types and applications of underground cables
 - construction types and structures of underground cables
 - characteristics of different types of underground cables
 - ratings
- aluminium and lead cable sheathed jointing procedures, including:
 - safety precautions specific to handling and jointing underground aluminium and lead cable, including provision of WHS/OHS information, such as material safety data sheets (MSDS)
 - requirements for the use of enterprise manuals, system diagrams/plans and drawings
 - construction and structure(s) of aluminium and lead cable underground cables
 - characteristics of aluminium and lead cable
 - ratings
 - techniques in the jointing of aluminium and lead sheathed cable
 - methods of testing cable after jointing.

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 workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated conditions involving realistic and authentic activities that replicate operational 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 PPE currently used in industry for locating faults in power system underground power cables
- applicable documentation, including workplace procedures, relevant industry standards,

equipment specifications, regulations, codes of practice and operation manuals.

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