



Australian Government

UETDRDU005 Install and maintain network infrastructure LV underground cables

Release: 1

UETDRDU005 Install and maintain network infrastructure LV underground 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 Release 2.0.

Application

This unit covers the installation and maintenance of de-energised low voltage (LV) underground cables and covers the laying of cables as well as the jointing, terminating, repair and replacement of cables. It also includes direct laying of cables in trenches, on racks, in troughs and/or in conduit or ducts; and the isolation of systems and circuits, the procedure of issuing/accepting electrical access permits, the undertaking of pre-commissioning and/or recommissioning tests and the updating of system data/maintenance records.

The application of the skills and knowledge described in this unit may require a licence/registration to practice in the workplace subject to regulations for undertaking of electrical work.

Other conditions may apply under state and territory legislative and regulatory licensing requirements which must be confirmed prior to commencing this unit.

Pre-requisite Unit

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

UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEG033A Solve problems in single and three phase low voltage electrical apparatus and circuits

UEENEEG063A Arrange circuits, control and protection for general electrical installations

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG103A Install low voltage wiring and accessories

UEENEEG104A Install appliances, switchgear and associated accessories for low voltage electrical installations

UEENEEG105A Verify compliance and functionality of low voltage general electrical installations

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

UEENEEG107A Select wiring systems and cables for low voltage general electrical installations

UEENEEG108A Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

UEENEEG109A Develop and connect electrical control circuits

UEENEEK142A Apply environmentally and sustainable procedures in the energy sector

UETDREL005 Work safely in the vicinity of live electrical apparatus

UETDRIS005 Implement & monitor power system environmental & sustainable energy management policies & procedures

UETDRIS006 Implement and monitor the power system organisational WHS/OHS policies, procedures and programs

UETDRIS009 Install and maintain ESI network infrastructure electrical equipment

Competency Field

Distribution Underground

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare for the laying, installation and maintenance of underground cables

PERFORMANCE CRITERIA

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

- 1.1** Work schedules, including drawings, plans, requirements, established procedures and material lists, are received, analysed and confirmed, as necessary, by site inspection
- 1.2** Relevant requirements and established procedures for the work are communicated to all personnel and identified for all worksites

- 1.3 Work health and safety (WHS)/occupational health and safety (OHS) policies and procedures related to requirements and established procedures for the laying, installing and maintenance of LV underground cables are obtained and confirmed for the purposes of the work to be performed and communicated
 - 1.4 Work is prioritised and sequenced following consultation with others for completion within acceptable timeframes and in accordance with established procedures
 - 1.5 Hazards are identified, WHS/OHS risks assessed and control measures prioritised, implemented and monitored, including emergency exits kept clear, according to established procedures
 - 1.6 Relevant work permits are obtained to access and perform work according to requirements and/or established procedures
 - 1.7 Resources, including personnel, equipment, tools and personal protective equipment (PPE), required for the job are obtained and confirmed to be in working order
 - 1.8 Relevant personnel at worksite are confirmed current in first aid and other related work procedures according to requirements
 - 1.9 Liaison and communication issues with others/authorised personnel, authorities, clients and landowners are resolved to carry out work where necessary
 - 1.10 Site is prepared according to the work schedule and to minimise risk and damage to property, commerce and individuals in accordance with established procedures
 - 1.11 Personnel participating in the work, including plant operators and contractors, are fully briefed and respective responsibilities confirmed where applicable in accordance with established procedures
 - 1.12 Road signs, barriers and warning devices are positioned in accordance with requirements
- 2 **Carry out the laying, installation and maintenance of LV**
 - 2.1 WHS/OHS and sustainable energy principles and practices to reduce the incidents of accidents and minimise waste are monitored and followed in

underground cables	accordance with requirements and/or established procedures
2.2	Lifting, climbing, working in confined spaces and working aloft, and use of power tools/equipment, techniques and practices are safely followed and, currency checked according to requirements confirmed
2.3	Systems and circuits are isolated as required, proved safe to work on in accordance with the requirements/permits and established procedures
2.4	Essential knowledge and associated skills are applied for the safe installation and maintenance of LV underground cables to ensure completion in an agreed timeframe and to quality standards with a minimum of waste according to requirements
2.5	Electrical cables are laid in accordance with the work schedule and requirements/established procedures
2.6	De-energised LV underground cables are installed according to the work schedule and requirements/established procedures
2.7	Maintenance, including repair and/or replacement of de-energised LV underground cables, is carried out in accordance with the work schedule and requirements/established procedures
2.8	Hazard warnings and safety signs are recognised and hazards and assessed WHS/OHS risks are reported to immediate authorised personnel for directions according to established procedures
2.9	Unplanned events in the laying, installing and carrying out the maintenance of LV underground cables are undertaken within the scope of established procedures
2.10	Known solutions to a variety of problems are applied using acquired essential knowledge and associated skills
2.11	Ongoing checks of quality of the work are undertaken in accordance with instructions and established procedures
3 Complete the laying, installation and maintenance of LV underground cables	3.1 Work undertaken is checked against work schedule for conformance with requirements and anomalies reported in accordance with established procedures

- 3.2 Accidents and/or injuries are reported in accordance with requirements/established procedures, where applicable
- 3.3 Worksite is rehabilitated, cleaned up and made safe in accordance with established procedures
- 3.4 Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures
- 3.5 Relevant work permits are signed off and LV underground cables are returned to service in accordance with requirements
- 3.6 Work completion records, reports, drawings and/or documentation and information are finalised and processed, and appropriate personnel notified

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 UET Transmission, Distribution and Rail Sector Training Package Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to UETTDRCJ33 Install and maintain network infrastructure LV underground cables.

Links

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

Assessment Requirements for UETDRDU005 Install and maintain network infrastructure LV underground 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
- laying at least one (1) of the following low voltage (LV) cable types:
 - LV polymeric
 - LV paper insulated
- laying LV cables using at least one (1) of the following installation types:
 - direct lay
 - on racks
 - in conduits
- laying LV cables using at least one (1) of the following cable pulling methods:
 - stocking pulling
 - bond pulling
 - armour pulling
 - nose pull attachments
- sealing LV cables using at least two (2) of the following cable sealing methods:
 - heat shrinkable
 - pre-stretched materials
 - tin/lead wiping
 - pre-moulded components
- cutting LV cables using at least one (1) of the following cable cutting methods:
 - hydraulic cutters
 - electric reciprocating
 - motorised
 - hand tools
- laying LV cables using at least four (4) of the following supporting plant and equipment:
 - drum jacks

- winches
- spindles
- capstans
- bollards
- cable trailers
- rollers
- lubricants
- ropes
- bell mouths
- draw wires/rods
- joining LV cables using at least two (2) of the following jointing methods:
 - tee-off joints
 - straight through joints
 - parallel branch joints
 - parallel joints
- terminating LV cables in/on at least two (2) of the following locations:
 - transformers
 - LV switchboards
 - pillars/turrets
 - lighting columns
 - ring main units
 - chamber substations
- terminating LV cables using at least two (2) of the following types of equipment:
 - busbar/termination boxes
 - links/fuses
 - disconnect boxes
 - termination boxes
 - control gear
 - underground/overhead terminations
 - circuit breakers
- jointing and terminating LV cables using at least one (1) of the following material types:
 - resin filled boxes
 - compound filled boxes
 - polymeric tape
 - heat shrink
 - 'slip-on' moulds
 - pre-stretched polymeric
- terminating LV cables using at least one (1) of the following connectors:
 - compression lugs

- welded connections
- mechanical connectors
- insulation piercing connectors
- testing LV cables using all of the following testing and recording equipment:
 - insulation resistance testers
 - voltage detectors
- 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:

- transmission, distribution and rail systems encompassing:
 - relationship between the transmission, distribution and rail/tram system within an overall power system - different organisations responsible for generation, transmission, distribution and rail/tram; how they correlate and their functions
 - characteristics of a transmission, distribution and rail system - principal components; typical voltage levels and methods of transmission and distribution, including grid type transmission systems, radial, parallel and ring main feeders
 - relationship between an overhead and underground supply systems within an overall power system - advantages/disadvantages, applications and the basic steps for planning and installing an overhead and underground distribution system
 - single line drawings and layouts - drawings and layouts of transmission and distribution systems, including, radial, parallel and ring main feeders and the HV equipment associated with substations
- substations, power transformers and reactors encompassing:
 - relationship between the substations within an overall power system - purpose, location in relation to load centres, layout of high voltage (HV) equipment within the substation and auxiliary equipment
 - characteristics of a power transformer - basic construction of distribution transformers; operation under load/no-load conditions; types and basic operation of tap changing switches, including solid state types, efficiency and cooling
 - auxiliary equipment used on transformers - function and basic operation of equipment
 - maintenance of a power transformer - basic connections, restrictions to parallel operation, problems and remedies associated with harmonics, and testing and fault-finding procedures
 - description, purpose and characteristics of a reactors
- powerline safety practices encompassing:
 - protective apparatus and apparel for linework - responsibilities for the selection, use, maintenance and storage of protective apparatus and apparel and the types of protective apparatus and apparel used for the line worker
 - requirements for the use of ladders - carrying, erecting, collapsing and lowering different types of extension ladder against a standing pole; maintenance checks on different types

of ladders; renewal of extension ropes and the safety issues relating to clearances from overhead conductors

- requirements for climbing and working aloft - methods used to identify a pole is safe to climb; methods used to inspect a line worker's body belt; application of knots and hitches appropriate to the requirements of a line worker; height safety principles, including personal fall protection, prevention and related requirements; and the practical procedures of climbing an overhead structure and fitting a pole chair
- traffic management - purpose of traffic management and a line worker's responsibilities in accordance with relevant statutory requirements and electricity supply industry (ESI) requirements, demonstration of the procedure used to provide an effective traffic management scheme and the use of a two-way radio
- control of small fires - identification, selection and operation of the appropriate extinguishing mediums for various types of fires, general fire prevention methods and the precautions for personal protection when fighting small fires
- rescue victims from heights and confined spaces - planning and identifying procedures; establishing responses; developing techniques; involvement of external emergency services; and emergency procedures for the rescue of an electric shock victim, including cardiopulmonary resuscitation (CPR)
- requirements for aerial linework - planning, establishing and implementing relevant aviation authority clearances; determining system requirements; aircrew familiarisation with network operations and equipment; and requirements for effective communications operations for aerial work
- procedures in providing store support encompassing:
 - classification and identification of equipment, components and tools
 - procedures for purchasing/ordering items, removing/dispatching items, stocktaking, security and bookkeeping/record keeping
 - material handling - warehouse/depot storage techniques, handling equipment, pallet lift trucks and forklifts
 - cable drum handling equipment
 - safety procedures - storage and care of safety equipment; handling hazardous materials; storage of hazardous substances and dangerous goods; depot safety procedures; manufacturer and supplier information, including material safety data sheets (MSDS)
- installation of underground cable encompassing:
 - 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
- LV polymeric cable jointing principles encompassing:
 - techniques in jointing LV cross-linked polyethylene (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
- jointing and termination of LV polymeric cable encompassing:
 - 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 XLPE insulation
 - methods of cable handling - direct laid cables, duct laid cables, solid laid cables and cables supported in cleats or hangers
 - corrosion protection
 - minimum bending radius of cables
 - methods of cable sealing - shorting of cables cores and core of un-terminated cables
 - methods of protection from corrosion
 - polymeric sheathed cables sealing with mastic lined
 - 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, 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
- underground cables construction and types encompassing:
 - 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.

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
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

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