



Australian Government

Department of Education, Employment and Workplace Relations

UETDRRT34A Install and maintain traction network wiring systems

Release: 1

UETTDRT34A Install and maintain traction network wiring systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This Competency Standard Unit covers the installation and maintenance of overhead traction wiring systems to ensure proper installation, in particular the correct registration of the contact wire with respect to the current collectors. It includes the undertaking of safe working practices on or about the running line/track and the preparation needed for stringing and profiling including the isolation of systems and circuits for safe working according to work plans, the diagnosis of faults and the modification and re-adjustment to appropriate standards. It may also encompass the correct positioning of road signs, barriers and or warning devices, and the procedure of issuing/accepting electrical permits. It also includes the visual and other necessary checks to confirm that equipment and associated hardware have been correctly installed according to design and are in a safe condition to undertake pre-commissioning tests prior to, putting into service, and updating of, installation and maintenance data such as as-built drawings and relevant quality assurance documentation.

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 requires 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 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
UEENEEE105A	Fix and secure electrotechnology equipment

Prerequisite Unit(s)**4)**

UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in electromagnetic devices and related circuits
UEENEEG103A	Install low voltage wiring and accessories
UEENEEG104A	Install appliances, switchgear and associated accessories for low voltage electrical installations
UEENEEG105A	Verify compliance and functionality of low voltage general electrical installations
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEG109A	Develop and connect electrical

Prerequisite Unit(s)**4)**

	control circuits
UEENEEK142A	Apply environmentally and sustainable energy procedures in the energy sector
UETTDREL16A	Working safely near live electrical apparatus
UETTDRI62A	Implement and monitor the power system organisational OHS policies, procedures and programs
UETTDRI63A	Implement and monitor the power system environmental and sustainable energy management policies and procedures
UETTDRI67A	Solve problems in energy supply network equipment

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 install and maintain traction network wiring systems	1.1 Works schedule(s), including drawings, plans, requirements, established procedures, and material lists, are received, analysed and confirmed, if necessary, by site inspection. 1.2 Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites. 1.3 OHS policies and procedures related to requirements and established procedures for the installation and maintenance of traction network wiring systems are obtained and confirmed for the purposes of the work to be performed and communicated. 1.4 Work is prioritised and sequenced following consultation with others for completion within acceptable timeframes and in accordance with established procedures. 1.5 Hazards are identified; OHS risks assessed and control measures are prioritised, implemented and monitored including emergency exits kept clear according to established procedures. 1.6 Relevant work permits are obtained to access and perform work according to requirements and/or established procedures. 1.7 Resources including personnel, equipment, tools and personal protective equipment required for the job are obtained and confirmed in working order.

ELEMENT	PERFORMANCE CRITERIA
	1.8 Relevant personnel at worksite are confirmed current in CPR, First Aid, and other rescue procedures and related work procedures according to requirements. 1.9 Liaison and communication issues with other authorised personnel, authorities, clients and land owners are resolved to carry out work where necessary. 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 confirmed where applicable in accordance with established procedures. 1.12 Rail/Road signs, barriers and warning devices are positioned in accordance with requirements. 1.13 Environmental constraints applicable to work are identified and control measures applied
2 Carry out the installation and maintenance of traction network wiring systems	2.1 OHS and sustainable energy principles and practices to reduce the incidents of accidents and minimise waste are monitored and followed in accordance with requirements and/or established procedures. 2.2 Lifting, climbing, working aloft, and use of power tools/equipment, techniques and practices are safely followed and, currency according to requirements confirmed. 2.3 Systems and circuits are isolated as required, proved safe to work on in accordance with the requirements/permits and established procedures. 2.4 Essential knowledge and associated skills are applied in the safe installation and maintenance of traction network wiring systems to ensure completion in an agreed timeframe and, to

ELEMENT**PERFORMANCE CRITERIA**

		quality standards with a minimum of waste according to requirements.
	2.5	Overhead traction wiring systems, including cables, fittings, traction conductors and associated equipment are installed according to design and work schedule requirements and established procedures.
	2.6	Maintenance, including repair and/or replacement of overhead traction wiring systems, including the modification and re-adjustment of overhead traction conductors is carried out, in accordance with the work schedule and requirements/established procedures.
	2.7	Profiling completed according to established procedures.
	2.8	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.
	2.9	Unplanned events in the installation and maintenance of traction network wiring systems are undertaken within the scope of established procedures.
	2.10	Known solutions to a variety of problems are applied using acquired essential knowledge and associated skills.
	2.11	Ongoing checks of quality of the work are undertaken in accordance with instructions and established procedures.
3. Complete the installation and maintenance of traction network wiring systems	3.1	Work undertaken is checked against design drawings and works schedule for conformance with requirements and anomalies reported in accordance with established procedures.
	3.2	Accidents and/or injuries are reported in accordance with requirements/established procedures, where applicable.

ELEMENT**PERFORMANCE CRITERIA**

- 3.3 Work site is rehabilitated, cleaned up and made 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, the overhead traction network wiring system is returned to service in accordance with requirements.
- 3.6 Works completion records, reports, as installed /modified drawing and/or documentation and information are finalised and 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 of installing overhead traction wiring systems has been acquired.

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

KS01-TRT34A Electrical Rail Traction Wiring Systems Installation

Evidence shall show an understanding of electrical rail traction wiring systems installation to an extent indicated by the following aspects:

T1 Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to the electrical traction.

T2 Electrical traction voltage and current circuit paths encompassing:

- Transmission distribution voltages
- Traction supply system and voltages
- Return and stay current paths, including electrolysis

T3 Relationship of sectioning, section insulator and overlaps/air gaps in a traction power system.

T4 Traction power system components encompassing:

- Function of transformer/rectifiers
- Configuration and purpose of traction overhead wiring systems
- Function of isolators/switches
- Function of the circuit breaker

T5 Reliability and security of traction supply

T6 Traction power system electrical protection encompassing:

- Load protection
- Surge protection
- Fault protection
- Electrolytic protection

T7 Impact of electromagnetic forces encompassing:

- Telephone interference
- Effects of television/radio interference

T8 Insulation methods in a traction power system encompassing:

- Types of electrical insulation
- Insulation coordination
- Reason for electrical clearances

REQUIRED SKILLS AND KNOWLEDGE

T9 Bonding systems - structure bonds, traction bonds/bonding cables and impedance bonds

T10 Ancillary conductors - feeder wires, current return path and other ancillary conductors

T11 Relationship of current and potential drapers/jumpers to the traction power system

T12 Electrical wiring system components - earth wires, feeder wire, return conductor, insulators, catenary wire, contact/trolley wire, droppers, tensioning equipment, current collectors, tram support networks, tram fittings, bridge/tunnel fittings

T13 Electrical traction circuits encompassing:

- Types
- Applications

T14 Relationship of the components, apparatus and the conductors to the operation of the traction system

T15 Effective current collection and wire interface

T16 Effective registration in the traction power system

T17 Profiling overhead traction wire methods.

- Factors that impact on current collectors
- Methods to achieving smooth current collector transitions and interfaces

T18 Dynamic and static forces encompassing:

- Types that effect traction systems
- Effects on effective registration
- Techniques to minimise the adverse effects

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the competency standard unit and must be read in conjunction with the Performance Criteria and the range statement of the competency standard unit 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 – UET12”. 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	Item List

	demonstrated	
A	Install and maintain at least four of the following:	Support structure, Span, Section insulator, Neutral section, Midpoint anchor, Support equipment, Tension regulators, Stay/guy wire, Tramway support network
B	With regards to "A" incorporate at least two of the following:	Catenary, Dropper, Contact/trolley*, Feeder, Earth conductor, Drape/potential jumper (*must do)
C	With regards to "A" incorporate at least one of the following:	Elevating work platform, Ladder, Mobile platform
D	With regards to "A" incorporate at least two of the following:	Tensioning equipment*, Specialised tools, Ropes, Geometry profiling equipment. (*must do)
E	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 installation and maintenance of traction network wiring systems.

In addition to the resources listed above, in context of and specific resources for assessment, evidence should show demonstrated competency working below ground, 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 Transmission, Distribution and Rail Traction Industry. 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 competency standard unit 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 installation and maintenance of traction network wiring systems as it relates to the correct registration of the contact wire with respect to the current collectors

Types of conductor may include HD, CAD, tin bearing and magnesium copper, aluminium, steel, aluminium conductor steel reinforced (ACSR), insulated screened and unscreened cable and pilot and control cables.

Materials and equipment may include porcelain, glass, ceramic, fibre glass and composite insulators, steel, brass, stainless steel, neoprene, copper, cast and galvanized fittings, drums, pulleys, hooks, yoke plate, line grips, tensioning devices, ropes, slings, hydraulic/manual crimping and cutting tools, specialized tools and dynamometers; Conductors and support wires include droppers wire, catenary wire, contact/trolley wire, earth wire, feeder wire, drape/potential jumper wire, stay wire, cross-span, networks and head span wire.

Associated equipment to conductors may include registration arms, midpoint anchors, section insulators, neutral sections, supports, cantilevers, portals, drop verticals, surge diverters and tensioning devices.

Maintenance may include the removal, repair and replacement of cables, conductors and associated hardware.

Conductors and support wires include droppers wire, catenary wire, contact/trolley wire, earth wire, feeder wire, drape/potential jumper wire, stay wire, cross-span, networks and head span wire.

Associated equipment to conductors may include registration arms, midpoint anchors, section insulators, neutral sections, supports, cantilevers, portals, drop verticals, surge diverters and tensioning devices.

Plant may include ladders, elevating work platform, winches and capstans, specialist tensioning stringing equipment, cable trailers and drum stands, rail and road rail mounted overhead wiring vehicles.

Installing tension regulators encompasses fitting, positioning and securing weight chains and pulley systems.

Permits may include access permits, permits to work and or other relevant permits and documents by recognised bodies.

Profiling encompasses sag, tension, encumbrances, offsets, cants and registration which involves horizontal and vertical calibration of the contact wire or trolley wire to a design height and stagger in reference to the running rail.

Current collectors may include pantographs and tram trolley poles.

The following constants and variables included in the element/Performance Criteria in

RANGE STATEMENT

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 of 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
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

Unit Sector(s)

Not applicable.

Competency Field

Competency Field 11)

Rail Traction Units