



Australian Government

Department of Education, Employment and Workplace Relations

UETTDRCJ33A Install and maintain network infrastructure LV underground cables

Release: 1

UETTDRCJ33A Install and maintain network infrastructure LV underground cables

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

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

Application of the Unit

Application of the Unit 2)

This Competency Standard Unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice 3)

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

License to practice**3)**

Practice in workplace and during training is also subject to regulations directly related to Occupational Health and Safety, electricity/telecommunications/gas/water industry safety and compliance, industrial relations, environmental protection, anti discrimination and training. Commonwealth, State/Territory or Local Government legislation and regulations may exist that limits the age of operating certain equipment.

Pre-Requisites**Prerequisite Unit(s)****4)****Competencies****4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
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

Prerequisite Unit(s)**4)**

	electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase 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 electromagnetic devices and related 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 energy procedures in the energy sector
UETTDREL16A	Working safely near live electrical

Prerequisite Unit(s) 4)

apparatus

UETTDNIS46A	Install and maintain ESI network infrastructure electrical equipment
UETTDNIS62A	Implement and monitor the power system organisational OHS policies, procedures and programs
UETTDNIS63A	Implement and monitor the power system environmental and sustainable energy management policies and procedures

Literacy and numeracy skills 4.2)

Participants are best equipped to achieve 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 4

Employability Skills Information**Employability Skills 5)**

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 competency standard unit. Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare for the laying, installation and maintenance of underground cables	1.1 Works schedule(s), including drawings, plans, requirements, established procedures, and material lists, are received, analysed and confirmed, if necessary, by site inspection. 1.2 Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites. 1.3 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, OHS risks assessed and control measures are 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 required for the job are obtained and confirmed in working order.

ELEMENT	PERFORMANCE CRITERIA
2 Carry out the laying, installation and maintenance of LV underground cables	1.8 Relevant personnel at work site are confirmed current in First Aid and other related work procedures according to requirements. 1.9 Liaison and communication issues with other/authorised personnel, authorities, clients and land owners 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.
	2.1 OHS and sustainable energy principles and practices to reduce the incidents of accidents and minimise waste are monitored and followed in 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 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

ELEMENT	PERFORMANCE CRITERIA
	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 OHS risks are reported to the immediate authorised persons 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 works 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 Work site 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.

ELEMENT**PERFORMANCE CRITERIA**

- 3.5 Relevant work permit(s) are signed off and LV underground cables are returned to service in accordance with requirements
- 3.6 Works completion records, reports, drawings and/or documentation and information are finalised and processed and appropriate personnel notified.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Essential knowledge and associated skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of laying, installing and maintaining LV underground cables.

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

KS01-TCJ33A Network infrastructure LV underground cables

Evidence shall show an understanding of installation and maintenance of network infrastructure LV underground cables to an extent indicated by the following aspects:

T1 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 and, how they correlate and their functions
- Characteristics of a transmission, a distribution and a 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

T2 Substations, power transformers and reactors encompassing:

- Relationship between the substations within an overall power system - purpose, location in relation to load centres, layout of 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, testing and fault finding procedures
- Description, purpose and characteristics of a reactors

T3 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

REQUIRED SKILLS AND KNOWLEDGE

- 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 procedure 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 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, identifying, the procedures, and establishing responses, developing techniques, involvement of external emergency services and practical demonstration/rehearsals of rescuing a person from heights and from confined spaces and emergency procedures for the rescue of an electric shock victim including CPR
- Requirements for aerial linework - planning, establishing and implementing relevant aviation authority clearances, determining system requirements, aircrew familiarisation with network operations and equipment, requirements for effective communications operations for aerial work

T4 Procedure in providing store support encompassing:

- Classification and identification of equipment, components and tools
- Procedures for purchasing/ordering items, removing/dispatching items, stocktaking, security, bookkeeping/record keeping
- Material handling - warehouse/depot storage techniques, handling equipment, pallet lift trucks, 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, manufacturers and suppliers information including material safety data sheets (MSDS)

T5 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, hazards for the use of LPG equipment for

REQUIRED SKILLS AND KNOWLEDGE

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

T6 LV polymeric cable jointing principles encompassing:

- 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, repairs to cores
- Methods of testing cable after jointing

T7 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, cables supported in cleats or hangers
- Corrosion protection
- 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
- Heat shrink caps buried sealed ends
- Types of jointing tools - general hand tools, compression tools
- Techniques in the use of LPG - safety precautions, personal protective equipment, 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

T8 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 UC
- Construction types and structures of underground cables
- Characteristics of different types of underground cables

REQUIRED SKILLS AND KNOWLEDGE

- Ratings

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all component parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to 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's 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 accord with Industry and, Regulatory policy in this regard.

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. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day 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 practiced. 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 shall 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 – UET12”. Evidence shall also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this 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; and
 - Apply sustainable energy principles and practices as specified in the performance criteria and range; and
 - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner’s performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
 - Demonstrate an appropriate level of employability skills; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	The minimum number of items on which skill is to be demonstrated	Item List
A	Laying at least one of the following:	LV polymeric LV paper insulated
B	With regards to "A" incorporate at least one of the following:	Direct lay On racks In conduits
C	With regards to "A" incorporate at least one cable pulling methods of the following:	Stocking pulling Bond pulling Armour pulling Nose pull attachments
D	With regards to "A" incorporate at least two cable sealing methods of the following:	Heat shrinkable Pre-stretched materials Tin/lead wiping Pre-moulded components
E	At least one cable cutting methods of the following:	Hydraulic cutters Electric reciprocating Motorised Hand tools
F	With regards to "A" incorporate at least four of the following:	Drum jacks Winches Spindles Capstans Bollards Cable trailers Rollers Lubricants

		Ropes Bell mouths Draw wires/rods
G	Installation and maintenance of all of the following:	LV polymeric cable
H	With regards to "G" incorporate at two of the following:	Tee-off joints Straight through joints Parallel branch joints Parallel joints
I	With regards to "G" incorporate at least one of the following:	Transformers, LV switchboards Pillars/turrets Lighting columns Ring main units Chamber substations
J	With regards to "G" incorporate at least two of the following:	Busbar/termination boxes Links/Fuses Disconnect boxes Termination boxes Control gear UG/OH terminations Circuit breakers
K	With regards to "G" incorporate at least one of the following:	Resin filled boxes, Compound filled boxes Polymeric tape Heat shrink Slip-on' moulds Pre-stretched polymeric
L	With regards to "G" incorporate at least one of the following:	Compression lugs Welded connections

		Mechanical connectors Insulation piercing connectors
M	With regards to the above incorporate all of the following:	Insulation resistance testers Voltage detectors
N	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

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 installation and maintenance network infrastructure low voltage underground cables.

In addition to the resources listed above, in context of and specific resources for assessment, evidence should show demonstrated competency working below ground, in limited spaces, with different structural/construction types and method and in a variety of environments.

Method of assessment 9.4)

This Competency Standard 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 Competency Standard 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 associated skills described in this unit.

**Concurrent
assessment and
relationship with
other units****9.5)**

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with the following units:

UETTDRCJ3 Install and maintain network infrastructure HV
4A underground cables

Range Statement

RANGE STATEMENT

10) This relates to the unit of competency 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 Competency Standard Unit shall be demonstrated in relation to the installation and maintenance of de-energised low voltage underground polymeric cables and covers the laying, jointing, terminating, repair and replacement of cables used in systems and circuits and the issuing/accepting of relevant permits. It includes the laying of ducts and/or conduit for electrical cables.

The unit includes the laying of cables direct in trenches, on racks, in troughs and /or in conduit or ducts.

It also encompasses cable pulling methods, pulling tensions, minimum bending radii, reduction of frictional forces, use of supporting plant (e.g. dynamometers, rigging, winches, etc), working on FRC, PVC, A/C ducted systems and the cutting and sealing of cables.

Test and recording equipment may include voltage detectors, tong ammeters, cable identification equipment, and insulation resistance testers.

Jointing and terminating materials may include compound and resin filled boxes, polymeric tape materials, polymeric heat shrink materials, "slip-on" moulded components and pre-stretched polymeric materials, compression, welded and mechanical connectors.

Jointing and terminating equipment and locations may include links, fuses, disconnect boxes, ring main units, distribution fuse boxes, pad mount and ground transformers, chamber substations, LV switchboards, pillars/turrets, busbar/termination boxes, street lighting control points and street lighting columns.

The following constants and variables included in the element/performance criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform.
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration.
- Documenting detail work events, record keeping and or storage of information.
- Drawings and specifications

RANGE STATEMENT

- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation.
- Environmental management documentation.
- Established procedures.
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification.
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel.
- Quality assurance systems.
- Requirements.
- Testing procedures
- Work clearance systems.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Cable Jointing