Australian Government

Assessment Requirements for UETDRDS010 Draft and layout a power system street lighting system

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.

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
- producing all of the following:
  - preliminary plan for a street lighting system
  - a layout of a street lighting system
- 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
  - 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 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 of 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
- 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
- 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, 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 of 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 functions 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 the handling and installing of distribution components
- enterprise-specific switching diagrams and drawings 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
- 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 and 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
- 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
- principles to light design layout encompassing:
  - Commonwealth, state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to the light design principles
  - requirements for the use of street lighting system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of WHS/OHS risks
  - types of tariffs and charges
  - types of street lighting components:
    - column types, foundations, brackets, luminaries and mounting heights
  - types of electrical street lighting circuits:
    - types of supply, lighting circuit and control circuit
  - fundamentals of lighting production:
    - electromagnetic spectrum
    - visible and non-visible radiation
    - spectral energy distribution
    - infra-red, ultraviolet (UV), radiation safety, incandescence and phosphorescence
    - reflection and refraction
  - fundamentals of lighting concepts:
    - terms and units
    - purpose of reflectors and diffusers

- factors affecting external lighting design
- calculation of light output
- determining illuminance:
  - point to point method
  - lumen method
- determining rated life of luminaries
- fundamentals of street lighting design
- considerations for special lighting situations:
  - security lighting, hazardous street locations and emergency lighting

- principles to layout and draft a street lighting system encompassing:
  - Commonwealth, state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to street lighting system layouts and drafts
  - requirements for the use of street lighting system 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 and 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
  - determination of street lighting positions for optimum visibility and to minimise traffic hazards
  - techniques in mounting and position of lights
  - resources needed for the installation of street lighting system
  - methods of pegging out of pole positions and/or underground cable positions
  - minimum clearances between overhead conductors and LV/and HV structures
  - estimation of the duration of overhead 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 personal protective equipment (PPE) currently used in industry to undertake drafting and layout of a street lighting system.
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

Links

Companion Volume Implementation Guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=229bace1-b7bc-4653-9300-dffb13ecfad7