



Australian Government

UETDRDS004 Design power system public lighting systems

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 technical design of public lighting systems. This includes pedestrian and traffic route lighting to relevant Australian Standards utilising appropriate software to generate design conformance.

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

All competencies in the Common Unit Group must have been completed, plus all competencies in one (1) of the identified Pathway Unit Group(s).

Common Unit Group

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

UEENEEE125A Provide engineering solutions for problems in complex multiple path circuits

UEENEEE126A Provide solutions to basic engineering computational problems

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG149A Provide engineering solutions to problems in complex polyphase power 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

Pathway Unit Group 1

UETDRDS013 Organise and implement ESI line and easement surveys

UETDRDS014 Prepare and manage detailed construction plans for electrical power system infrastructure

Pathway Unit Group 2

UETDRDS006 Develop high voltage and low voltage distribution protection systems

Competency Field

Design

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Plan for and coordinate the safe design of public lighting systems

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

- 1.1** Work health and safety (WHS)/occupational health and safety (OHS) practices/procedures and environmental and sustainable energy procedures which may influence the design of public lighting systems are reviewed and determined
- 1.2** Purpose of the design is established and expected outcomes of the work are confirmed with appropriate personnel
- 1.3** Organisational established procedures on policies and specifications for the design are obtained or established with appropriate personnel
- 1.4** Equipment/tools and personal protective equipment (PPE) are selected and coordinated based on specified requirements and established procedures
- 1.5** 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
- 1.6** Risk control measures are identified, prioritised and evaluated against the work schedule
 - 1.7** Relevant work permits are secured to coordinate the performance of work according to requirements and/or established procedures
 - 1.8** Resources, including equipment, tools and PPE required for the job are identified, scheduled and coordinated and confirmed safe and in technical working order
 - 1.9** Liaison and communication issues with other/authorised personnel, authorities, clients and landowners are resolved and activities coordinated to carry out work
 - 1.10** Site is prepared according to the work schedule and to minimise risk and damage to property, commerce and individuals in accordance with established procedures
 - 1.11** 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
- 2 Carry out and coordinate the design of public lighting systems**
- 2.1** Circuit/systems modelling is used to evaluate alternative proposals in accordance with established procedures
 - 2.2** WHS/OHS and sustainable energy principles, functionality and practices to reduce the incidence of accidents and minimise waste are incorporated into the project in accordance with requirements and/or established procedures
 - 2.3** System design decisions are made on the basis of safety and effective outcomes according to requirements and/or established procedures
 - 2.4** Mathematical models of the distribution system are used to analyse the effectiveness of the finished project in accordance with requirements and established procedures
 - 2.5** Technical advice is given to potential hazards, safety risks and control measures so that monitoring and preventative action can be undertaken and/or appropriate

	authorities consulted, where necessary, in accordance with requirements and established procedures
	2.6 Essential knowledge and associated skills are applied to analyse specific data and compare it with compliance specifications to ensure completion of the project within an agreed timeframe according to requirements 2.7 Solutions to non-routine problems are identified and actioned using acquired essential knowledge and associated skills according to requirements 2.8 Quality of work is monitored against personal performance agreement and/or established organisational and professional standards
3 Complete and coordinate the design of public lighting systems	3.1 Final inspections of the design are undertaken to ensure they comply with all requirements and include all specifications and documentations needed to complete the design brief 3.2 Appropriate personnel are notified of completion and reports and/or completion documents are finalised 3.3 Reports and/or completion documents are submitted to relevant personnel/organisations for approval and, where applicable, statutory or regulatory approval 3.4 Approved copies of design documents are issued and records are updated in accordance with established procedures

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 UETTD RDS38 Design power system public lighting systems.

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 UETDRDS004 Design power system public lighting 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 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
- completing six (6) technical designs of a public lighting system utilising at least three (3) of the following project types:
 - single light on existing assets
 - main road/minor road schemes
 - intersections
 - traffic management devices
 - alteration to existing assets
 - multi-circuit systems
- completing designs, including:
 - 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:

- mathematics techniques encompassing:
 - calculations involving fractions, decimals, ratios and proportions
 - calculations involving area, volume, mass and density
 - calculations involving transposition and substitution of formulae
 - calculations involving simple trigonometric problems
- engineering mechanics encompassing:

- identification of basic concepts, principles and applications:
 - application of velocity, acceleration, force, density, torque and pressure
- applications of the International System of Units (SI) units
- the relationship between work, power and energy
- behaviour of object under force:
 - using a block and tackle under load
 - concept of mechanical advantage
 - determination of resultant forces
 - determining the sag in a catenary conductor and the force applied at each end
- fundamentals of the basic laws of fluid mechanics
- materials properties encompassing:
 - identification and classification of engineering materials material properties
 - types and applications:
 - properties of tensile strength
 - effects of temperature on the expansion of metals
 - ductility, malleability, work hardening and annealing and the conditions that lead to corrosion and the properties of timbers
- transmission, distribution and rail systems encompassing:
 - relationship between the transmission, distribution and rail/tram system within an overall power system:
 - different organisations responsible for generation, transmission, distribution and rail/tram and how they correlate and their functions
 - characteristics of a transmission, distribution and rail system:
 - principal components
 - typical voltage levels and methods of transmission and distribution, including grid type transmission systems, radial, parallel and ring main feeders
 - relationship between an overhead and underground supply systems within an overall power system:
 - advantages/disadvantages
 - applications and the basic steps for planning and installing an overhead and underground distribution system
 - single line drawings and layouts:
 - drawings and layouts of transmission and distribution systems, including radial, parallel and ring main feeders and the high voltage (HV) equipment associated with substations
- 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 low voltage (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 and 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 and 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
 - fault indicators
- techniques for the inspection, testing and commissioning of street lighting systems
- principles of statutory and safety considerations encompassing:
 - Commonwealth/state/territory legislation, standards, codes, supply authority regulations and/or enterprise requirements associated with working on HV systems
 - particular reference to state and territory regulations regarding working near energised conductors, electrical access, heights, confined space, testing procedures and licensing rules
- principles of 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, radiation-safety, incandescence and phosphorescence
 - reflection and refraction
- fundamentals of lighting concepts:
 - terms and units and the purpose of reflectors and diffusers
- factors affecting external lighting design
- calculation of light output
- determining illuminance:
 - point to point and 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 positioning 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
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

Links

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