# 22458VIC

# Diploma of
# Railway Signalling Systems

This course has been accredited under Parts 4.4 of the Education and Training Reform Act 2006

**Accredited for the period 1 January 2018 to 31 December 2022**

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# Contents

## Section A: Copyright and course classification information

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| **1. Copyright owner of the course** | Copyright of this course is held by the Department of Education and Training, Victoria<br>© State of Victoria (Department of Education and Training) 2017. |
| **2. Address** | Executive Director<br>Industry Engagement and VET Systems<br>Higher Education and Skills Group<br>Department of Education and Training (DET)<br>GPO Box 4367<br>Melbourne Vic 3001<br><br>**Organisational Contact:**<br>Manager Training Products<br>Higher Education and Skills Group<br>Telephone: (03) 9637 3092<br>Email: course.enquiry@edumail.vic.gov.au<br><br>**Day-to-Day Contact:**<br>Curriculum Maintenance Manager - Engineering Industries<br>Box Hill Institute of TAFE<br>Private Bag 2014<br>Box Hill, Victoria 3128<br>Ph: 03 9286 9880<br>Email: gadda@bhtafe.edu.au |
| **3. Type of submission** | Accreditation |
| **4. Copyright acknowledgement** | The following unit of competency:<br>– BSBWOR502 – Lead and manage team effectiveness<br>is from the BSB Business Services Training Package.<br>The following units of competency:<br>– MEM16010A – Write reports<br>– MEM16011A – Communicate with individuals and small groups<br>are from the MEM05 Metals and Engineering Training Package.<br>The following unit of competency:<br>– MSS408007 – Develop problem solving capability of an organisation<br>is from the MSS Sustainability Training Package.<br>The following unit of competency:<br>- TLIE4032 – Use internal communication systems for rail industry regulatory compliance |

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| | Is from the TLI Transport and Logistics Training Package.<br>© Commonwealth of Australia<br>The following unit of competency:<br>– VU21990 – Recognise the need for cyber security in an organisation<br>is from 22334VIC Certificate IV in Cyber Security.<br>© State of Victoria (Department of Education and Training) |
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| **6. Course accrediting body** | Victorian Registration and Qualifications Authority (VRQA) |
| **7. AVETMISS information** | **ANZSCO code:** 233311 Railway Signalling Engineer<br>**ASCED Code:** 0399 Other Engineering and Related Technologies<br>**National course code:** 22458VIC |
| **8. Period of accreditation** | 1 January 2018 to 31 December 2022 |

## Section B: Course information

| 1. Nomenclature | *Standard 1 AQTF Standards for Accredited Courses* |
|---|---|
| **1.1 Name of the qualifications** | Diploma of Railway Signalling Systems |
| **1.2 Nominal duration of the course** | 540 – 600 hours |
| **2. Vocational or educational outcomes** | ***Standard 1 AQTF Standards for Accredited Courses*** |
| **2.1 Purpose of the course** | The purpose of the Diploma of Railway Signalling Systems is to provide paraprofessional level training for railway signalling and communications technical officers. Participants will develop the range of skills and knowledge that will enable them as part of a team, to plan, develop and implement railway signalling systems, manage repair and maintenance of the systems and associated equipment and undertake signalling incident investigations.<br><br>The course allows for existing railway technicians with a Certificate IV in Electrical - Rail Signalling or equivalent and relevant work experience to upgrade their qualifications.<br><br>The course responds to a Victorian Government priority in building the competencies of the railway industry by enhancing the employability of participants through the provision of a career pathway. |
| **3. Development of the course** | ***Standards 1 and 2 AQTF Standards for Accredited Courses*** |
| **3.1 Industry / enterprise/ community needs** | The Victorian Government has initiated a comprehensive railway industry skills program to train Victorians to deliver an unprecedented amount of work on the Melbourne railway network over the next ten years and beyond. This includes the removal of 50 dangerous and congested level crossings across Melbourne, the extension of railway to Mernda and the Melbourne Metro Rail project.<br><br>The skills program will result in a new generation of skilled railway workers for Victoria. It will contribute to the Victorian economy and to Victorians by providing a range of training opportunities to address skills needs at various levels, from individuals who are entering the railway industry, have come across from other industry areas as well as those already existing in the industry. |

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| | This course development initiative is being led by the Level Crossing Removal Authority, with input from Melbourne Metro Rail Authority, Metro Trains Melbourne, Public Transport Victoria, V/Line and other industry stakeholders.<br><br>As part of this initiative the Level Crossing Removal Authority has recognised the need for nationally recognised qualifications that specifically addresses the training needs for railway signal engineers and technologists in their role of signalling management and telecommunications for a safe and modern railway system. The first courses developed were a Graduate Certificate and Graduate Diploma of Railway Signalling Systems. These qualifications provide specialist training for railway signalling engineers responsible for managing the design, development, integration and installation of railway signalling systems and networks.<br><br>The Diploma of Railway Signalling Systems is a continuation of this initiative. It will provide a level of training for railway signalling technical officers and assistant engineers to work as part of a team under the direction and leadership of specialist railway signalling engineers. In addition, the diploma qualification creates a vocational educational pathway in which existing technical operatives can upskill and move into more responsible positions in the rail industry. Likewise, the railway industry can have confidence that a formal educational pathway of recognised training is available and this initiative is aligned to the Victorian Government strategic infrastructure plan.<br><br>At the initial stage of this project, the Level Crossing Removal Authority in conjunction with industry stakeholders conducted a workshop to determine the key knowledge and skills areas to be included in the proposed diploma level course. The key knowledge and skills areas identified are:<br><br>Technical knowledge and skill areas:<br><br>- Signalling systems/network infrastructure - current and future<br>- Infrastructure and equipment components of a signalling network<br>- Railway signalling systems rules and operating procedures including codes of practice and legislative environment<br>- Roles and responsibility of the various disciplines in railway signalling operations and their interface<br>- Railway safety (National Rail Safety Regulator Guidelines/Transport Safety Victoria)<br>- Signalling systems maintenance (planning and implementing a technical maintenance plan)<br>- Testing, assessing and commissioning of signalling equipment/systems<br>- Fault finding and rectification of equipment and systems |

- Investigation of incidents - may use the Incident Cause Analysis Method (ICAM)

Generic Knowledge and Skills areas:

- Technical report writing – content and quality
- People management/team effectiveness
- Problem solving – scenarios consistent with the field of issues
- IT/cyber security – monitoring risk to IT/security breach
- Project management (planning /resourcing / administering and finalising)

Following the workshop a research and mapping exercise was undertaken by the Curriculum Maintenance Manager – Engineering Industries to determine what existing training package units and accredited course units were already available to address the key knowledge and skills areas identified above. The key skills and knowledge areas were later validated by the Course Steering Committee when it was formed and the findings of the mapping exercise were reviewed. The committee decided which existing units were suitable and identified the areas where new units are required. In total, eight new units were developed for the course all addressing technical areas of the railway signalling industry. All but one of these units are used in the core component of the course structure.

It is expected the Diploma of Railway Signalling Systems will primarily be delivered at the recently launched Rail Academy at Newport and according to academy staff, the expected annual enrolment number will be approximately 20 students per year. The major cohort of the course will most likely be matured aged and have extensive work experience in the railway signalling sector as a tradesperson or technician. This cohort may have trade qualifications and be selected on the basis of their potential to undertake higher level of responsibility in the industry.

The Course Steering Committee met formally on five occasions during the life of the project and comprised of the following industry representatives:

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| Nicole Sullivan (Chair) | Metro Trains Melbourne |
| Peter Rimkevicus | Metro Trains Melbourne |
| Andrew Greenhall | Metro Trains Melbourne |
| Paul Govett | V/Line |
| Alan Weston | Level Crossing Removal Authority |
| Maurice Graham | EPIC Industry Training Board/Electrical Trade Union |
| Garry Doyle | Siemens Mobility |

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| | In attendance:<br><br>George Adda — Curriculum Maintenance Manager - Engineering Industries<br><br>Trevor Lange — Curriculum Maintenance Manager - Engineering Industries<br><br>It is confirmed that the Diploma of Rail Signalling Systems:<br>• does not duplicate, by title or coverage, the outcomes of an endorsed training package qualification<br>• is not a subset of a single training package qualification that could be through one or more statements of attainment or a skill set<br>• does recognised not include units of competency additional to those in a training package qualification that could be recognised through statements of attainment in addition to the qualification<br>• does not comprise units that duplicate units of competency of a training package qualification |
| **3.2 Review for re-accreditation** | Not applicable |
| **4. Course outcomes** | ***Standards 1, 2, 3 and 4 AQTF Standards for Accredited Courses*** |
| **4.1 Qualification level** | The course outcomes of the Diploma of Railway Signalling Systems are consistent with the characteristics and outcomes of the Australian Qualifications Framework Level 5 (Diploma). It is expected that graduates at this level will have:<br><br>*Knowledge:*<br>• Technical and theoretical knowledge and concepts, with depth in key areas of railway signalling technology<br><br>*Skills:*<br>• Cognitive and communication skills to identify, analyse, synthesise and act on information from a range of sources<br>• Cognitive, technical and communication skills to analyse, plan, design and evaluate approaches to unpredictable problems in the field of railway signalling system and network technologies<br>• Specialist technical and creative skills to express ideas and perspectives in the railway signalling systems<br>• Communication skills to transfer knowledge and specialist skills to others and demonstrate understanding of railway signalling technology |

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| | *Application of knowledge and skills:*<br>• The ability to apply knowledge and skills in rail signaling technology:<br>– with depth in some areas of railway signalling equipment and related technologies, in known and changing contexts<br>– to transfer and apply theoretical concepts and/or technical and/or creative skills in a range of situations such the integration of network equipment and other related technologies<br>– with personal responsibility and autonomy in performing complex technical operations with responsibility for own outputs in relation to broad parameter for quantity and quality<br>– with initiative and judgment to organise the work of self and others<br>– and plan, coordinate and evaluate the work of teams within broad, but generally well defined parameters.<br>The Volume of Learning for the Diploma of Railway Signaling Systems is consistent with the Australian Qualifications Framework Level 5 which is typically 1 - 2 years. It is expected the course will have a typical duration of 1 year which will incorporate structured training delivery and assessment and non-structured learning activities undertaken by the learner. Non-structured learning activities may include independent study, assignments/projects and work experience. |
| **4.2 Employability skills** | (Refer to **Appendix 1** at the end of Section B) |
| **4.3 Recognition given to the course (if applicable)** | *Not applicable* |
| **4.4 Licensing/ regulatory requirements (if applicable)** | *Not applicable* |

## 5. Course rules

***Standards 2, 6,7 and 9 AQTF Standards for Accredited Courses***

To be awarded the Diploma of Railway Signalling Systems participants must complete a total of 8 units consisting of:

- 7 core units
- 1 elective unit**

**Another training package or accredited course unit first packaged at Diploma level maybe selected if it is consistent with the vocational outcomes of the course and does not duplicate any of the core or selected elective units listed in Table 1 below.

Participants who do not complete all the requirements of the qualification will be issued with a Statement of Attainment for units of competency successfully completed.

| Unit of competency/ module code | Field of Education code (six-digit) | Unit of competency/module title | Pre-requisite | Nominal hours |
|---|---|---|---|---|
| ***Core units*** | | | | |
| VU22293 | 039907 | Contribute to the safe operations of railway signalling systems and network | None | 60 |
| VU22294 | 039907 | Apply communication network concepts and practices to railway signalling systems | VU22293 | 60 |
| VU22295 | 039907 | Test and commission signalling equipment and integrated systems | VU22293 | 80 |
| VU22296 | 039907 | Participate in the investigation of a railway signalling incident | VU22293 | 80 |
| VU22297 | 039907 | Develop and implement a railway signalling systems technical maintenance program | VU22293 | 80 |
| VU22298 | 039907 | Coordinate fault diagnosis and rectification in integrated signalling systems | VU22293 | 80 |
| VU22299 | 039907 | Undertake a railway signalling systems project | VU22293<br>VU22294<br>VU22295 | 80 |
| | | **Total nominal hours for core units** | | **520** |
| ***Elective units*** | | | | |
| VU22300 | 039907 | Evaluate signalling equipment and integrated systems | VU22293 | 60 |
| TLIE4032 | | Use internal communication systems for rail industry regulatory compliance | None | 20 |
| VU21990 | 029901 | Recognise the need for cyber security in an organisation | None | 60 |
| MEM16010A | | Write Reports | None | 20 |
| BSBWOR502 | | Lead and manage team effectiveness | None | 60 |
| MSS408007 | | Develop problem solving capability of an organisation | None | 80 |
| MEM16011A | | Communicate with individuals and small groups | None | 20 |
| | | **Total nominal hours for elective units** | | **20 - 80** |
| | | **Total nominal hours for core and elective units** | | **540 – 600** |

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| **5.2 Entry requirements** | To be eligible for entry into the Diploma of Railway Signalling Systems applicants must have successfully completed UEE41211 Certificate IV in Electrical – Rail Signalling or equivalent competencies.<br><br>Applicants are best equipped to successfully undertake the qualification if they have minimum language, literacy and numeracy skills that align to Level 3 of the Australian Core Skills Framework (ACSF), details of which can be accessed from: https://www.education.gov.au/australian-core-skills-framework.<br><br>Application with language, literacy and numeracy skills at lower levels than those suggested will require additional support to successfully undertake the qualification. |
| **6. Assessment** | **Standards 10 and 12 AQTF Standards for Accredited Courses** |
| **6.1 Assessment strategy** | All assessment including Recognition of Prior Learning (RPL) must be compliant with:<br>• Standard 1.2/1.5 of the Australian Quality Training Framework (AQTF): *Essential Conditions and Standards for Initial/Continuing Registration or;*<br>• Standard 1, Clauses1.1 and 1.8 of the *Standards for Registered Training Organisations (RTOs) 2015 or;*<br>• The relevant standards for RTOs in effect at the time of assessment.<br>Assessment strategies must therefore ensure that:<br>• all assessments are valid, reliable, flexible and fair<br>• learners are informed of the context and purpose of the assessment and the assessment process<br>• feedback is provided to learners about the outcomes of the assessment process and guidance given for future options<br>• time allowance to complete a task is reasonable and specified to reflect the industry context in which the task takes place.<br>Assessment strategies should be designed to:<br>• cover a range of skills and knowledge required to demonstrate achievement of the course aim<br>• collect evidence on a number of occasions to suit a variety of contexts and situations<br>• be appropriate to the knowledge, skills, methods of delivery and needs and characteristics of learners<br>• assist assessors to interpret evidence consistently<br>• recognise prior learning<br>• be equitable to all groups of learners<br>Assessment methods are included in each unit and include:<br>• oral and/or written questioning<br>• portfolio of documented evidence<br>• research and case study analyses |

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| | • projects and written reports<br>• demonstration of practical skills<br>Units imported from endorsed training packages or accredited courses must reflect the assessment requirements of the relevant training package or accredited course.<br>Units maybe assessed on the job, off the job or a combination of both. Where assessment occurs off the job, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. |
| **6.2 Assessor competencies** | Assessment must be undertaken by a person or persons with competencies compliant with:<br>• Standard 1.4 of the AQTF: Essential Conditions and Standards for Initial/Continuing Registration or,<br>• Standard 1, Clauses 1.13, 1.14, 1.15, 1.16 and 1.17 of the Standards for Registered Training Organisations 2015 (SRTOs) or,<br>• The relevant standards for RTOs in effect at the time of assessment.<br>Assessors of the imported units of competency must meet the requirements of the relevant accredited course or training package. |
| **7. Delivery** | **Standards 11 and 12 AQTF Standards for Accredited Courses** |
| **7.1 Delivery modes** | There are no restrictions on the delivery for the Diploma of Rail Signalling Systems.<br>The qualification may be delivered in a variety of modes including:<br>• classroom based<br>• workplace or simulated environment<br>• blended or flexible delivery<br>To maximise opportunities for course participants to have learning experiences which are as close as possible to a real workplace environment it's recommended workplace project be used where practical to support delivery.<br>Delivery strategies should actively involve the participants and learning where possible is experiential, relevant and age appropriate.<br>A holistic approach to delivery is encouraged. This may be achieved by combining the delivery of more than one unit where it better replicates working practice.<br>There is no restriction on offering this course on either a full- time or part-time basis.<br>Trainers and assessors should contextualise delivery of the course in response to learner needs, while still meeting the requirements of the units of competency. |

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| **7.2 Resources** | General facilities, equipment and other resources required to deliver this course includes:<br>• general training facilities and class room equipment<br>• access to computers and internet<br>• communication technologies<br>• general workplace documentation, forms and resources<br>• access to Public Transport Corporation Rules and Operating Procedures<br>• relevant organisational policies and procedures<br>• codes of practice, texts and references<br>• appropriate environmental safeguards and occupational health and safety equipment;<br>• a rail signalling workplace or simulated workplace environment, with individuals with whom the learner can interact.<br>Trainers/assessors should refer to the individual units of competency for specific resource requirements.<br>Training must be undertaken by a person or persons with competencies compliant with:<br>• Standard 1.4 of the AQTF: Essential Conditions and Standards for Initial/Continuing Registration or,<br>• Standard 1, Clauses 1.13, 1.14, 1.15, 1.16 and 1.17 of the Standards for Registered Training Organisations 2015 (SRTOs), or,<br>• The relevant standards for RTOs in effect at the time of assessment.<br>The delivery of units of competency that have been imported from training packages must reflect the requirements for trainers specified in that training package. |

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| **8. Pathways and articulation** | Successfully completion of the Diploma of Railway Signalling Systems provides a pathway into the 22326VIC - Graduate Certificate in Railway Signalling Systems or 22327VIC - Graduate Diploma of Railway Signalling Systems.<br><br>Graduates of the course who have completed an imported unit will gain a credit for any qualifications they undertake in the future that includes that unit. Likewise, participants who have already completed an imported unit from another qualification will be granted credit for the unit.<br><br>There are no formal arrangements for articulation with qualifications offered in higher education sector. When RTOs are arranging articulation they should refer to the: *AQF Second Edition 2013 Pathways Policy*. |
| **9. Ongoing monitoring and evaluation** | The Curriculum Maintenance Manager - Engineering Industries is responsible for the ongoing monitoring and maintenance of this course during the accreditation period.<br><br>The Curriculum Maintenance Manager - Engineering Industries will undertake a formal review of the course at the mid - point during the accreditation period.<br><br>Evaluations will involve consultation with:<br>• course participants and graduates<br>• railway signalling and systems industry representatives<br>• teaching/assessing staff<br><br>Any significant changes to the course resulting from the monitoring and evaluation processes will be reported to the Victorian Registrations and Quality Authority through a formal amendment process.<br><br>Course review process may also indicate that the course in total should be expired if a suitable qualification becomes available through the continuous improvement of a training package. |

## Appendix 1: Summary of the Employability Skills for the Diploma of Railway Signalling Systems

The following table contains a summary of the employability skills for this course. This table should be interpreted in conjunction with the detailed requirements of each unit of competency packaged in this course. The outcomes described here are broad industry requirements.

| **Employability Skill** | **Industry/enterprise requirements for this qualification include the following facets. On successful completion of the course a graduate should be able to:** |
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| Communication | • research, organise, analyse and communicate complex information from the Public Transport Corporation Rules and Operating Procedures, reference texts, manufacturer's catalogues and industry documentation/bulletins, websites<br>• communicate effectively across a range of communication networks in the workplace<br>• produce, interpret and analyse railway system/network drawings, charts and graphs<br>• use railway signalling systems terminology and language appropriate to the situation and target audience<br>• write technical reports that include a level of analysis and/or research |
| Teamwork | • work alone or as part of a team that may include apprentices, other technicians, engineers and technical and administrative personnel<br>• provide clear and precise information to team members<br>• delegate and supervise work where required |
| Problem-solving | • analyse and evaluate information, ideas and concepts as well as test results, trends and graphical data<br>• develop continuous improvement solutions and recommendations to signalling systems problems<br>• apply mathematical techniques and scientific principles to railway signalling systems and network situations<br>• implement problem solving and decision making tools, including root cause analysis and solution evaluation techniques |
| Initiative and enterprise | • apply statistical processes to make recommendations solutions for equipment and process improvements<br>• make modifications to work plans and schedules to overcome unforeseen difficulties or developments<br>• initiate significant recommendations for modifications to signalling system network equipment that lead to desired changes in performance |

| Employability Skill | Industry/enterprise requirements for this qualification include the following facets. On successful completion of the course a graduate should be able to: |
|---|---|
| Planning and organising | • organise, sequence and implement plans and schedules<br>• select and use planning techniques and tools to plan, sequence and prioritise work operations<br>• organise physical resources requirements<br>• maintain records of operations or project for accountability against project objectives, schedule and budget<br>• maintain records of legislative compliance |
| Self-management | • accept full responsibility and accountability for personal outputs<br>• establish personal responsibilities for significant operations or projects<br>• establish, maintain and perform personal priorities<br>• establish and pursue a personal professional development program |
| Learning | • maintain knowledge of relevant rules and operational procedures legislative requirements, codes and standards relevant to railway signalling systems<br>• use information from a range of sources to research technical information and data relevant to railway signalling technologies<br>• identify and consult appropriate personnel and technical experts or other reference sources to obtain and verify information. |
| Technology | • apply a range of highly specialised, technical, creative or conceptual skills in a highly specialised and varied context<br>• calibrate equipment, take measurements and analyse results<br>• use software for modelling, human machine interfaces, graphical user interfaces, and networks for data handling and control |

Section C—Units of competency

Following is the list of imported units of competency for this course, and which can be downloaded from the National Register (training.gov.au):

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| BSBWOR502 | Lead and manage team effectiveness |
| MEM16010A | Write reports |
| MEM16011A | Communicate with individuals and small groups |
| MSS408007 | Develop problem solving capability of an organisation |
| TLIE4032 | Use internal communication systems for rail industry regulatory compliance |

Following is the imported accredited unit of competency from the 22334VIC Certificate IV in Cyber Security **(**available at: www.education.vic.gov.au/training/providers/rto/pages/courses):

| | |
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| VU21990 | Recognise the need for cyber security in an organisation |

Following are the units of competency developed for the course, which complies with the current requirement from the Training Package Development Handbook and is detailed in this section of the course document:

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| VU22293 | Contribute to the safe operations of railway signalling systems and network |
| VU22294 | Apply communication network concepts and practices to railway signalling systems |
| VU22295 | Test and commission signalling equipment and integrated systems |
| VU22296 | Participate in the investigation of a railway signalling incident |
| VU22297 | Develop and implement a railway signalling systems technical maintenance program |
| VU22298 | Coordinate fault diagnosis and rectification in integrated signalling systems |
| VU22299 | Undertake a railway signalling systems project |
| VU22300 | Evaluate signalling equipment and integrated systems |

## VU22293 - Contribute to the safe operations of railway signalling systems and network

**Unit Descriptor**

This unit describes the skills and knowledge required to contribute to the safe, reliable and efficient operations of railway signalling systems and network.

No licensing or certification requirements apply to this unit at the time of accreditation.

**Employability Skills**

This unit contains employability skills.

**Application of the Unit**

This unit applies to railway signalling technical officers working as part of a team responsible for overseeing safe railway signalling systems and network operations. In this role, they are required to have thorough knowledge of railway signalling equipment, subsystems, operating principles, rules, regulations and work practices that contribute to the operation of a safe and efficient railway system.

| Element | Performance Criteria |
|---|---|
| Elements describe the essential outcomes of a unit of competency. Elements describe actions or outcomes that are demonstrable and assessable. | Performance criteria describe the required performance needed to demonstrate achievement of the element – they identify the standard for the element. Where bold/italicised text is used, further information or explanation is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide. |
| 1. Determine the objectives and priorities of a railway signalling systems | 1.1 ***Objectives of railway signalling systems*** are identified and established. |
| | 1.2 ***Railway industry priorities*** are identified and defined. |
| 2. Plan to participate in railway signalling operations | 2.1 Operating principles of different ***signalling systems*** in current use are identified. |
| | 2.2 Role and operation of key components and equipment in a modern railway signalling system are recognised. |
| | 2.3 Railway signalling systems ***rules and operating procedures,*** codes of practices, standards and legislative environment are interpreted and followed. |
| | 2.4 Appropriate signalling terminology and relevant graphics are identified and used. |
| | 2.5 Developments in railway signalling technology are identified and researched. |
| 3. Model a railway signalling system | 3.1 Topographical and functional analyses are conducted to determine the appropriate railway signalling system for a specific situation and ***environment.*** |

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| | 3.2 | ***Operational factors*** are considered in creating the signalling system layout. |
| | 3.3 | Relevant equipment and subsystems are evaluated and selected. |
| | 3.4 | Automatic warning systems are evaluated to determine the system. |
| | 3.5 | Control tables are developed and incorporated into the signalling design. |
| | 3.6 | Typical application data and circuits are developed for the control tables. |
| | 3.7 | Signalling power systems including smooth (low voltage) power supplies are determined and documented. |
| | 3.8 | Requirements for the train control centre are specified including the equipment required, in accordance with railway rules and operating procedures. |
| | 3.9 | The signalling system is evaluated for safety and cost effectiveness over the system life cycle. |
| 4. Assess the risks, safety and reliability requirements of the signalling system | 4.1 | Factors affecting the safety, reliability and maintainability of signalling equipment and systems are identified. |
| | 4.2 | Measures taken to guard against human failure and are determined. |
| | 4.3 | Rules and procedures for conducting a risk assessment of a signalling system are identified and followed. |
| | 4.4 | Risks, safety and reliability considerations of the system are collated, evaluated and documented. |
| 5. Work effectively with others to provide safe signalling operation | 5.1 | Role and responsibilities of all personnel involved in railway signalling operations are identified and clarified. |
| | 5.2 | Own role, responsibilities and relationship to other signalling functions and personnel are identified and established. |
| | 5.3 | Rules and procedures for effective communication with the various roles and personnel are clarified and applied. |
| | 5.4 | Own contribution to the work team is evaluated and any unresolved issues or concerns are addressed. |

## Required Knowledge and Skills

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

**Required Knowledge**:

- background of the national railway systems and how signalling evolved
- railway signalling systems rules and operating procedures, codes of practices, standards and legislative environment
- objectives of signalling systems – safety and traffic management efficiency
- signalling principles: safe separation of trains, proving and holding the route, clearance points, roll out protection, failsafe design
- signals, train detection, points, control panels, level crossing protection: equipment and interlocking principles and requirements
- signalling terminology and graphics symbols
- range of roles and responsibilities workers in railway and signalling operations and their interface requirements

**Required Skills**

- researching railway signalling operations and developments
- working within the boundaries of the railway rules, operating procedures and codes of practice in the provision of safe railway signalling system
- identifying the operation of the various components of a modern railway signalling system
- modelling a signalling system to suit topographical and environment considerations
- evaluating railway signalling systems for safety, suitability and effectiveness
- undertaking a risk assessment of a signalling system
- working and contributing as a member of a team
- recognising and interpreting signalling terminology and graphics symbols

## Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below.

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| ***Objectives of railway signalling systems*** may include but not limited to: | • central control of railway traffic management<br>• automated control of railway management<br>• safe and efficient movement of trains on the railway<br>• safe separation of trains<br>• reliability<br>• train detection. |

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| ***Railway industry priorities*** may include but not limited to: | • more trains to cope with increased customer numbers<br>• extending the railway network<br>• upgrades to existing railway to ensure greater safety<br>• removal of railway crossings<br>• increased efficiency<br>• increased safety. |
| ***Signalling systems*** may include but not limited to: | • multi-aspect and In-cab signals<br>• interlocking systems<br>• point machines<br>• level crossing controls<br>• control tables<br>• application data and circuits<br>• signalling power systems<br>• signalling communications networks<br>• manual and automatic systems<br>• automatic train protection<br>• train detection<br>• train control centres<br>• transmission/radio based systems<br>• moving blocks. |
| ***Rules and Operating Procedures*** may include but not limited to: | • Public Transport Corporation - Book of Rules and Operating Procedures (1994)<br>• Authorised Rail Operation (ARO) rules. |
| ***Environment*** may include but not limited to: | • single line<br>• double line<br>• block controls<br>• sidings. |
| ***Operational factors*** may include but not limited to: | • dwell time at platforms<br>• maximisation of line capacity<br>• reducing operating costs<br>• positioning of crossing points.<br>• |

## Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Accreditation Submission.

**Critical aspects for assessment and evidence required to demonstrate competency in this unit**

Assessment must confirm the ability to:

- define the objectives and priorities of railway signalling systems and network
- define the different railway signalling systems and explain their operating principles
- model an effective railway signalling systems to suit a specific situation and environment
- identify and document the risk factors that can impact on a safe, reliable and effective railway signalling system operation
- work effectively as a team member in accordance to the rules, regulations and work practices designated by the railway authority
- use appropriate railway signalling terminology during railway signalling operations.

**Context of and specific resources for assessment**

Assessment should be conducted in a railway signalling workplace or simulated environment that replicates workplace conditions.

Resources for assessment include:

- access to legislation, policies, railway rules, regulations, and codes of practice relevant to railway signalling systems and networks
- workplace documentation, equipment manuals and specifications.

**Methods of assessment**

The following suggested assessment methods are suitable for this unit:

- workplace projects
- simulation or role play
- case studies and scenarios
- observations
- portfolio of evidence
- oral and written questioning
- third party report from supervisor, team leader or other appropriate persons.

## VU22294 - Apply communication network concepts and practices to railway signalling systems

**Unit Descriptor**

This unit describes the skills and knowledge required to apply communication network concepts and practices that are deployed in railway signaling systems. The concepts and practices includes the way data traverses, railway signalling networks, protocols, networking and communication devices, IP addressing, routing protocols, Virtual Local Area Networks (VLANs), troubleshooting logs and networking monitoring tools.

The unit includes building a small network facilitating interlocking and associated equipment in order to practice troubleshooting methodology.

No licensing or certification requirements apply to this unit at the time of accreditation.

**Employability skills**

This unit contains employability skills.

**Pre-requisite Unit**

VU22293 – Contribute to the safe operations of railway signalling systems and network

**Application of the Unit**

This unit is applicable to individuals working as railway paraprofessionals responsible for maintaining, monitoring and upgrading railway signalling systems. In this role, they apply knowledge of communication network concepts and practices to building and troubleshooting railway signaling systems.

| Element | Performance Criteria |
|---|---|
| 1. Establish key communication network concepts | 1.1 ***Types of communication networks*** are defined. |
| | 1.2 Data transmission in a communication network is explained. |
| | 1.3 Physical communication network equipment and cables are identified. |
| | 1.4 Methods, tools and infrastructure used to connect to the internet from a workstation are explained. |
| 2. Apply key elements to communication networking devices | 2.1 Physical and logical network representations of a local area network are established. |
| | 2.2 Function and operation of network switches, VLANs and network routers are identified and used. |
| | 2.3 Function and operation of a computer based interlocking device is recognised and operated. |
| | 2.4 Function and operation of a wireless access point (WAP) is identified and established. |
| | 2.5 Appropriate firewalls and network monitoring tools are recognised and applied. |
| | 2.6 Log files used for troubleshooting are identified and applied. |

| | | |
|---|---|---|
| 3. | Construct, configure and commission a basic network | 3.1 Key features and structure of an internetworking operating system (IOS) to prepare a communication network device for operation are defined. |
| | | 3.2 Communication network is cabled according to a provided network diagram. |
| | | 3.3 Configuring communication network addresses for a workstation is performed. |
| | | 3.4 ***Communication network*** is constructed, configured, tested and commissioned. |
| 4. | Apply the key features of the protocols and models used for OSI and TCP/IP | 4.1 Function and basic operation of ***key protocols*** in the Open Systems Interconnect (OSI) and Transmission Control Protocol/Internet Protocol (TCP/IP) communication models are established. |
| | | 4.2 Differences and commonalities between the OSI and TCP/IP models for a communication network are determined and considered. |
| | | 4.3 OSI Layer 1 standards and types of communication channels are identified. |
| | | 4.4 OSI Layer 2 Protocols, standards and addressing (MAC addresses) for both LANs and WANs are identified and applied. |
| | | 4.5 Binary number system and hexadecimal number systems are defined and used. |
| | | 4.6 IPv4 and IPv6 addressing schemes are defined. |
| | | 4.7 Function and operation of ***OSI Layer 3 Routed and Routing addressing protocols*** are identified and applied. |
| | | 4.8 Packet encapsulation and decapsulation concepts are defined and established. |
| | | 4.9 Function and operation of ***OSI Layer 4 Protocols*** are defined and applied. |
| | | 4.10 Function and operation of ***OSI Layer 5 to 7 protocols*** and networking applications are defined and applied. |
| 5 | Establish IP addressing schemes | 5.1 Sub-netting an IPv4 communication network is established and applied. |
| | | 5.2 Configuring IPv4 and IPv6 communication network addresses for a workstation is performed. |
| 6. | Implement a small routed communication network | 6.1 Appropriate media, cables, switches and routers are selected. |
| | | 6.2 Communication network topology is cabled. |
| | | 6.3 Basic switch and router configuration for the network topology is performed. |
| | | 6.4 End to end connectivity for a communication network topology utilising ***troubleshooting methodologies tools and commands*** are demonstrated |

## Required Knowledge and Skills

This describes the essential skills and knowledge and their level required for this unit

**Required skills**

- articulating railway signalling operational issues
- numeracy skills to perform calculations in binary and hexadecimal number systems
- problem solving skills to implement provided scripts for a switch and a router
- reading and accurately interpreting documents and reports
- operating a railway signalling personal computer
- identifying network cabling types
- interpreting test information

**Required knowledge:**

- concepts and functions of communication networks relevant to rail signalling systems, including:
    - OSI layered communication model
    - TCP/IP layered communication model
    - media Access Layer (MAC) addresses
    - packet encapsulation and decapsulation concepts and operation
    - binary number system
    - hexadecimal number system
    - transmission Control Protocol (TCP) protocol
    - user Datagram Protocol (UDP)
    - function and operation of application layer protocols
    - VLANs
    - network monitoring tools e.g. Wireshark
    - log files generated from networking devices eg Interlocking device, switches, operating system
    - IPV4 and IPV6 addressing and subnetting
    - network cabling
    - network devices including:
        - routers
        - switches
        - computer based interlocking device
        - firewall fundamentals
        - wireless access points
    - routers, switches, firewall fundamentals & wireless access points
    - end to end test commands e.g. Ping, Traceroute
    - switch and router IOS commands.

## Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below

| | |
|---|---|
| ***Types of communication networks*** may include but not limited to: | ○ Local Area Network (LAN)<br>○ Wide Area Network (WAN)<br>○ Metropolitan Area Network (MAN)<br>○ Wireless LAN (WLAN)<br>○ Virtual LAN (VLAN)<br>○ Virtual Private Network (VPN)<br>○ signaling network. |
| ***Functional communication network*** may include but not limited to: | ○ workstations<br>○ router<br>○ switch<br>○ hubs. |
| ***Key protocols*** may include but not limited to: | ○ Address Resolution Protocol (ARP)<br>○ Reverse Address Resolution Protocol (RARP)<br>○ Transmission Control Protocol (TCP)<br>○ User Datagram Protocol (UDP)<br>○ Internet Protocol (IP)<br>○ Internet Control Message Protocol (ICMP)<br>○ File Transfer Protocol (FTP)<br>○ Simple Mail Transfer Protocol (SMTP)<br>○ Domain Name Server (DNS)<br>○ Internet Group Management Protocol (IGMP) |
| ***OSI Layer 3 Routed and Routing addressing protocols*** may include but not limited to: | ○ Routing Information Protocol (RIP)<br>○ Enhanced Interior Gateway Routing Protocol (EIGRP) |
| ***OSI Layer 4 Protocols*** may include but not limited to: | ○ Transmission Control Protocol (TCP)<br>○ User Datagram Protocol (UDP) |
| ***OSI Layer 5 to 7 protocols*** may include but not limited to: | ○ Hypertext Transfer Protocol (HTTP)<br>○ File Transfer Protocol (FTP)<br>○ Trivial File Transfer Protocol (TFTP)<br>○ Simple Mail Transfer Protocol (SMTP)<br>○ Domain Name Server (DNS) |
| ***Troubleshooting methodologies tools and commands*** may include but not limited to: | ○ bottom up testing<br>○ ping<br>○ traceroute<br>○ event log<br>○ network monitoring. |

## Evidence Guide

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 section in Section B of the accreditation submission.

**Critical aspects for assessment and evidence required to assess competency in this unit**

Assessment must confirm the candidate's ability:

- outline the function and operation of key network concepts
- define and apply key features of the TCP/IP and OSI models
- apply the functions and operations of key networking devices
- construct and configure a basic network
- apply configuration of IP addressing scheme
- troubleshoot a small communication routed network.

**Context of and specific resources for assessment**

Assessment should be conducted in a railway signalling workplace or simulated environment that replicates workplace conditions.

Resources for assessment include:

- access to legislation, policies, railway rule, regulations, and codes of practice relevant to railway signalling systems and networks.
- workplace documentation, equipment manuals and specifications
- relevant resources to build and troubleshoot a small network.

**Methods of assessment**

The following suggested assessment methods are suitable for this unit:

- workplace projects
- simulation
- case studies and scenarios
- observations
- portfolio of evidence
- oral and written questioning
- third party report from supervisor, team leader or other appropriate persons.

## VU22295 - Test and commission signalling equipment and integrated systems

**Unit Descriptor**

This unit describes the knowledge and skills required to undertake testing and commissioning procedures related to integrated railway signalling systems and associated equipment.

This includes verifying interfacing functions, performing installations, testing and commissioning, as well as verifying system design integrity. It also includes safe working practices and compliance with established procedures.

No licensing, legislation or certification requirements apply to this unit at the time of publication.

**Employability Skills**

This unit contains employability skills.

**Pre-requisite Unit**

VU22293 – Contribute to the safe operations of railway signalling systems and network

**Application of the Unit**

This unit applies to a technical officer working as part of a team responsible for one or more railway signalling systems and associated infrastructure integrated with a control centre to form a complete railway signalling system. In this role, they undertake testing and commissioning procedures for integrated railway signalling systems and related equipment.

| Element | Performance Criteria |
|---|---|
| Elements describe the essential outcomes of a unit of competency. Elements describe actions or outcomes that are demonstrable and assessable. | Performance criteria describe the required performance needed to demonstrate achievement of the element – they identify the standard for the element. Where bold/italicised text is used, further information or explanation is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide. |
| 1 Plan and prepare to undertake testing and commissioning procedures | 1.1 ***Testing and commissioning procedures*** are planned and prepared to ensure the work is sequenced and scheduled in an orderly manner.<br>1.2 ***Occupational health and safety (OH&S) requirements*** including risk control measures are identified and followed<br>1.3 ***Appropriate personnel*** are consulted to ensure the work is coordinated effectively and roles and responsibilities are clarified.<br>1.4 Equipment, resources, and testing devices needed to carry out the task are obtained in accordance with ***established procedures*** and checked for correct operation and safety. |

| | | |
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| | 1.5 | ***Integrated system*** requirements for signalling systems are analysed from documentation, specifications, manufacturers' manuals, PLC logic assembly printouts and drawings, or discussions with appropriate personnel. |
| | 1.6 | Preparatory work is checked to ensure no unnecessary damage has occurred. |
| **2.** Undertake testing and commissioning procedures for integrated signalling systems and associated equipment, and circuits | 2.1 | Occupational health and safety requirements for carrying out the work are followed. |
| | 2.2 | Signalling systems and circuits are checked as being isolated where necessary using specified testing procedures. |
| | 2.3 | Testing and commissioning procedures are scheduled and performed in accordance with requirements, without damage to the surrounding environment or services. |
| | 2.4 | Testing and commissioning procedures are performed in collaboration with team members. |
| | 2.5 | Technical requirements are communicated to appropriate personnel. |
| | 2.6 | Contingency measures are implemented in accordance with established procedures to ensure that commissioning is completed as intended and to requirements. |
| | 2.7 | Unplanned events or conditions are responded to in accordance with established procedures. |
| | 2.8 | On-going checks of the quality of the work are undertaken in accordance with established procedures. |
| 3. Inspect and document testing and commissioning work and notify completion | 3.1 | Final inspections and performance checks are undertaken to ensure that the integrated signalling system, associated equipment and circuits meet intended criteria. |
| | 3.2 | Records, and documentation are completed in accordance with workplace requirements |
| | 3.3 | Appropriate personnel are notified of work completion in accordance with established procedures. |

## Required Knowledge and Skills

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

**Required Knowledge:**

- railway signalling systems, infrastructure and worksite protection
- principles and components of data communications
- testing and commissioning procedures for integrated railway signalling systems and related equipment

- equipment and resources required to undertake testing and commissioning procedures
- typical work allocation for testing and commissioning procedures
- writing techniques, formats and version control relevant to reporting on testing and producing technical documentation.

**Required Skills:**

- interpreting, evaluating, reporting on documentation, specifications, manufacturers' manuals, computer based interlocking assembly printouts and drawings with respect to signalling equipment and associated infrastructure
- coordinating signal and infrastructure testing and commissioning
- scheduling testing and commissioning of integrated signalling equipment and associated infrastructure, in accordance with workplace procedures
- inspecting that technical/operational specifications are met and that equipment operation follows work orders
- verify integrity of integrated signalling system design
- applying signalling system interfaces and protocol conversion methods
- ensuring compliance with relevant occupational health and safety requirements including risk control measures
- working with others and in teams
- communicating technical requirements to others
- completing relevant records and documentation.

## Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below.

| | |
|---|---|
| ***Testing and commissioning procedures*** may include but not limited to***:*** | • integrated signalling systems which include subsystem software, firmware, equipment and circuits<br>• failure analysis of train protection, points train detection, telemetry, interlocking and control and indication<br>• analysis of road and pedestrian protection<br>• version control management. |
| ***Occupational health and safety*** (***OH&S) requirements*** may include but not limited to***:*** | • legislation, regulation, codes of practice, guidelines<br>• protective equipment<br>• material safety management systems<br>• local safe operation procedures. |
| ***Appropriate personnel*** may include but not limited to***:*** | • supervising signalling engineer<br>• site supervisor/engineer<br>• team leader<br>• team members. |
| ***Established procedures*** may include but not limited to***:*** | • use of tools and equipment<br>• instructions, including job sheets, plans, drawings and designs |

| | |
|---|---|
| | • reporting and communication<br>• manufacturers' manuals and specifications<br>• operational procedures. |
| ***Integrated system*** may include but not limited to***:*** | • computer based interlocking<br>• mechanical interlocking<br>• relay based interlocking. |

## Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Accreditation Submission.

| | |
|---|---|
| **Critical aspects for assessment and evidence required to demonstrate competency in this unit** | Assessment must confirm the candidate's ability to:<br>• implement occupational health and safety workplace procedures and codes of practice including the use of risk control measures<br>• test, assess and commission integrated signalling systems and associated infrastructure on two types of interlocking systems<br>• complete relevant records and documentation and ensure appropriate personnel are notified of work completion in accordance established procedures. |
| **Context of and specific resources for assessment** | Assessment should be conducted in a railway signalling workplace or simulated environment that replicates workplace conditions.<br>Resources for assessment include:<br>• access to legislation, policies, railway rule, regulations, and codes of practice relevant to railway signalling systems and networks.<br>• workplace documentation, equipment manuals and specifications<br>• resources required to complete testing and commissioning procedures for integrated railway signalling systems and related equipment. |
| **Methods of assessment** | The following suggested assessment methods are suitable for this unit:<br>• workplace projects<br>• simulation<br>• observations<br>• portfolio of evidence<br>• oral and written questioning<br>• third party report from supervisor, team leader or other appropriate persons. |

## VU22296 - Participate in the investigation of a railway signalling incident

**Unit Descriptor**

This unit describes the knowledge and skills required to participate in the planning, conducting and reporting of an investigation of a railway signalling incident which has resulted in, or have a potential to result in, injury or damage. The situation may range from relatively minor through to major incident.

It includes undertaking an initial assessment of the situation, establishing the scope and legal parameters of the investigation, conducting a systematic analysis to identify underlying cause/s and actions for prevention and reporting on the outcomes of the investigation.

The incident investigation report maybe required as evidence in a court of law and subject to cross examination.

No licensing or certification requirements apply to this unit at the time of accreditation.

**Employability Skills**

This unit contains employability skills.

**Pre-requisite Unit**

VU22293 – Contribute to the safe operations of railway signalling systems and network

**Application of the Unit**

This unit applies to technical officers in the signalling sector of the railway industry who are required to participate in a signalling incident investigation team

| Element | Performance Criteria |
|---|---|
| Elements describe the essential outcomes of a unit of competency. Elements describe actions or outcomes that are demonstrable and assessable. | Performance criteria describe the required performance needed to demonstrate achievement of the element – they identify the standard for the element. Where bold/italicised text is used, further information or explanation is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide. |
| 1. Participate in the establishment of an investigation process | 1.1 ***Investigation team*** is convened appropriate to the level of the investigation. |
| | 1.2 Organisational policies and procedures for incident investigation are accessed and applied. |
| | 1.3 Scope of the investigation is defined taking account of legislative requirements and workplace procedures.<br><br>Own responsibilities and tasks within the investigation team are identified and confirmed |
| | 1.4 Involvement of interested parties is facilitated in accordance with regulations and workplace procedures. |

| | | |
|---|---|---|
| | 1.5 | Resources required to conduct the investigation, including the need for expert advice are identified and sourced as required. |
| | 1.6 | ***Barriers to investigation*** are identified and addressed. |
| | 1.7 | Action plans and time lines are developed by the investigation team in line with legislation and workplace procedures. |
| 2. Collect information and data for analysis | 2.1 | Sources of information and data are identified and accessed. |
| | 2.2 | Incident site/s, equipment and other evidence involved is inspected. |
| | 2.3 | Information and data is gathered on the inspection. |
| | 2.4 | Statements, photographs, measurements and documentary evidence are taken and recorded, taking account of objectivity, confidentiality and legal implications. |
| | 2.5 | Site evidence and all necessary documentation is appropriately secured. |
| 3. Establish causes and prevention measures | 3.1 | Information and data gathered is analysed to identify immediate and underlying causes and practical prevention measures. |
| | 3.2 | ***Conceptual basis for the analysis*** is identified and understood by the investigation team. |
| | 3.3 | Time line of events leading up to incident is constructed. |
| | 3.4 | The key event/s that resulted in the outcome/s of injury or damage is identified. |
| | 3.5 | ***Conditions and circumstances*** that contributed to the causative event are identified. |
| | 3.6 | Intervention points on the time line for prevention are identified. |
| | 3.7 | Strategies to prevent the re-occurrence of the incident are identified. |
| 4. Compile investigation report | 4.1 | Results of analysis are documented in a format to suit the required ***target audiences*** and legal requirements. |
| | 4.2 | Report is phrased in objective terms and cites evidence and reasons for conclusions. |
| | 4.3 | Report includes recommendations for prevention. |

4.4 Relevant information and data is disseminated to key personnel, stakeholders and external agencies as appropriate.

4.5 Findings from the report are used to develop further prevention strategies.

4.6 Own role and contribution to the investigation team is self-assessed and strengths and weaknesses are identified

## Required Knowledge and Skills

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

**Required Knowledge:**

- railway signalling regulations rules and codes of practice
- railway signalling safety management systems
- incident investigation methods, processes and reporting requirement for the investigation of railway signalling incidents
- interviewing techniques used to investigate railway signalling incidents
- concept and process for establishing timelines of events that extend back in time as far as required and not just focus on immediate events
- concept and process for establishing causative events that resulted in the outcome/s of injury or damage
- role and responsibilities of an incident investigation team
- concept of common law and duty of care and its relevance to railway signalling incidents
- court of law procedures, appearances and the process of cross examination.

**Required Skills:**

- accessing and working within railway industry standards, rules, codes of practice and guidelines for investigating incidents
- reading and interpreting instructions, procedures and information relevant to investigating safety incidents
- working and communicating effectively within an investigation team
- applying an agreed investigation process
- managing own investigative tasks within agreed timelines
- working systematically with required attention to detail when gathering evidence
- conducting interviews and taking statements
- analysing information and data and making observations
- using computing skills to conduct, research and preparing statements
- setting out and compiling a detailed incident report with recommendations for improvements
- assessing the strength and weaknesses of own contribution to the investigation team

## Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance

| | |
|---|---|
| ***Investigation team*** may include but not limited to: | • team leader<br>• team member<br>• occupational health and safety representative<br>• other railway/transport department representatives<br>• union representative<br>• legal adviser<br>• technical experts and equipment suppliers. |
| ***Barriers to investigation*** may include but not limited to: | • changes to incident scene<br>• length of time from when incident occurred/first identified<br>• management and employee attitude including desire to protect self and others<br>• political and other railway stakeholder sensitivity<br>• time limits imposed<br>• limited resources available<br>• legal restrictions or limitations (temporary, short-term or long-term)<br>• geographical location and/or accessibility<br>• economic implications<br>• availability of research data and analysis or testing equipment<br>• availability of technical design information and data relevant to the investigation<br>• lack of records. |
| ***Conceptual basis for the analysis*** may include but not limited to: | • analysis of the systems in place at the time of the incident<br>• focus on the 'why' and 'how' rather than the 'what'<br>• encourage an open minded, objective approach. |
| ***Conditions and circumstances*** may include but not limited to: | • a permanent situation such as type of equipment, work practice, design of work environment<br>• a short-term situation that is relatively unusual, such as a storm or when a key person is absent. |
| ***Target audiences*** may include but not limited to: | • board of management<br>• senior managers<br>• Occupational health and safety committee<br>• external agencies e.g. Coroner, Office National Rail Safety Regulator (ONRSR). |

## Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Accreditation Submission.

**Critical aspects for assessment and evidence required to demonstrate competency in this unit**

Assessment must confirm the ability to:

- contribute effectively as part of a railway signalling incident investigation team in two contexts such as level crossing accident and derailment
- carry out own defined tasks and responsibilities within agreed timelines
- collect and analyse information and data, make observations and identify causes
- contribute to the preparation of a detailed incident investigation report and recommendations for improvement/s.

**Context of and specific resources for assessment**

Assessment should be conducted in a railway signalling workplace or simulated environment that replicates workplace conditions.

Resources for assessment include:

- access to relevant legislation, policies, regulations, rules and codes of practice
- workplace documentation, case studies to assist with investigation and incident investigation tools and procedures.

**Methods of assessment**

The following suggested assessment methods are suitable for this unit:

- workplace projects/investigations
- simulation or role play
- case studies and scenarios
- observations
- portfolio of evidence
- oral and written questioning
- third party report from supervisor, team leader or other appropriate persons.

## VU22297 - Develop and implement a railway signalling systems technical maintenance program

**Unit Descriptor**

This unit describes the knowledge and skills required to develop and implement a railway signalling systems technical maintenance program in accordance with workplace procedures and regulatory requirements. It includes the planning and scheduling process, implementation activities, review and reporting requirements.

No licensing or certification requirements apply to this unit at the time of accreditation.

**Employability Skills**

This unit contains employability skills.

**Pre-requisite Unit**

VU22293 – Contribute to the safe operation of railway signalling systems and network

**Application of the Unit**

This unit applies to a railway signalling systems technical officer responsible for developing and implementing technical maintenance programs under the direction of a maintenance engineer.

| Element | Performance Criteria |
|---|---|
| Elements describe the essential outcomes of a unit of competency. Elements describe actions or outcomes that are demonstrable and assessable. | Performance criteria describe the required performance needed to demonstrate achievement of the element – they identify the standard for the element. Where bold/italicised text is used, further information or explanation is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide. |
| 1. Plan to implement a railway signalling system technical maintenance program | 1.1 ***Technical maintenance program documentation*** is accessed and clarified to ensure the planned works are compliant with workplace procedures.<br>1.2 Hazards, environmental issues and risks associated with the planned technical maintenance work are identified and evaluated.<br>1.3 Previous maintenance documentation is reviewed and current condition of the assets scheduled for maintenance is confirmed.<br>1.4 Members of the ***maintenance team*** are confirmed and individual roles are clarified.<br>1.5 ***Resources*** required to implement ***technical maintenance plan*** are identified. |

| | |
|---|---|
| 2. Prepare the detailed railway signalling systems technical maintenance program | 2.1 Viable available options for the implementation of the specific railway signalling systems maintenance tasks are identified. |
| | 2.2 Preferred option is selected and the implementation program is drafted in consultation with relevant team members to ensure best use of available resources. |
| | 2.3 Contingency requirements allowed for in the implementation of the plan are identified. |
| | 2.4 Resources required are identified for the execution of the maintenance plan. |
| | 2.5 ***Maintenance work milestones*** are identified and clarified. |
| | 2.6 Accurate estimate of the cost of execution of the maintenance plan is prepared in consultation with relevant team members. |
| | 2.7 Implementation of the technical maintenance plan is documented and approved. |
| 3. Initiate railway signalling systems technical maintenance implementation plans | 3.1 Resources are acquired and made available to team members. |
| | 3.2 Work schedules are confirmed and issued to team members. |
| | 3.3 Clear and timely instructions are provided to team members and others involved. |
| | 3.4 Maintenance work is carried out in accordance to approved schedule and time allowance. |
| | 3.5 Any contingencies that arise are addressed in accordance with the requirement of the maintenance implementation plan and workplace procedures. |
| 4. Complete maintenance work, review performance and report on outcomes | 4.1 Completed work is checked against maintenance schedule and work plan. |
| | 4.2 Feedback from team members is sought and recorded for future maintenance planning. |
| | 4.3 Any additional maintenance issues noted by team members are recorded in accordance with workplace procedures. |
| | 4.4 Completed maintenance work is recorded in accordance with workplace procedures. |
| | 4.5 ***Technical maintenance report*** is completed and distributed to relevant persons. |

## Required Knowledge and Skills

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

**Required Knowledge**:

- maintenance requirements of railway signalling systems and equipment that includes testing devices
- function and components of the railway signalling technical maintenance program documentation including:
    - planning and scheduling requirements
    - maintenance reporting requirements
    - resources requirements
- team leadership principles and techniques relevant to developing, monitoring and reporting on a railway signalling technical maintenance program.

**Required Skills:**

- applying maintenance rules, regulations and codes of practice
- planning, costing, implementing and coordinating a maintenance program
- managing and coordinating a technical maintenance team
- accessing and using testing devices and equipment
- reporting on the outcome of a maintenance program
- identifying areas of improvement.

## Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below.

| | |
|---|---|
| ***Technical maintenance program documentation*** may include but not limited to: | • network rules and procedures manuals<br>• signalling plans<br>• diagrams<br>• circuits books<br>• maintenance records/reports<br>• signalling failures and irregularities records<br>• technical maintenance plan. |
| ***Maintenance team*** may include but not limited to: | • signalling engineer<br>• signalling supervisor<br>• signalling maintenance technician<br>• other equipment technicians. |

| | |
|---|---|
| ***Resources*** may include but not limited to: | • calibrated test equipment<br>• tools<br>• materials<br>• replacement parts/components. |
| ***Technical maintenance plan*** may include but not limited to: | • specifications of the work to be carried out<br>• work schedules<br>• instructions<br>• coordination with operation and details of train movements<br>• resourcing requirements. |
| ***Maintenance works milestones*** may include but not limited to: | • stages in the maintenance program which indicate level or degree of progress<br>• components of the maintenance plan which collectively make up the program<br>• time frame established for each stage<br>• expenditure allocated for each stage. |
| ***Technical maintenance report*** may include but not limited to: | • overview of the technical maintenance work program<br>• details of the maintenance work that was completed<br>• details of any work not completed and reasons including further action/s required<br>• details of any additional work completed<br>• sign off authority<br>• projection of further maintenance requirements and reasons or justification/s. |

## Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Accreditation Submission.

**Critical aspects for assessment and evidence required to demonstrate competency in this unit**

Assessment must confirm the ability to:

- develop a signalling technical maintenance plan which identifies:
  - work to be undertaken,
  - sequencing of the maintenance work,
  - skills required to carry out the planned maintenance
  - testing equipment and other resources
  - risk management plan
  - review process
  - reporting requirements
- implement the technical maintenance plan and review the outcomes against the intended objectives
- prepare a technical maintenance report on completed work.

**Context of and specific resources for assessment**

Assessment should be conducted in a railway signalling workplace or simulated environment that replicates workplace conditions.

Resources for assessment include:

- access to relevant legislation, maintenance policies, regulations, rules and codes of practice
- workplace documentation, testing devices and equipment and maintenance procedures.

**Methods of assessment**

The following suggested assessment methods are suitable for this unit:

- workplace projects
- simulation
- observations
- portfolio of evidence
- oral and written questioning
- third party report from supervisor, team leader or other appropriate persons.

# VU22298- Coordinate fault diagnosis and rectification in integrated signalling systems

**Unit Descriptor**

This unit describes the knowledge and skills required to coordinate the maintenance and repair of integrated railway signalling systems and associated infrastructure, and to provide technical guidance and support to maintenance personnel as well as working safely and complying with regulatory requirements. It includes coordinating fault diagnosis and repair procedures to ensure the ongoing operation and functionality of integrated signalling systems and infrastructure.

No licensing or certification requirements apply to this unit at the time of accreditation.

**Employability Skills**

This unit contains employability skills.

**Pre-requisite Unit**

VU22293 – Contribute to the safe operations of railway signalling systems and network

**Application of the Unit**

The unit applies to a railway signalling systems technical officer responsible for coordinating fault diagnosis and rectification in integrated signalling systems.

| **Element** | **Performance Criteria** |
|---|---|
| Elements describe the essential outcomes of a unit of competency. Elements describe actions or outcomes that are demonstrable and assessable. | Performance criteria describe the required performance needed to demonstrate achievement of the element – they identify the standard for the element. Where bold/italicised text is used, further information or explanation is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide. |
| 1. Plan and prepare coordination of fault diagnosis and procedures | 1.1 Diagnosis of integrated signal system ***faults*** is planned to ensure the work is sequenced and scheduled in an orderly manner.<br>1.2 ***Occupational health and safety (OH&S) requirements*** including risk control measures are identified and followed<br>1.3 ***Appropriate personnel*** are consulted to ensure the work of others is coordinated effectively on the work site.<br>1.4 ***Integrated signal systems*** and equipment fault diagnosis is scheduled according to enterprise requirements.<br>1.5 The required materials to complete the work are organised to be available in accordance with ***established procedures*** and checked against job requirements. |

| | | |
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| | 1.6 | Tools, equipment and testing devices needed to carry out the work are organised to be available in accordance with established procedures and checked for correct operation and safety. |
| | 1.7 | Preparatory work is checked to ensure no unnecessary damage has occurred and that it complies with requirements. |
| 2. Coordinate fault diagnosis procedures | 2.1 | Reported faults are confirmed and normal function of integrated systems and equipment are ascertained in accordance with requirements. |
| | 2.2 | Integrated systems and circuits are checked as being isolated where necessary using specified testing procedures. |
| | 2.3 | Fault diagnosis procedures are coordinated in accordance with requirements |
| | 2.4 | Contingency measures are implemented in accordance with established procedures to ensure that the integrated system operates as intended/designed. |
| | 2.5 | Unplanned events or conditions are responded to in accordance with established procedures. |
| | 2.6 | On-going checks of quality of the work are undertaken in accordance with established procedures***.*** |
| 3. Coordinate fault rectification | 3.1 | Occupational health and safety requirements for carrying out the work are followed. |
| | 3.2 | Integrated systems and equipment are isolated in accordance with established procedures as required. |
| | 3.3 | Repair or replacement of faulty components is coordinated accordance with established procedures. |
| | 3.4 | Unplanned events or conditions are responded to in accordance with established procedures. |
| | 3.5 | Appropriate personnel are consulted before any contingencies are implemented. |
| | 3.6 | On-going checks of the quality of work are monitored in accordance with established procedures. |
| | 3.7 | Integrated systems and associated circuit testing is coordinated to ensure safety of the installation. |
| | 3.8 | Integrated systems and associated circuits are returned to service in accordance with established procedures. |

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| 4. Provide status report | 4.1 | Arrangements are made for maintenance and any repair as required, with relevant authorised personnel in accordance with requirements. |
| | 4.2 | Status report is completed and checked for accuracy |
| | 4.3 | Status report is distributed in accordance with established procedures. |

## Required Knowledge and Skills

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

**Required Knowledge:**

- railway integrated signalling systems, infrastructure and protection
- industrial computers and logic controllers and configuration
- principles and components of data communication
- purpose and function of the maintenance and repair of integrated railway signalling systems
- integrated system and equipment techniques and practices relevant to the maintenance and repair of integrated railway signalling systems, including:
    - redundancy techniques
    - fault diagnosis techniques
    - test equipment practices
    - work allocation procedures
    - control/electrical calculations
- writing techniques, formats and version control relevant to reporting on testing and produce technical documentation
- occupational health and safety requirements including risk control measures and workplace procedures.
- tools, equipment and testing devices

**Required Skills:**

- interpreting, evaluating and reporting on documentation, specifications, manufacturers' manuals and drawings of integrated signalling equipment and associated infrastructure
- coordinating fault diagnosis of integrated signalling systems and infrastructure
- planning and preparing integrated signal and infrastructure fault rectification
- communicating technical requirements to others
- applying effective fault finding techniques
- advising on the need/scheduling the maintenance and repair of integrated signalling systems and equipment
- checking that technical/operational specifications are met and that equipment follows work orders

- selecting the appropriate test methods and equipment
- ensuring the required work is performed efficiently
- following relevant railway rules and regulations
- following relevant occupational health and safety and environmental protection procedures and requirements
- applying risk control measures
- working in teams and with others
- completing relevant records and documentation.

## Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below.

| | |
|---|---|
| ***Faults*** may include but not limited to: | Faults are to be considered in the following signalling systems, equipment and infrastructure context:<br>• signals<br>• train protection<br>• points<br>• track circuits<br>• telemetry<br>• interlocking<br>• control and indication<br>• signal power supply and associated equipment<br>• protection:<br>  - road<br>  - pedestrian<br>• security. |
| ***Occupational health and safety*** (***OH&S) requirements*** may include but not limited to: | • legislation, regulation, codes of practice guidelines<br>• protective equipment<br>• material safety management systems<br>• hazardous substances and dangerous goods codes<br>• local safe operation procedures<br>• awards provisions. |
| ***Appropriate personnel*** may include but not limited to: | • supervisor<br>• leading hand<br>• foreman<br>• manager<br>• site engineer<br>• team member. |

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| ***Integrated signalling systems*** may include but not limited to: | • computer-based interlocking<br>• telemetry systems<br>• train describer/panel processor<br>• protocol converters<br>• LAN/WAN networks<br>• train protection<br>• electrical, hydraulic and pneumatic power supplies<br>• trackside equipment (relay room)<br>• hot box/axle detectors<br>• radio frequency (RF) systems<br>• fibre optics systems<br>• computer software. |
| ***Established procedures*** may include but not limited to: | • the use of tools and equipment<br>• instructions, including job sheets, plans, drawings and designs<br>• reporting and communication<br>• manufacturers' specifications<br>• operational procedures. |

## Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Accreditation Submission.

| | |
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| **Critical aspects for assessment and evidence required to demonstrate competency in this unit** | Assessment must confirm the ability to:<br>• implement occupational health and safety procedures and practices including the use of risk control measures<br>• coordinate and schedule the diagnosis and rectifying of faults in integrated railway signalling systems and associated infrastructure on more than one occasion and in different contexts<br>• prepare a fault rectification report in accordance with appropriate railway rules and regulations. |
| **Context of and specific resources for assessment** | Assessment should be conducted in a railway signalling workplace or simulated environment that replicates workplace conditions.<br>Resources for assessment include:<br>• access to relevant legislation, maintenance policies, regulations, rules and codes of practice<br>• workplace documentation, testing devices and equipment and procedures. |

**Methods of assessment**

The following suggested assessment methods are suitable for this unit:

- workplace projects
- simulation
- case studies and scenarios
- observations
- portfolio of evidence
- oral and written questioning
- third party report from supervisor, team leader or other appropriate persons.

## VU22299 - Undertake a railway signalling systems project

**Unit Descriptor**

This unit describes the skills and knowledge to plan, administer, finalise a railway signalling systems project.

It includes the ability to define the project, develop the project plan, administer and monitor the project within project timelines, quality standards and budget control before finalising and reviewing the project outcomes.

An example of a project could be a renewable construction program authorised by the appropriate railway operator such as the replacement of life expired assets.

No licensing or certification requirements apply to this unit at the time of accreditation.

**Employability Skills**

This unit contains employability skills.

**Pre-requisite Unit**

VU22293 –Contribute to the safe operations of railway signalling systems and networks

VU22294 – Apply communication network concepts and practices to railway signalling systems

VU22295 –Test and commission signalling equipment and integrated systems

**Application of the Unit**

This unit applies to railway signalling technical officer working either as an individual on a specific project or coordinating a project team.

| **Element** | **Performance Criteria** |
|---|---|
| Elements describe the essential outcomes of a unit of competency. Elements describe actions or outcomes that are demonstrable and assessable. | Performance criteria describe the required performance needed to demonstrate achievement of the element – they identify the standard for the element. Where bold/italicised text is used, further information or explanation is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide. |
| 1. Define the project | 1.1 ***Project scope and other relevant details*** are identified. |
| | 1.2 ***Project stakeholders*** are identified. |
| | 1.3 Own responsibility and reporting requirements are established. |
| | 1.4 Relationships of the project to other projects and to the organisation's objectives are clarified. |
| | 1.5 Resources required to undertake the project are determined and accessed. |
| | 1.6 Project team members are determined and confirmed as required. |

| | | |
|---|---|---|
| 2. Develop project plan | 2.1 | ***Project plan*** is developed in line with the project parameters. |
| | 2.2 | Appropriate ***project management tools*** are Identified and accessed. |
| | 2.3 | Risk management plan for the project, including work health and safety requirements is formulated. |
| | 2.4 | Project budget is developed and documented for approval. |
| | 2.5 | Team members are consulted and their views are considered in the planning of the project. |
| | 2.6 | Project plan is finalised and the approval is gained to commence project according to documented plan. |
| 3. Administer and monitor project | 3.1 | Project requirements and project team members' responsibilities are clarified and confirmed. |
| | 3.2 | Support for project team members with specific needs or tasks are provided to ensure the quality of the expected outcomes and documented time lines are met. |
| | 3.3 | Record keeping system is established and maintained throughout the project. |
| | 3.4 | Plans for managing project finances, resources and quality are implemented and monitored. |
| | 3.5 | Project reports are prepared as required and forwarded to stakeholders. |
| | 3.6 | ***Risk management*** plan is implemented as required to ensure project outcomes are met. |
| | 3.7 | Project deliverables are achieved in-line with plan and time frame. |
| 4. Finalise project | 4.1 | Recordkeeping associated with the project is completed in accordance with required procedures and checked for accuracy. |
| | 4.2 | Project documentation is completed and the necessary sign-offs are obtained. |
| 5. Review project | 5.1 | Project outcomes and processes are reviewed against the project scope and plan. |
| | 5.2 | Team members input is sought as part of the project review. |
| | 5.3 | Lessons learned from the project are documented and shared with key stakeholders within the organisation. |

## Required Knowledge and Skills

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

**Required Knowledge:**

- principles and practices of project management
- project management tools, including software for project planning and budgeting
- communication and negotiation skills to relevant to project management.

**Required Skills:**

- managing a project with agreed timelines, budget and quality outcomes
- using technology for project management tools
- communicating with a diverse range of people
- planning and organising project resources
- liaising and negotiating with others to achieve desired outcomes
- researching and gathering information in defining a project
- compiling and presenting a project report.

## Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below.

| | |
|---|---|
| ***Project scope and other relevant details*** may include but not limited to: | • contract or other agreement<br>• project brief<br>• project plan or summary<br>• other documents outlining:<br>  - expected outcomes of the project<br>  - inclusions and exclusions from project<br>  - project resources<br>  - quality standards for project<br>  - time frame for project. |
| ***Project stakeholders*** may include but not limited to: | • clients or customers (internal and external)<br>• funding bodies<br>• management, employees and relevant key personnel (internal and external) with special responsibilities<br>• railway signalling equipment sponsor. |

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| ***Project plan*** may include but not limited to: | • details of how the project will be managed<br>• roles and responsibilities<br>• time lines<br>• work breakdown structure. |
| ***Project management tools*** may include but not limited to: | • cost schedule control system<br>• Critical Path Method<br>• Gantt and bar charts<br>• life cycle cost analysis<br>• logistics support analysis<br>• project management software<br>• risk and issues logs<br>• spreadsheets<br>• technical resources required for the project, for example occupational health and safety management-system tools<br>• Program evaluation review technique (PERT). |
| ***Risk management*** may include but not limited to: | • changing roles and responsibilities in project team<br>• negotiating an extension of deadline, or redefining completion or quantity or quality of outcomes<br>• outsourcing some aspects of the project<br>• reducing costs<br>• researching and applying more efficient methods for completing project tasks<br>• seeking further resources to meet deadline<br>• sharing ideas to gain improvements to work undertaken in the project. |

## Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Accreditation Submission.

| | |
|---|---|
| **Critical aspects for assessment and evidence required to demonstrate competency in this unit** | Assessment must confirm the ability to:<br>• define the project with relevant stakeholders based on establishing the project scope and other requirements<br>• plan, administer and finalise a railway signalling project in line with agreed deliverables/outcomes, timeline and allocated budget evaluate the project outcomes that incorporates feedback from team members. |

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| **Context of and specific resources for assessment** | Assessment should be conducted in a railway signalling workplace or simulated environment that replicates workplace conditions.<br><br>Resources for assessment include:<br><br>• workplace documentation, project specifications<br>• resources required to plan, monitor and finalise project. |
| **Methods of assessment** | The following suggested assessment methods are suitable for this unit:<br><br>• workplace project outcomes<br>• observations<br>• portfolio of evidence<br>• oral and written questioning<br>• third party report from supervisor, team leader or other appropriate persons. |

## VU22300 - Evaluate signalling equipment and integrated systems

| | |
|---|---|
| **Unit Descriptor** | This unit describes the knowledge and skills required to evaluate and test railway signalling equipment and circuits to ensure that the equipment and integrated signalling systems and infrastructure are functioning to specification. It includes safe work practices and working in accordance to the Authorised Rail Operator (ARO) rules, regulations and reporting requirements.<br>No licensing or certification requirements apply to this unit at the time of accreditation. |
| **Employability Skills** | This unit contains employability skills. |
| **Application of the Unit** | This unit applies to railway signalling technical officers working as part of a team responsible for the installation, maintenance servicing and repair of railway signalling equipment and associated infrastructure. As part of their role, they evaluate the reliability of signalling equipment and integrated systems. |
| **Pre-requisite Unit** | VU22293 – Contribute to the safe operations of railway signalling systems and networks |

| **Element** | **Performance Criteria** |
|---|---|
| Elements describe the essential outcomes of a unit of competency. Elements describe actions or outcomes that are demonstrable and assessable. | Performance criteria describe the required performance needed to demonstrate achievement of the element – they identify the standard for the element. Where bold/italicised text is used, further information or explanation is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide. |
| 1. Plan and prepare for signalling equipment and integrated systems evaluation | 1.1 ***Evaluation and testing*** is planned in accordance with the relevant ARO rules and regulations<br>1.2 Occupational, health and safety (OHS) requirements and safe work practices are identified and applied.<br>1.3 Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for correct operation and safety. |
| 2. Evaluate equipment and integrated systems | 2.1 Testing and evaluating signalling equipment, ***integrated systems*** and associated infrastructure is undertaken in accordance with workplace procedures.<br>2.2 Circuits are checked as being isolated where necessary using specified testing procedures.<br>2.3 Contingency measures are implemented in accordance with established procedures to ensure that the ***signalling system*** is performing as intended***.*** |

| | |
|---|---|
| | 2.4 Unplanned events or conditions are responded to in accordance with established procedures. |
| 3. Report on evaluation outcomes | 3.1 Final inspections are undertaken to ensure the system tests conform to requirements. |
| | 3.2 Evaluation results and recommendations are documented in accordance with established procedures. |
| | 3.3 Evaluation report is prepared in accordance with established procedure |

## Required Knowledge and Skills

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

**Required Knowledge**:

- railway integrated signalling systems, infrastructure and protection
- testing equipment used for railway signalling operations
- analysis of test results relevant evaluating railway signalling equipment and circuits
- relevant ARO rules and regulations relevant to testing railway signalling equipment
- relevant OHS requirements and safe work practices relevant to testing railway signalling equipment
- techniques and formats for recording data/event processing and reporting evaluation results of railway signalling equipment testing.

**Required Skills:**

- interpreting and evaluating documentation, specifications, manufacturers' manuals and drawings with respect to signalling equipment and associated infrastructure
- planning and preparing signalling systems/equipment for testing and evaluation
- testing and evaluating signalling equipment and associated infrastructure in accordance with workplace procedures
- checking that technical/operational specifications are met and that equipment is in compliance with work orders
- selecting the appropriate test/evaluation methods and equipment
- ensuring safe train movement through work area
- undertaking the required work efficiently
- following relevant rules, regulations, codes of practise, OH&S and environmental protection procedures and requirements
- collaborating with others in coordinating responsibilities for the work
- communicating technical requirements to others
- writing a technical report completing relevant records and documentation.

## Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below.

| | |
|---|---|
| ***Evaluation and testing*** may include but not limited to: | • signalling systems which include subsystem software, firmware, equipment and circuits<br>• failure analysis of train protection, points, track circuits, telemetry, interlocking and control and indication<br>• analysis of road and pedestrian protection<br>• evaluation of data logger events<br>• trend analysis<br>• version control procedures (software, firmware, documentation). |
| ***Integrated systems*** may include but not limited to: | • computer based interlocking (CBI)<br>• telemetry systems<br>• train describer/panel processor<br>• protocol converters<br>• LAN/WAN networks<br>• train protection<br>• electrical ,hydraulic and pneumatic power supplies<br>• trackside equipment (relay room)<br>• hot box/axle detectors<br>• RF systems<br>• fibre optic systems<br>• computer software. |
| ***Signalling system*** may include but not limited to: | • multi-aspect and In-cab signals<br>• interlocking systems<br>• point machines<br>• level crossing controls<br>• control tables<br>• application data and circuits<br>• signalling power systems<br>• signalling communications networks<br>• manual and automatic systems<br>• automatic train protection<br>• train detection<br>• train control centres<br>• transmission/radio based systems<br>• moving blocks. |

## Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Accreditation Submission.

**Critical aspects for assessment and evidence required to demonstrate competency in this unit**

Assessment must confirm the ability to:

- plan, carry out evaluation and testing of railway signalling equipment and associated infrastructure in accordance to relevant railway signalling procedures, rules and regulations on more than one occasion and in different contexts
- complete final test and report and make recommendations on evaluation results.

**Context of and specific resources for assessment**

Assessment should be conducted in a railway signalling workplace or simulated environment that replicates workplace conditions.

Resources for assessment include:

- access to relevant legislation, policies, railway rule, regulations, and codes of practice
- workplace documentation and specifications
- resources required to evaluate and test railway signalling equipment.

**Methods of assessment**

The following suggested assessment methods are suitable for this unit:

- workplace assignment
- case studies and scenarios
- observations
- portfolio of evidence
- oral and written questioning
- third party report from supervisor, team leader or other appropriate persons.