



**Australian Government**

# **UEENEEN102A Assemble and wire internal electrical rail signalling equipment**

**Release 2**

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## **Modification History**

Not applicable.

## **Unit Descriptor**

### **Unit Descriptor**

#### **1) Scope:**

##### **1.1) Descriptor**

This unit covers assembly and wiring internal signalling equipment for location boxes, enclosures and equipment rooms. It encompasses safe working, regulatory requirements and following work procedures assembling and mounting components, performing internal wiring, terminating cables, and wiring and testing to certify equipment.

## **Application of the Unit**

### **Application of the Unit 2)**

This unit shall apply to qualifications in installations 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 '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 063A Arrange circuits, control and protection for general electrical installations

AND

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 assemble and wire internal signalling 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 noted, and established risk control measures are implemented.                                                      |
|                                                              | 1.4 Technical requirements relating to specific signalling equipment are established.                                                                                              |
|                                                              | 1.5 Assembly and wiring is appropriately sequenced in accordance with job schedule                                                                                                 |
|                                                              | 1.6 Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site                                                        |
|                                                              | 1.7 Materials needed for assembly and wiring are obtained in accordance with established procedures and checked against job requirements                                           |
|                                                              | 1.8 Tools, equipment and testing devices needed to assemble and wire equipment are obtained in accordance with established procedures and checked for correct operation and safety |

| <b>ELEMENT</b>                                                      | <b>PERFORMANCE CRITERIA</b>                                                                                                                                                                                 |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 Assemble and wire internal signalling equipment                   | 2.1 OHS risk control measures and procedures for carrying out the work are followed.                                                                                                                        |
|                                                                     | 2.2 Equipment is assembled, wired, connected and labelled to comply with technical standards and job specifications and requirements.                                                                       |
|                                                                     | 2.3 Established methods for dealing with unexpected situations are discussed with appropriate person(s) and documented.                                                                                     |
|                                                                     | 2.4 Unexpected situations are dealt with safely and with the approval of an authorised person.                                                                                                              |
|                                                                     | 2.5 Equipment is assembled, wired, connected and labelled efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices. |
| 3 Complete the assembly and wiring of internal signalling equipment | 3.1 OHS work completion risk control measures and procedures are followed.                                                                                                                                  |
|                                                                     | 3.2 All terminations are tested in accordance with appropriate testing procedures to ensure tightness and functionality.                                                                                    |
|                                                                     | 3.3 Mandatory continuity and insulation tests are carried out at the workplace as per appropriate test procedures to ensure and verify system standards are met.                                            |
|                                                                     | 3.4 Documentations including wiring diagrams are completed to establish procedures and requirements to ensure quality and safety issues are addressed, and relevant reports produced.                       |

## 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 assembling and wiring internal electrical rail signalling equipment.

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

#### **KS01-EN102A      Install electrical rail signalling equipment**

Evidence shall show an understanding of internal electrical rail signalling equipment assembly and wiring, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Rail signalling principles, mechanical encompassing:

- Overview of mechanical rail signalling
- Purpose of elements of a mechanical rail signalling systems - signals, point actuating systems, locking and train detection systems, control input devices, indicators, diagrams and monitors, interlocking, and safe working systems.

T2. Rail signalling, regulations and codes encompassing:

- Codes philosophy and format
- How to read and apply a code
- Codes that apply to rail signalling

Note: Codes are relevant to a particular rail network.

T3. Technical manuals and catalogues encompassing:

- Typical format
- How to read and apply information

T4. Electrical safe working practices encompassing:

- Risk management and assessment of risk:
  - Principle and purpose of risk management, and
  - Processes for conducting a risk assessment
- Hazards associated with low-voltage, extra-low voltage and high-currents:
  - Arrangement of power distribution and circuits in an electrical installations
  - Parts of an electrical system and equipment that operate at low-voltage and extra-low voltage,
  - Parts of an electrical system and equipment where high-currents are likely.
- Risks and control measures associated with high-voltage:
  - Parts of an electrical system and equipment that operate at high-voltage,
  - The terms 'touch voltage', 'step voltage', 'induced voltage' and 'creepage' as they relate to the hazards of high-voltage, and

## REQUIRED SKILLS AND KNOWLEDGE

- Control measures used for dealing with the hazards of high-voltage.
- Optical fibre safety:
  - Coherent optical sources and joining procedures
  - Laser safety class 3a devices or their replace
- Risks and control measures associated with low voltage:
  - Risks associated with modifying electrical installations, fault finding, maintenance and repair.
  - Control measures before, while and after working on electrical installations, circuits or equipment.
  - Isolation and tagging-off procedures.
  - Risks and restrictions in working live.
  - Control measures for working live.
- Risks and control measures associated with harmful dusts and airborne contaminants - thermal insulation, fibrous cement materials and asbestos and other fibre reinforced switchboard materials.
- Safety, selection, use, maintenance and care of test equipment:
  - Safety characteristics of electrical testing devices,
  - Safe use of electrical testing device, and
  - Checks and storage methods for maintaining the safety of testing devices.

### T5. Rail safe working practices encompassing:

- Rail enterprise safety standard and procedures
- Rail safe working requirements
- Possessions protection and management

### T6. Rail signalling, drawings and diagrams encompassing:

- Drawing types and applications encompassing:
  - Drawing layouts and conventions.
  - Drawing symbols
- Cable and equipment schedules

### T7. Rail signalling, mechanical equipment encompassing:

- Equipment and their components
- Operating principles
- Servicing procedures.

### T8. Rail signalling, electro-pneumatic equipment encompassing:

- Equipment and their components  
Note: Examples include compressors, air lines, control valves
- Operating principles and parameters
- Servicing procedures.

## REQUIRED SKILLS AND KNOWLEDGE

T9. Inverters encompassing:

- Features and characteristic of inverters under load and no-load characteristics - circuit configuration, input and output wave forms, relationship between input and output voltages and output voltage under load conditions.
- Faults in inverters
- Typical applications of inverters

T10. Linear and switch mode power supplies encompassing:

- Operation and characteristics of switched mode power supplies
- Isolation requirements and circuitry
- Operation of step-down and step-up regulators
- DC to DC converters
- Operation of variable frequency and pulse width modulated regulation techniques
- Radiation suppression circuitry
- Diagnostic procedures to isolate faults

## 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 time frames 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:
  - Assemble and wire internal electrical signalling equipment as described in 8) and including:
    - a. Interpreting specifications correctly
    - b. Assembling and wiring equipment to specified/technical workplace requirements
    - c. Following correct testing procedures
    - d. Ensuring assembled/wired equipment operates to specifications
    - e. Using appropriate tools correctly and safely
    - f. Following relevant codes of practice, OHS and environmental protection procedures and requirements
    - g. Conducting mandatory tests and identifying non-conformance using effective workplace methods
    - h. Interpreting signalling circuit diagrams
    - i. Completing mandatory reporting.
    - j. Completing relevant technical reports, records and documentation, and
    - k. 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 assembling and wiring internal electrical 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)

There are no concurrent assessment recommendations for this unit.

## 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.
- Code of practice for the defined interstate rail network.

Note: Internal equipment is that associated with location boxes, enclosures and equipment rooms

Equipment relevant to a particular rail network may include, and not be limited to

- relay, racks/frames/enclosures, switch circuit controllers, telephones, and vital computer based interlocking modules

Components may include: relays, fuses, terminals, transformers, lightning arresters, resistors, leads, switches and conduits, relay plug boards and electronic components

Plant may include: Vehicle mounted crane, Generators and Scissor lift

Test equipment may include: continuity tester, insulation tester, multimeter, earth leakage tester

Specialised tools may include: crimpers, relay spring clip removal tool, plug coupler pin removal tool and explosive power tools.

Activities may include: assemble procedures, mounting, and wiring of internal equipment using plans, completion of testing documentation.

Testing may include: inspection, continuity, wire count, null count, etc in a simulated environment or operational test on specific signalling equipment to specified tolerance.

Technical report may include: incident report, equipment report, and site survey report.

Certify may include ensuring the equipment is assembled and wired in accordance with the design.

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