



Australian Government

Assessment Requirements for UETTDRDS58 Design underground transmission systems

Release: 1

Assessment Requirements for UETTDRDS58 Design underground transmission systems

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
- completing six (6) compliant technical designs of an underground transmission network with at least one (1) relating to each of the following project types:
 - alteration to existing assets
 - underground supplies between substations including overhead to underground connections
- completing designs, including all the following:
 - activities that address the correction of errors in the process
 - application of a design control checklist which lists all of the required design activities to be carried out in this process
- 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:

- 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 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 transmission structures
- other equipment used on transmission structures, e.g. aircraft warning devices
- voltages on transmission structures
- 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 (TAS)
 - 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
- high voltage (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; and 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; and the purpose and procedure for operational forms, 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 personal protective equipment (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
- feeder automation system encompassing:
 - function of feeder automation system and the main components
 - operation procedure for a remote field device from a local control station
 - functions of supervisory control and Data acquisition (SCADA) (or any other relevant data acquisition and control) systems and its main components
 - SCADA system security interlocks and access restrictions
 - SCADA system operation when switching apparatus or retrieving data via a remote access device, such as remote access terminal (RAT), dial up voice annunciated system and local control station
 - function of the main components of a local/remote control system
 - operation of a field devices using SCADA systems via a RAT, dial up annunciated system and local control station
- 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, and 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
- effects of harmonics to an extent indicated by the following aspects:
 - characteristics and effects of harmonics on protection device functions/malfunction
 - effects of harmonics on transformers, generators, motors and quality of supply
- HV system load calculation principles encompassing:
 - structure of HV systems
 - ratings of HV system components
 - relationship to HV customers
 - methods of determining load on HV systems
 - records of load on HV systems
 - effect of added load on HV feeders - variation of current, voltage, power, reactive power and power factor
 - load flows in parallel or loop operation
 - enterprise specific network coordination tools
- EHV system load calculation principles encompassing:
 - structure of EHV transmission systems
 - ratings of EHV system components
 - relationship to EHV customers
 - relationship to generation sources
 - methods of determining load on EHV systems
 - records of load on EHV systems
 - effect of added load on EHV transmission systems - variation of current, voltage, power, reactive power and power factor
 - load flows in parallel or loop operation
 - enterprise-specific network coordination tools.

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
- 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>