



Australian Government

Department of Education, Employment and Workplace Relations

UETDRDS34A Draft and layout a power system distribution substation minor upgrade

Release: 1

UETTDRDS34A Draft and layout a power system distribution substation minor upgrade

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This Competency Standard Unit covers the drafting and laying out of minor 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.

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. 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

License to practice

3)

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
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in electromagnetic devices and related circuits
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDREL16A	Working safely near live electrical apparatus

Prerequisite Unit(s) 4)

UETTDRIS62A	Implement and monitor the power system organisational OHS policies, procedures and programs
UETTDRIS63A	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/plan to draft and layout a distribution substation upgrade	1.1 Works schedule(s), including drawings, plans, requirements, established procedures, and material lists, are obtained and analysed, if 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 to all personnel and identified for all work sites.
	1.5 Hazards are identified, 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 according to 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 required for the job are identified, scheduled and coordinated and confirmed in a safe and 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 other/authorised personnel, authorities, clients and land owners are resolved and activities coordinated to carry out work.

ELEMENT	PERFORMANCE CRITERIA
	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 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 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

ELEMENT

PERFORMANCE CRITERIA

		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 like 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 works schedule for conformance with requirements, anomalies 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	Work site 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 permit(s) 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	Works completion records, reports, as installed /modified drawing(s) and/or documentation and information are confirmed, 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 drafting and laying out a distribution substation minor upgrade.

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

KS01-TDS34A Power system distribution substation minor upgrade

Evidence shall show an understanding of the power system distribution substation minor upgrade to an extent indicated by the following aspects:

T1 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 characterises of overhead conductors
- Resources for the stringing and maintenance of conductors - types of low and high voltage 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 low and high voltage structures.
- Techniques for conductor installation - types and application of tools, equipment and hardware, methods of stringing, tensioning and termination of low and high voltage conductors.

T2 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 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.

T3 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

REQUIRED SKILLS AND KNOWLEDGE

- Types and applications of UC
 - Construction types and structures of underground cables
 - Characteristics of different types of underground cables
 - Ratings
- T4 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, instruction/work sheets.
 - Interpretation of different system switching diagrams - LV system switching diagrams, DC traction supply sectioning diagrams, HV transmission and distribution system symbols and feeder plans, processes of updating switching diagrams.
- T5 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 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, instruction/worksheets sheets.
 - Interpretation of different diagrams and documentation on LV and HV systems - overhead distribution extensions, underground distribution extensions, distribution substation, street lighting system.
- T6 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, 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
- T7 Fundamentals of computer aided drafting (CAD) for drafting and layout of distribution extension and upgrades encompassing:

REQUIRED SKILLS AND KNOWLEDGE

- 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
- Note: Examples include 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 2D 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

T8 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 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 to include a requirement to eliminate OHS hazards, minimise risks and provide residual 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

T9 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

REQUIRED SKILLS AND KNOWLEDGE

manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of 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 to include a requirement to eliminate OHS hazards, minimise risks and provide residual 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.

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 – UET12UET12". 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	At least one of the following:	Produce a multi-phase pole mounted distribution transformer upgrade plan/layout Produce an single-phase pole mounted transformer upgrade plan/layout
B	At least one of the following:	Layout an multi-phase underground distribution substation upgrade Layout a multi-phase distribution substation or associated equipment upgrade e.g. Substations, transformers, HV/LV switchgear etc.
C	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.
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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 drafting and layout of a distribution substation upgrade.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working at realistic heights above ground i.e. above 3 metres, 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)

There are no recommended concurrencies for this unit.

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 draft and layout of a minor distribution substation upgrade and may include the following equipment:

Substations, transformers, cables, Surge Div, HV Switchgear, LV Switchgear, links, relays, power supply, signage, busbars, relevant protection systems including fuses and circuit breakers and associated civil works.

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
- 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

RANGE STATEMENT

- Personnel
- Quality assurance systems
- Requirements
- Safe design principles
- Testing procedures
- Work clearance systems

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**
Design.