



Australian Government

UEENEEN111A Install and maintain trackside signal and train protection equipment

Release: 2

UEENEEN111A Install and maintain trackside signal and train protection equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers installation and maintenance of trackside signal and train protection equipment. It encompasses safe working, regulatory requirements and following installation and work procedures, performing scheduled maintenance, finding and repairing faults, performing operational tests, certifying and reporting.

Application of the Unit

Application of the Unit 2)

This unit shall apply to qualifications in installation and maintenance of rail signalling electrical power and control systems.

Licensing/Regulatory Information

License to practice 3)

The skills and knowledge described in this unit may only be practised in the workplace under regulations related to electrical work, the codes of practice and regulations of the State/Territory in which the work is carried out. This includes codes of practice such as the 'Code Of Practice for the Defined Interstate Rail Network' for work carried out on that network.

Pre-Requisites

Prerequisite Unit(s) 4)

Competencies 4.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEN 109A Install and maintain train detection equipment

AND

Relevant work place requirements in 'Work site protection' have been acquired.

Literacy and numeracy skills 4.2)

Participants are best equipped to achieve competency in 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)

This unit contains Employability Skills

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 to install and maintain trackside signal and train protection equipment	1.1 OHS procedures for a given work area are identified, obtained and understood.
	1.2 Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3 Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4 Appropriate personnel are consulted to ensure the work can proceed without delaying or compromising the operational safety of train movements.
	1.5 Materials needed for the installation/maintenance work are obtained in accordance with established procedures and checked against job requirements
	1.6 Tools, equipment and testing devices needed for the installation/maintenance work are obtained in accordance with established procedures and checked for correct operation and safety.
2 Install and maintain trackside signal and train protection equipment	2.1 OHS risk control measures and procedures for carrying out the work are followed.
	2.2 Signal and train protection equipment is checked

ELEMENT

PERFORMANCE CRITERIA

- to confirm technical specifications can be met.
- 2.3 Sub assemblies of signal and train protection equipment are assembled in accordance with work specifications and checked to confirm circuit integrity.
 - 2.4 Complete sub assemblies are tested off site where possible to ensure technical operations can be met.
 - 2.5 Installation, wiring and assembly of signal and train protection equipment is done efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
 - 2.6 Signal and train protection components and sub assemblies are checked and installed in accordance with job specifications.
 - 2.7 Component and wiring test are performed to 'live test' conditions to ensure and train protection equipment functions correctly.
 - 2.8 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
 - 2.9 Installation and maintenance work are carried out to manufacturer specifications using procedures consistent with enterprise standards.
 - 2.10 Appropriate operational test procedures are applied to ensure equipment and components are fully operational
 - 2.11 Signal and train protection equipment is monitored and tested to ensure it operated within the technical parameters specified.
 - 2.12 Testing is performed efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

ELEMENT	PERFORMANCE CRITERIA
3 Complete the installation and maintenance of trackside signal and train protection equipment	3.1 OHS work completion risk control measures and procedures are followed.
	3.2 Work site is made safe in accordance with established safety procedures.
	3.3 Test results and documentation is completed to confirm operational compliance to system requirements and job specifications, and relevant reports produced.
	3.4 Work completion is documented and appropriate person(s) notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and installing and maintaining trackside signal and train protection equipment.

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

KS01-EN111A Trackside signal and train protection equipment installation and maintenance

Evidence shall show an understanding of trackside signal and train protection equipment installation and maintenance, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

Rail signalling principles, electrical

Overview of electrical rail signalling encompassing:

Types of rail signalling / safeworking systems

Note:

Systems include: CTC, automatic, controlled and interlocked signalling.

Advantages of electrical over mechanical signalling

Advantages of CBI over electrical signalling systems

Effects of overhead traction systems on electrical signalling systems (where applicable).

Purpose of elements of an electrical rail signalling systems.

Note: Elements include signals and aspect systems, train protection systems, point actuating systems, mechanical locking, relay interlocking, computer based interlocking, train detection systems, control input devices, indicators, diagrams and monitors, and safe working systems.

Rail signalling principles, mechanical

Overview of mechanical rail signalling encompassing:

Types of mechanical rail signalling systems for different rail traffic

Note:

Rail traffic may include: passenger train, freight train, maintenance vehicles, heritage/tourism train.

Deficiencies of mechanical signalling systems

Note:

Mechanical systems may include: automatic, controlled and interlocked signalling.

REQUIRED SKILLS AND KNOWLEDGE

Effects of overhead traction systems on mechanical signalling systems (where applicable)

Effects of external factors on the mechanical rail signalling system.

Note:

Factors may include: rail overhead , gradients/terrain, environmental and civil configuration.

Purpose of elements of a mechanical rail signalling systems encompassing:

Note: Elements include signals, point actuating systems, locking and train detection systems, control input devices, indicators, diagrams and monitors, mechanical interlocking frames, safe working systems and electro-mechanical interfaces.

Rail signalling, signal equipment

Equipment and their components encompassing:

Incandescent lamps

LED lamps

Electro-Mechanical

Mechanical.

Note:

Including interfacing to different interlocking systems, E.g. relay and CBI

Operating principles and parameters encompassing:

Automatic signal control circuits

Controlled signal control circuits

Approach control circuits

Bi-directional block control circuits

Lamp proving circuits

Failure mode

Interpreting circuits diagrams to evaluate correct operation and relationship to other signalling circuits

Correct operation in accordance with control and locking tables.

Servicing procedures encompassing:

Maintenance documentation

Coordination/planning sequence

Operational test procedures

Scheduled/corrective maintenance

REQUIRED SKILLS AND KNOWLEDGE

Unscheduled/preventative maintenance

Certifying signal equipment (commission and de-commission).

Note:

Certifying procedures are only applicable for compliance with rail operator and/or enterprise standards.

Rail signalling, train protection equipment

Equipment and their components encompassing:

Electro-mechanical (E.g. trainstops)

Electro-magnetic (E.g. AWS)

Electronic (E.g. TPWS)

ATP system - Balise/beacon based (E.g. ETCS Level 1, and Westect).

Note: include concept of interface to on-board system.

Operating principles encompassing:

Permissive operation

Restrictive operation

Failure modes

Interpreting circuits diagrams to evaluate correct operation and relationship to other signalling circuits

Correct operation in accordance with control and locking tables.

Servicing procedures and parameters encompassing:

Maintenance documentation

Coordination/planning sequence

Operational test procedures

Scheduled/preventative maintenance

Unscheduled/corrective maintenance

Certifying train protection equipment (commission and de-commission).

Note:

Certifying procedures are only applicable for compliance with rail operator and enterprise standards.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components 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-preferred model for apprenticeships. However, where summative (or final) assessment is used it must 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. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

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 issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/much 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 practised. 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 must 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 – UEE11'. Evidence shall also comprise:

- A representative body of work performance 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 statement
 - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
 - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
 - Demonstrate an appropriate level of skills enabling employment
 - Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
 - Install and maintain power operated trackside signal and train protection equipment as described in 8) and including:
 - a. Interpreting specifications and circuit diagrams correctly
 - b. Using appropriate fault finding techniques
 - c. Installing and maintaining trackside signal and train protection equipment to operational requirements
 - d. Organising work to minimise traffic disruptions

- e. Using tools and test equipment correctly
- f. Following relevant codes of practice and environmental protection procedures and requirements
- g. Completing relevant technical reports and documentation, and
- h. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

**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 work as prescribed by this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to installing and maintaining power operated signalling equipment.

**Method of
assessment** **9.4)**

This 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 Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

**Concurrent
assessment and
relationship with
other units**

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged in combination with other competencies required by a given enterprise installation, maintenance and repair functions.

Concurrent assessment may include:

UEENEEN118A Find and repair rail signal system faults

UEENEEN114A Install and maintain computer based interlocking systems

Range Statement

RANGE STATEMENT

10) This relates to the 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 unit shall be demonstrated in relation to:

- The relevant State/Territory codes of practice and safe working requirements.
- Equipment relevant to a particular rail network.
- Code of practice for the defined interstate rail network.

Activities may include: procedures for the installation and maintenance of trackside signal and train protection equipment and may also include; the use of plans and drawings, manufacturer's / enterprise specifications and manuals.

Maintenance activities may include: finding and repairing faults on signals and train protection equipment in a rail network and may also incorporate safe working, working according to regulatory requirements and following work procedures, adjust, test and verifying operational integrity and completing report documentation.

Installing equipment may include: components and wiring as well as connecting, checking and testing wiring and equipment.

Plant may include: elevated work platforms and crane trucks

Electrical equipment may include: searchlight signal indicating devices, LED signal indicating devices, incandescent signal indicating devices, electro-mechanical rail traffic protection devices, and electronic rail traffic protection devices.

Mechanical equipment may include: signal masts

Test equipment may include: multimeter, frequency meter and rail traffic protection gauges

Technical report may include: Signal passed at danger incident report, site survey and data log report

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Section 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field 11)

Rail Signalling