



Australian Government

UETDRTO008 Install/maintain overhead transmission network infrastructure

Release: 1

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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 erection of non-energised, pyramid, delta, Pi or enterprise-specific transmission towers and associated hardware and includes installation and maintenance of poles and/or structures and associated hardware and the installation and maintenance of overhead conductors and cables used on towers. It encompasses the erection of components in accordance with construction plans, specifications, work orders and standing enterprise requirements. Erection also involves cleaning and welding.

It also encompasses maintenance work associated with the diagnosing of faults, the conducting of visual inspections, the confirmation of phasing and the completion of other enterprise tests on overhead conductors and cables. It also encompasses confirming isolation of systems and circuits, and accepting/issuing electrical permits. The updating of system data, records and/or completion of relevant documentation in accordance with enterprise requirements also forms part of this competency.

The application of the skills and knowledge described in this unit requires 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

UETTDRIS67 Solve problems in energy supply network equipment

Competency Field

Transmission Overhead

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare/plan for the installation and maintenance of transmission network

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

infrastructure

- 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 installation and maintenance of transmission network infrastructure are obtained and confirmed for the purposes of the work to be performed and communicated to relevant personnel
- 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 in working order
- 1.8** Relevant personnel at worksite are confirmed current in first aid, tower/pole top rescue 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** Personnel participating in the work, including plant operators and contractors, are fully briefed and respective responsibilities confirmed, where applicable, in accordance with established procedures
- 1.11** Site is prepared according to the work schedule and to minimise risk and damage to property, commerce, and individuals in accordance with established procedures

- 2 Carry out the installation and maintenance of transmission network infrastructure**
- 1.12** Traffic management plan is identified and implemented
 - 2.1** WHS/OHS, sustainable energy and environmental 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 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 in the safe installation and maintenance of transmission network infrastructure to ensure completion in an agreed timeframe and to quality standards with a minimum of waste according to requirements
 - 2.5** Poles and/or structures and their associated hardware to be installed are stabilised according to requirements
 - 2.6** Installation of poles and/or structures is carried out in accordance with the work schedule and requirements/established procedures
 - 2.7** Towers and associated hardware to be erected are stabilised according to requirements
 - 2.8** Maintenance, including repair and/or replacement of poles and/or structures, is carried out in accordance with the work schedule and requirements/established procedures
 - 2.9** Overhead conductor/cables are strung, tensioned and terminated in accordance with requirements/established procedures
 - 2.10** Conductors and anti-vibration devices, spaces/spreaders are secured in accordance with established procedures
 - 2.11** Electrical connections are made in accordance with requirements/established procedures
 - 2.12** Maintenance, including repair and/or replacement of

overhead conductors and cables used on towers, is carried out in accordance with the work schedule and requirements/established procedures

- 2.13 Hazard warnings and safety signs are recognised and hazards and assessed WHS/OHS risks reported to immediate authorised personnel for directions according to established procedures
- 2.14 Erection of towers and associated hardware is carried out in accordance with the work schedule and requirements/established procedures
- 2.15 Unplanned events in the erection of towers and associated hardware are undertaken within the scope of established procedures
- 2.16 Known solutions to a variety of problems are applied using acquired essential knowledge and associated skills
- 2.17 Ongoing checks of quality of the work are undertaken in accordance with instructions and established procedures

3 Complete the installation and maintenance of transmission network infrastructure

- 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 or disposed of in accordance with established procedures
- 3.5 Relevant work permits are signed off and the transmission network infrastructure is returned to service in accordance with requirements
- 3.6 Work completion records, reports, as installed/modified 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 UETTDRTTP34 Install/maintain overhead transmission network infrastructure.

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 UETDRT0008 Install/maintain overhead transmission network infrastructure

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.

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
- installing and maintaining at least one (1) of the following:
 - wood pole/structure
 - steel pole/structure
 - concrete pole/structure
 - composite pole/structure
- incorporating at least three (3) of the following hardware:
 - insulators
 - cross-arm braces
 - cross-arms
 - pole steps
 - shackle straps
 - earth leads
 - traction supports
 - traction registration
 - bonding
- incorporating at least one (1) of the following:
 - baulking
 - stays
 - concreting, including foundation
- incorporating at least one (1) of the following:
 - crane
 - auger/erector
 - 'A' frame
 - lifting beam

- pole pikes
- helicopter lift
- erecting one (1) of the following towers:
 - pyramid
 - delta pi
 - enterprise-specific type
- incorporating at least two (2) of the following:
 - insulators
 - clamps
 - bolts
 - structural components
- using at least one (1) of the following methods:
 - welding
 - cleaning
- installing and maintaining at least one (1) of the following conductor types:
 - copper
 - aluminium
 - steel
 - composite
 - aluminium/steel reinforced
 - pilot
- incorporating at least two (2) of the following access equipment:
 - elevated work platform (EWP)
 - portable platform
 - gondola
 - hook ladder*
 - elevated work box
 - (*must do)
- incorporating at least five (5) of the following:
 - winches*
 - tension equipment*
 - stringing equipment
 - cable trailers
 - crimping equipment *
 - pre-formed splices
 - hardware
 - cable drum stands
 - ropes
 - rollers/ sheaves

- comealongs
- swivels
- (*must do)
- incorporating at least two (2) of the following:
 - voltage/de-energised indicating device
 - field intensity meter
 - operating rods
 - (*must do)
- incorporating at least one (1) of the following methods to tension overhead conductors:
 - dynamometer
 - site board
 - abney level
 - sag chart*
 - theodolite
 - (*must do)
- 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:

- mathematical techniques encompassing:
 - calculations involving fractions, decimals, ratios and proportions
 - calculations involving area, volume, mass and density
 - calculations involving transposition and substitution of formulae
 - calculations involving simple trigonometric problems
- engineering mechanics encompassing:
 - identification of basic concepts, principles and applications - application of velocity, acceleration, force, density, torque and pressure
 - applications of the International System of Units (SI) units
 - the relationship between work, power and energy
 - behaviour of object under force - using a block and tackle under load, concept of mechanical advantage, determination of resultant forces and determining the sag in a catenary conductor and the force applied at each end
 - fundamentals of the basic laws of fluid mechanics
- materials properties encompassing:
 - identification and classification of engineering materials material properties
 - types and applications - properties of tensile strength; effects of temperature on the expansion of metals; ductility, malleability, work hardening and annealing; and the conditions that lead to corrosion and the properties of timbers
- basic rigging techniques encompassing:

- standards, codes, legislation, supply authority regulations and/or enterprise requirements associated with rigging, including the operation of cranes, hoists and winches and relevant certification and licensing (if required)
- requirements for the use of enterprise construction manuals, system diagrams/plans and drawings
- safe use of rigging equipment, tools and associated equipment - types, techniques and application
- site inspection procedures - identifying hazards, assessing and controlling risks, appropriate sequence of loading and unloading
- determining the mass and dimensions of load
- selection and inspection procedures - rigging equipment, materials and tools (natural and synthetic fibre ropes and chains, fittings, winch and capstan); ratings of wire ropes and slings; removing, repairing and replacing damaged parts
- techniques for assembling and erecting power winches and capstans
- checking the integrity of support structure - visual inspection of load connections
- techniques in moving, lifting, shifting, managing and placing loads - use of appropriate communication and signalling methods; codes of practice/compliance, enterprise and Commonwealth/state/territory legislative requirements; weather conditions; erection of safety nets and lines; methods of fixing and anchoring loads; and load stability
- 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, and cable drum handling equipment
 - safety procedures - storage and care of safety equipment, handling hazardous materials, storage of hazardous substances and dangerous goods, and depot safety procedures
 - manufacturer and supplier information, including material safety data sheets (MSDS)
- generation systems encompassing:
 - methods of generating electricity - types of power stations and reasons for their location, and layout of thermal and hydroelectric power stations
 - relationship between power control and load requirements - operating speeds for thermal and hydroelectric generating sets, typical generator voltage levels and output ratings
 - the purpose and features of typical types of co-generation systems
- 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; and 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 high voltage (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 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
- installation of poles and or structures and hardware encompassing:
 - standards, codes, legislation, supply authority regulations and/or enterprise requirements applicable to installing poles and associated hardware
 - requirements for the use of enterprise construction manuals, system diagrams/plans and drawings
 - characteristics and applications of different types of poles and associated hardware
 - techniques for installing poles and associated hardware - types of installation equipment/tools, excavation methods, types of footings/foundations, types of attachments, earthing systems, and clearances between conductors
 - safe methods of erecting and stabling poles and/or structures and cross-arms
 - techniques for maintenance of poles and associated hardware - stabilisation techniques for unstable poles
 - methods of strengthen poles, maintenance and replacement of HV insulators and cross-arms
- transmission structures and hardware encompassing:
 - requirements for the use of enterprise construction manuals, system diagrams/plans and drawings
 - types of structures
 - types and function of associated hardware/equipment and insulators
 - types of conductors
 - location of transmissions structures
 - other equipment used on transmission structures, e.g., aircraft warning devices
- procedures for routine maintenance on transmission structures and hardware encompassing:
 - procedures for gaining access permits
 - reasons for gaining access
 - types of maintenance procedures on transmission structures - procedure to follow for

- inspection/patrols according to the transmission supply authority
- erecting and removing of transmission equipment and hardware from a tower - climbing procedures, square rigging principles, calculation of forces at work within a given square rigging system, and construction of a square rigging system
 - procedures for changing insulators - vertical angle suspension, strain insulator, post insulator (horizontal or vertical) and bridge insulator, and calculation of conductor forces
 - installation of temporary work platforms - types and function of installation tools and equipment, precautions and work methods to follow, and procedures for installations of temporary work platforms
 - installation of conductor protective hardware - types and selection of common dampers, tools and equipment, control of Aeolian vibration and procedures for the installation of dampers onto conductors
 - dead line insulator washing - supply authority regulations, and procedures for washing de-energised transmission lines
 - procedures for installation and maintenance on transmission lines, structures and hardware encompassing:
 - standards, codes, legislation, supply authority regulations and/or enterprise requirements pertaining to the installation and maintenance of transmission lines and associated equipment
 - requirements for the use of enterprise construction manuals, system diagrams/plans and drawings - minimum construction clearances for transmission lines and sag/tension requirements
 - construction types and structures used in transmission lines
 - types, sizes and characteristics of transmission conductors - aluminium conductors, steel reinforced and earthing conductors
 - types of electrical connections used to connect transmission conductors - compression termination and bolted termination
 - causes and effects of poor electrical connections
 - types and application of specialised tools, equipment and hardware for the stringing of transmission conductors
 - techniques for stringing, tensioning and terminating transmission conductors
 - techniques for installation of associated hardware used on transmission towers
 - techniques for maintenance of damaged transmission conductors - repair and replacement
 - safe working practices and procedures for the installation of overhead transmission conductors encompassing:
 - limits of approach for personnel, vehicles, mobile plant and EWP
 - requirements of persons prior to making bare hand contact with dead low voltage (LV) mains and apparatus
 - requirements of relevant electrical access permits necessary to allow work to be performed on LV and HV apparatus
 - safe working practices - requirements to enable safe working on conductive poles; procedures to attach an on-site earthing device to de-energised LV and HV overhead circuit; safe working practices when working with associated hardware/equipment and insulators; precautions of voltages on transmission structures; dangers when working at

- heights; identification of hazards; assessing and controlling risks; types, selection, maintenance and uses of personnel protective equipment (PPE); permit to work systems and isolation procedures; and safe working practices when using specialised equipment
- emergency response and rescue, including first aid
 - 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 procedures 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 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 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.

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, equipment and PPE currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

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