



Australian Government

UETDRDS008 Draft and layout a power system distribution substation minor upgrade

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 drafting and laying out of minor low voltage (LV) distribution substation upgrades, including the estimating of the costs and/or resources for the work to be undertaken. It also encompasses on-the-job design, surveying techniques, the pegging and/or marking out of the trench position, the pit/pillar position and the cable position according to the work order and enterprise requirements.

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

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

UETDREL001 Apply environmental requirements

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

Competency Field

Design

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare/plan to draft and layout a distribution substation upgrade

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 obtained and analysed, as necessary, by site inspection and the extent of the work determined for planning and coordination
- 1.2** Work is prioritised and sequenced for the most efficient and effective outcome following consultation with others for completion within acceptable timeframes, to a quality standard and in accordance with established procedures
- 1.3** Risk control measures are identified, prioritised and evaluated against the work schedule
- 1.4** Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites
- 1.5** Hazards are identified, work health and safety (WHS)/occupational health and safety (OHS) risks assessed and control measures are prioritised, implemented and monitored, including emergency exits kept clear, to ensure safe systems of work are followed and in accordance with established procedures
- 1.6** Relevant work permits are secured to coordinate the performance of 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 identified, scheduled and coordinated and confirmed safe and in technical working order

- 1.8** Clients/customers are provided with possible solutions and/or options within the scope, acceptable cost and requirements
- 1.9** Liaison and communication issues with others/authorised personnel, authorities, clients and landowners are resolved and activities coordinated to carry out work
- 1.10** Personnel participating in the work, including plant operators and contractors, are fully briefed and respective responsibilities coordinated and authorised, 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
- 1.12** Positioning of road signs, barriers and warning devices is planned in accordance with requirements

2 Carry out the drafting and layout of a distribution substation upgrade

- 2.1** WHS/OHS and sustainable energy principles and practices to reduce the incidence of accidents and minimise waste are monitored and actioned in accordance with requirements and/or established procedures
- 2.2** First aid, pole top rescue and other related work procedures are performed according to requirements and/or established procedures
- 2.3** Lifting, climbing, working in confined spaces and aloft, and use of power tools/equipment, techniques and practices are safely exercised according to requirements
- 2.4** Hazard warnings and safety signs are recognised and hazards and assessed WHS/OHS risks are reported to the immediate authorised persons for directions according to established procedures
- 2.5** Remedial actions are taken to overcome any shortfalls encountered in the work schedule according to requirements and/or established procedures
- 2.6** Drafting and layout of a distribution substation upgrade is carried out in accordance with the work schedule and

requirements and/or established procedures

2.7 Essential knowledge and associated skills are applied in the safe drafting and layout of a distribution substation upgrade to ensure completion in an agreed timeframe and to quality standards with a minimum of waste according to requirements

2.8 Solutions to non-routine problems are identified and actioned using acquired essential knowledge and associated skills according to requirements

2.9 Ongoing checks of quality of the work are undertaken in accordance with requirements and established procedures to ensure a quality outcome is achieved for the client/customer and to a community/industry standard

3 Complete the drafting and layout of a distribution substation upgrade

3.1 Work undertaken is checked against work schedule for conformance with requirements, anomalies are reported and solutions identified in accordance with established procedures

3.2 Accidents and/or injuries are reported and followed up in accordance with requirements/established procedures

3.3 Worksite is rehabilitated, cleaned up and confirmed 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 substation equipment, apparatus, wiring and instrumentation are returned to service and advised to client/customer in accordance with requirements

3.6 Work completion records, reports, as installed/modified drawings and/or documentation and information are confirmed, 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 UETTDRDS34 Draft and layout a power system distribution substation minor upgrade.

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 UETDRDS008 Draft and layout a power system distribution substation minor upgrade

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
- drafting at least one (1) of the following:
 - a multi-phase pole mounted distribution transformer upgrade plan/layout
 - a single-phase pole mounted transformer upgrade plan/layout
- laying out at least one (1) of the following:
 - a multi-phase underground distribution substation upgrade
 - a multi-phase distribution substation or associated equipment upgrade, e.g., substations, transformers, high voltage (HV)/low voltage (LV) switchgear
- 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 overhead distribution conductors encompassing:
 - standards, codes, legislation, supply authority regulations and/or enterprise requirements applicable to installing conductors and associated equipment
 - requirements for the use of overhead line construction manuals, system diagrams/plans and drawings:
 - material lists, conductor size, type and route length
 - constructions types and structures for distribution and sub-transmission lines
 - types, sizes and characteristics of overhead conductors
 - resources for the stringing and maintenance of conductors:
 - types of LV and HV overhead electrical conductor connections
 - causes and effects of poor electrical connections

- reasons for and methods used to maintain standard phase sequencing
- removing, repairing and replacing of damage conductors
- minimum clearances between overhead conductors and LV and HV structures
- techniques for conductor installation:
 - types and application of tools, equipment and hardware
 - methods of stringing, tensioning and termination of LV and HV conductors
- 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
- construction and types of underground cables 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
- enterprise-specific switching diagrams and drawing encompassing:
 - types and application of enterprise-specific switching drawings and documents:
 - wiring and schematic diagrams and switching symbols
 - mechanical drawings dealing with switching operations, project charts, switching schedules, graphs, technical manuals and catalogues, and instructions/worksheets
 - interpretation of different system switching diagrams:
 - LV system switching diagrams
 - direct current (d.c.) traction supply sectioning diagrams

- HV transmission and distribution system symbols and feeder plans
- processes of updating switching diagrams
- power distribution network documentation encompassing:
 - requirements for the use of manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of WHS/OHS risks
 - types and application of power distribution network documentation drawings and documents:
 - wiring and schematic diagrams, drawings and switching symbols
 - mechanical drawings dealing with the power distribution network, project charts, schedules, graphs, technical manuals and catalogues, and instructions/worksheets
 - interpretation of different diagrams and documentation on LV and HV systems:
 - overhead distribution extensions
 - underground distribution extensions
 - distribution substations
 - street lighting systems
- fundamentals of surveying for the purpose of producing an overhead or underground distribution extension encompassing:
 - Commonwealth, state/territory and local government legislation, standards, codes, supply and aviation authority regulations and/or enterprise requirements applicable to the surveying for an overhead and underground extension
 - techniques in measuring heights and distances
 - techniques in taking bearings/angles of deviation using a compass
 - techniques in using a clinometer
 - techniques in recording and storage of data
 - requirements for the use of overhead line construction manuals, system diagrams/plans and drawings
 - techniques in plotting long spans:
 - measuring stick, clinometer, trundle wheel and tapes
 - correction for sloping ground
 - distance across objects and range rods
 - techniques in pegging pole positions:
 - foot path alignments, types of pegs, pegs of other authorities and locating survey pegs
- fundamentals of computer-aided drafting (CAD) for drafting and layout of distribution extension and upgrades encompassing:
 - Commonwealth, state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to the drafting and layouts of distribution extensions and upgrades
 - types of computer hardware and software, tools and equipment for the production of a draft and layout of distribution extension and/or upgrade
 - techniques in storing and retrieving programs and files from the computer
 - identification and methods of retrieving and manipulating digital symbols, designs, layouts, fonts and graphs stored in the computer

- techniques in using the CAD package in following necessary commands and protocols in accordance with the operating instructions of the CAD software manufacturer, such as:
 - using file structure, menu utilisation, system library usage, data banking, achieving, file management and maintenance procedures
- calculation of dimensions and drafting measurements using the computer
- techniques in the preparation of preliminary sketches using the computer
- techniques in using 2-D computer graphics system and associated equipment to produce a distribution extension and or upgrade draft or layout
- techniques to diagnosing basic faults in computer operation
- layout principles for underground mains distribution extension encompassing:
 - Commonwealth, state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to underground mains distribution extension
 - requirements for the use of underground mains construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of WHS/OHS risks
 - methods in determining material, equipment and tool lists:
 - components types and quantity required
 - spacing of components and equipment
 - costings of items and components
 - purchasing and contractual arrangements, including requirements to eliminate WHS/OHS hazards, minimise risks and provide residual WHS/OHS risk information
 - determination of conductor size, type and route length
 - resources needed for the laying of conductors
 - determining the appropriate excavation for the location
 - determining the size and depth of excavation
 - determining the trench and pit layout procedures
 - minimum clearances between conductors
 - estimation of the duration of underground distribution extension project
- layout principles for a distribution substation minor upgrade encompassing:
 - Commonwealth, state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to a distribution substation minor upgrade
 - requirements for the use of distribution substation minor upgrade construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of WHS/OHS risks
 - methods in determining material, equipment and tool lists:
 - components types and quantity required
 - spacing of components and equipment
 - costings of items and components
 - purchasing and contractual arrangements, including requirements to eliminate WHS/OHS hazards, minimise risks and provide residual WHS/OHS risk information

- determination of conductor size, type and route length
- resources needed for the laying of conductors, cables and equipment
- determining the appropriate installation sequence
- minimum clearances between conductors and equipment
- estimation of the duration of underground distribution extension project.

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 to undertake drafting and layout of a distribution substation upgrade
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

Links

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