Australian Government

Assessment Requirements for UETTDRDS41 Manage electrical power systems infrastructure projects

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.

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
- managing at least six (6) projects that each encompass at least twenty (20) identifiable tasks and relate to four (4) of the following project types:
  - distribution overhead projects
  - distribution underground projects
  - distribution substation projects
  - public lighting projects
  - zone substation projects
  - transmission substation primary systems projects
  - transmission overhead projects
  - transmission underground projects
  - substation secondary system projects
  - generation secondary system projects
- dealing with unplanned events on at least one 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 characterises of overhead conductors
- resources for the stringing and maintenance of conductors:
  - types of low voltage (LV) and high voltage (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 damaged 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

- safe working practices and procedures for the installation of overhead distribution conductors encompassing:
  - limits of approach for personnel, vehicles, mobile plant and elevating work platforms (EWP)
  - requirements of persons prior to making bare hand contact with dead 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 and procedures to attach an 'on-site' earthing device to de-energised LV and HV overhead circuits
- 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
    - 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

- installation of LV electrical services encompassing:
  - standards, codes, legislation, supply authority regulations and/or enterprise requirements
  - requirements for the use of enterprise construction manuals, system diagrams/plans and drawings:
    - types of LV overhead services
    - methods of construction and installation
    - minimum clearances for overhead services to assets
    - structures and types of installation equipment/tools
  - characteristics and applications of different types of cables:
    - cable cross-sectional area of conductors and current rating and fuse type
  - techniques for maintenance of service installations:
    - diagnosis and repair of faults
  - jointing and terminating methods:
    - polymeric heat shrink materials
    - polymeric tape materials
    - energised and de-energised cables and connections to fuse boxes and pole top boxes
  - testing and commissioning procedures:
    - inspection and polarity
    - voltage and phase sequence tests
  - construction 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 damaged 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
- 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 damage transmission conductors:
    - repair and replacement
- procedures for installation and maintenance on public lighting structures and associated equipment encompassing:
  - standards, codes, legislation, supply authority regulations, local government and/or enterprise requirements pertaining to the installation and maintenance of public lighting systems and associated equipment
  - safety precautions specific to working on street lighting:
    - safe working practices and procedures
    - safe clearances from LV and HV mains
    - working at heights, working in confined spaces, permit to work systems and isolation procedures
    - emergency response and rescue procedures, including first aid
  - basic public lighting principles:
    - electromagnetic spectrum
    - principles of colour
    - behaviour of light
    - factors that affect illumination
  - requirements for the use of enterprise construction manuals, system diagrams/plans and drawings:
    - street lighting circuits
    - earthing system
  - types of tools and equipment used for installation and maintenance
  - types and function of lanterns/luminaires/lamps, control equipment, poles and associated hardware used for street lighting:
    - high pressure mercury vapour, low pressure and high pressure sodium vapour, fluorescent, quartz-halogen, wood, concrete, steel, composite, choke boxes, photo-electric cells, time switches and contactor boxes
  - types of lighting systems:
    - overhead and underground street lighting systems
    - controlling and switching of lighting systems
  - techniques for the installation of street lighting systems

- techniques for the maintenance of street lighting systems:
  - diagnosing faults
  - removing, repairing, replacing and cleaning of public lighting and associated hardware
- application of specific testing equipment:
  - voltage detectors, insulation resistance testers, clamp-on ammeters, continuity testers and fault indictors
- techniques for the inspection, testing and commissioning of street lighting systems
- different types and function of distribution components encompassing:
  - Commonwealth/state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to the use and application of distribution components
  - requirements for the use of overhead line construction manuals, system diagrams/plans and drawings
  - types, function and characteristics of distribution components
  - safety policies, procedures and precautions related to handling and installing distribution components
- principles of safe design encompassing:
  - Commonwealth/state/territory legislation, standards, codes, supply authority regulations and/or enterprise requirements associated with safe design principles
  - particular reference to state and territory regulations regarding working near energised conductors, electrical access, heights, confined space, testing procedures and licensing rules
  - application of safe design principles:
    - safe design duty related information, safe design process related information and safe design evaluations
- LV switching principles encompassing:
  - standards, codes, legislation, supply authority regulations and/or enterprise requirements applicable to switching of LV to a given schedule
  - requirements for the use of manuals, system diagrams/plans and drawings:
    - types, characteristics and capabilities of electrical apparatus
    - use, characteristics and capabilities of specialised tools and testing equipment
    - LV network interconnectors source of possible back-feed
  - LV switching techniques:
    - identifying hazards, assessing and controlling risks associated with LV switching operations, electrical access permits, operational procedures and earthing procedures
  - personnel protective equipment (PPE) for LV switching
- HV switching principles encompassing:
  - standards, codes, legislation, supply authority regulations and/or enterprise requirements applicable to switching of HV to a given schedule
  - requirements for the use of manuals, system diagrams/plans and drawings:
    - types, characteristics and capabilities of electrical apparatus
    - use, characteristics and capabilities of specialised tools and testing equipment

- HV network interconnectors source of possible back-feed
- role of the HV switching operator
- operational forms, access authorities and permits associated with HV switching:
  - types of operational forms, access authorities and permits
  - purpose and procedures for operational forms and access authorities and permits
- use and operation of equipment associated with HV overhead and substation equipment:
  - test instruments, sticks, interrupters and arc stranglers
- types and categories of HV switchgear
- application, function and operating capabilities of switchgear
- restrictions pertaining to HV switching equipment
- procedures for the isolation of HV transmission main and working earths
- earthing HV electrical apparatus practices and procedures for access:
  - purposes of operational and additional work part 'on-site' earths
  - factors determining the location and effectiveness of operational earthing
  - acceptable industry procedures and PPE
- HV switching techniques
- operate switching apparatus:
  - identifying hazards, assessing and controlling risks associated with HV switchgear operation, systematic and defensive techniques, mobile radio procedures and double isolation procedures

- HV fault switching principles encompassing:
  - primary causes, effects and types of HV electrical faults
  - HV protection devices:
    - main components, types, categories, applications and functions
  - basic principles of operation of HV system protection devices
  - protection coordination and protection zoning
  - HV feeder auto-reclosing suppression:
    - function and application
  - circuit condition requirements and switching considerations when paralleling and separating HV feeders
- implementation and monitoring requirements for the impact of powerline installations and operation on the environment and/or the area surrounding the powerline and/or equipment encompassing:
  - identification of relevant legislation, codes and government guidelines for the implementation and monitoring of environmental impact factors in the workplace and areas of power distribution or transmission:
    - Commonwealth/state/territory legislation relevant to the workplace and the Environment Protection Act legislation and common law
  - identification, assessment, control and monitoring of the hazards to the environment associated with the powerline industry
  - workplace environment quality standards enterprise plan:

- setting of acceptable emission level limits from power plant equipment
- impact of the enterprise activities on air and water quality, and nature
- impact and level of emissions from power plant, power distribution and transmission equipment and network infrastructure (noise generation, noxious gas emissions, greenhouse gas production, electromagnetic emissions, electromagnetic field strength, oil leakage and insulation breakdown products)

- provision of manufacturer and supplier information, such as material safety data sheets (MSDS)
- gathering of environment management information
- maintenance of environmental records
- risk assessment and its management in powerline industry
- maintenance strategies for environment protection programs:
  - developing processes for promoting, maintaining and improving environmental impact in the workplace
  - identifying techniques for evaluating and reviewing environment protection education and training programs and elements of an effective environment protection management system
  - Environment Protection Authority (EPA) consultation and accident/incident investigations

- 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
- layout principles for overhead distribution encompassing:
  - Commonwealth, state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to overhead distribution layout
  - requirements for the use of overhead line 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, such as equipment, poles, cross-arms, 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 stringing and maintenance of conductors
- types of LV and HV overhead electrical conductor connections
- minimum clearances between overhead conductors and LV and/HV structures
- estimation of the duration of overhead distribution extension project

- 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
- project management encompassing:
  - Commonwealth, state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements, including relevant certification and licensing applicable to the duties and responsibilities for management a project
  - analysis of functions of project management to determine achievement of project objectives
  - relationship of stakeholders to the project
  - techniques in development of project plan:
    - project integration, scope, timelines, cost, quality, resources, communication/protocol requirements, risk/uncertainties and procurement and contacting
  - relationship between project processes, project life and project phases
  - planning and control procedures, resource management and risk management
  - techniques, methodologies and tools available to project managers
  - types of internal and external environmental factors that may affect the 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 manage electrical infrastructure projects
- applicable documentation including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

Links

UET Training Package Companion Volume Implementation Guide is found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=229bace1-b7bc-4653-9300-dffb13ecfad7