



Australian Government

Department of Education, Employment and Workplace Relations

RIIRAI609A Establish and maintain electrical installations, reticulation and protection system

Release: 1

RIIRAI609A Establish and maintain electrical installations, reticulation and protection system

Modification History

Not applicable.

Unit Descriptor

This unit covers establishing and maintaining the mine electrical installations, reticulation and protection systems in the coal mining industry. It includes providing the following: power supply systems; electrical protection systems; cables from power source to point of usage; mobile machinery and electrical apparatus; overall electrical services that apply to production systems; and safe electrical work procedures.

Application of the Unit

This unit is appropriate for those working in a management role or as a technical specialist, within:

- Coal mining

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

<p>Elements describe the essential outcomes of a unit of competency.</p>	<p>Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.</p>
--	---

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
<p>1. Provide power supply systems for the mine site</p>	<p>1.1. Access, interpret and apply the <i>compliance documentation</i> requirements related to establishing and maintaining of <i>mine electrical power supply systems</i></p> <p>1.2. Install, maintain, review and modify mine power supply systems</p> <p>1.3. Undertake processes and procedures to ensure reliability and quality of supply taking into account transients, harmonics, over-voltages, voltage regulation, lightning and stray currents</p> <p>1.4. Plan and install alternative power supply associated with mine site conditions and safety needs</p> <p>1.5. Undertake processes and procedures to protect high energy sources (sub stations and transformers) through the selection and installation of switchgear and protective devices</p> <p>1.6. Provide mine illumination systems and equipment in accordance with site operations and safety needs</p> <p>1.7. Plan and install battery and associated charging equipment in accordance with mine site conditions and safety needs</p> <p>1.8. Review audit and maintain all power supply systems</p>
<p>2. Provide electrical protection system for mine sites</p>	<p>2.1. Access, interpret and apply the compliance documentation requirements related to <i>mine electrical protection system</i></p> <p>2.2. Install and maintain the electrical protection system</p> <p>2.3. Identify, isolate, rectify faults in electrical installations and verify ability of the system through recognised decision-making processes, including the use of fault level calculations, discrimination and component ratings</p> <p>2.4. Apply management decision-making processes for the maintenance, examination and testing of electrical protection systems</p>

	<p>relative to mine site and safety needs</p> <p>2.5. Review, modify, audit and maintain all electrical protection systems and devices</p>
<p>3. Provide cables from power source to point of usage</p>	<p>3.1. Access, interpret, apply and implement the compliance documentation requirements related to provision and use of <i>mine cables</i></p> <p>3.2. Identify, select and install mine cables</p> <p>3.3. Identify, report and rectify mine cable faults and hazards in accordance with mine site and hazard control requirements</p> <p>3.4. Inspect mine cables for their integrity, usage, consequence of fault/damage and previous repairs</p> <p>3.5. Carry out management, inspection, application, testing, fault finding and repair</p>
<p>4. Provide mobile machinery and electrical apparatus</p>	<p>4.1. Access, interpret, clarify and apply the compliance documentation requirements related to provision and use of mobile machinery and electrical apparatus</p> <p>4.2. Identify, select and install mobile machinery and electrical apparatus</p> <p>4.3. Inspect, monitor, report and rectify mobile machinery and electrical apparatus faults and <i>hazards</i></p> <p>4.4. Carry out testing</p>
<p>5. Provide overall electrical services that apply to production systems</p>	<p>5.1. Access, interpret, clarify and apply the compliance documentation requirements related to overall electrical services that apply to production systems</p> <p>5.2. Select, install, monitor and maintain mine <i>communication systems</i></p> <p>5.3. Select, install, monitor, modify and maintain the electrical components of the gas monitoring and detection systems</p> <p>5.4. Select, install, monitor, modify and maintain <i>control systems</i></p> <p>5.5. Control, monitor and rectify electromagnetic interference that may affect the safe use of electrical systems and other mining equipment</p> <p>5.6. Select, install, monitor, modify and maintain <i>remote control systems</i> on mining equipment</p> <p>5.7. Select, install, monitor, modify and</p>

	<p>maintain welding equipment and energy delivery sources, including pre and post operations</p> <p>5.8. Identify, control and manage hazards from electrostatic charges</p>
<p>6. Provide safe electrical work procedures</p>	<p>6.1. Access, interpret, clarify and implement the compliance documentation requirements related to safe electrical work procedures</p> <p>6.2. Monitor and audit <i>safe electrical work procedures</i></p> <p>6.3. Determine and implement training needs</p>

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Specific skills are required to achieve the performance criteria in this unit, particularly for the application in the various circumstances in which this unit may be applied. This includes the ability to carry out the following as required to establish and maintain the mine electrical installations, reticulation and protection systems:

- apply legislative, organisation and site requirements and procedures
- access, interpret and apply:
 - technical information
 - site/legislative requirements
 - records and reports
- apply the principles of electrical installations, reticulation, control and protection system theory
- apply procedures for the evaluation of designs and installations of electrical installations, reticulation, control and protection systems at a mine in terms of safety requirements
- apply risk management processes for the risks associated with and consequences of failure of electrical installations, reticulation, control and protection systems at a mine
- apply risk management processes for the risks associated with and consequences of changes to electrical installations, reticulation, control and protection systems at a mine
- apply develop procedures, for the management, operation, testing and maintenance of the mines electrical installations, reticulation, control and protection systems
- apply procedures for the planning, coordination and documentation of work on the mines electrical installations, reticulation, control and protection systems
- apply training needs analysis

Required knowledge

Specific knowledge is required to achieve the Performance Criteria of this unit, particularly its application in a variety of circumstances in which the unit may be used. This includes knowledge of the following, as required to establish and maintain the mine electrical installations, reticulation and protection systems:

- legislative and site requirements, inspections, and reporting procedures
- electrical protection theory, including earthing systems, coordination and fault level calculations, step and touch potential management
- fault discrimination and fault clearance characteristics of equipment
- mining electrical protection systems, including earth continuity monitoring, earth leakage protection, earth fault current limitation and relevant standards
- typical low and high voltage switching and distribution systems on mines

- transient over-voltages, harmonics and lightning theory, hazards and protection schemes
- hazards associated with high energy systems in mining
- mining cables, faults and consequences, cable protection systems, standards and cable repair
- classification of hazardous areas and explosion-protected electrical equipment principles, general requirements, verification, testing and standards
- automatic control system hazards, protection schemes and standards
- electromagnetic interference hazards, protection schemes and standards
- management and control of processes for change to software and hard wired based systems
- electromagnetic interference hazards, protection schemes and standards
- radio remote control systems hazards, protection schemes and standards
- safety protective devices associated with welding machines such as Voltage Reducing Devices
- the principles of electrical installations, reticulation, control and protection system theory
- the risks associated with and consequences of failure of electrical installations, reticulation, control and protection systems at a mine
- the risks associated with and consequences of changes to electrical installations, reticulation, control and protection systems at a mine

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	<p>The evidence required to demonstrate competency in this unit must be relevant to worksite operations and satisfy all of the requirements of the performance criteria, required skills and knowledge and the range statement of this unit and include evidence of the following:</p> <ul style="list-style-type: none"> • knowledge of the requirements, procedures and instructions for the establishment and maintenance of mine electrical installations, reticulation and protection systems • implementation of procedures and techniques for the safe, effective and efficient completion of the establishing and maintenance of mine electrical installations, reticulation and protection systems • the identification of the relevant information and scope of the work required to meet the required outcomes • the identification of viable program options and the selection of programs that best meet the required outcomes • working with others to establish and maintain mine electrical installations, reticulation and protection systems • consistent and timely completion of the establishing and maintenance of mine electrical installations, reticulation and protection systems
Context of and specific resources for assessment	<ul style="list-style-type: none"> • This unit must be assessed in the context of the work environment. Where personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills. • The assessment environment should not

	<p>disadvantage the participant. For example, language, literacy and numeracy demands of assessment should not be greater than those required on the job.</p> <ul style="list-style-type: none"> • Customisation of assessment and delivery environment to sensitively accommodate cultural diversity. • Aboriginal people and other people from a non English speaking background may have second language issues. • Assessment of this competency requires typical resources normally used in a civil works environment. Selection and use of resources for particular worksites may differ due to site circumstances. • Where applicable, physical resources should include equipment modified for people with disabilities. • Access must be provided to appropriate learning and/or assessment support when required.
<p>Method of assessment</p>	<p>This unit may be assessed in a holistic way with other units of competency. The assessment strategy for this unit must verify required knowledge and skill and practical application using more than one of the following assessment methods:</p> <ul style="list-style-type: none"> • written and/or oral assessment of the candidate's required knowledge • observed, documented and/or first hand testimonial evidence of the candidate's: <ul style="list-style-type: none"> • implementation of appropriate procedures and techniques for the safe, effective and efficient achievement of the required outcomes • identification of the relevant information and scope of the work required • identification of viable options and the selection of options that best meet the required outcomes • consistently achieving the required outcomes • first hand testimonial and documentary evidence of the candidate's: <ul style="list-style-type: none"> • working with others to establish and

	<p>maintain the mine electrical installations, reticulation and protection systems</p> <ul style="list-style-type: none">• consistent and timely gaining of approval of mine electrical installations, reticulation and protection systems• provision of clear, timely required support and advice on the implementation of mine electrical installations, reticulation and protection systems
Guidance information for assessment	Consult the SkillsDMC User Guide for further information on assessment including access and equity issues.

Range Statement

<p>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, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.</p>	
<p>Relevant compliance documentation may include:</p>	<ul style="list-style-type: none"> • legislative, organisation and site requirements and procedures • manufacturer's guidelines and specifications • Australian standards • code of practice • Employment and workplace relations legislation • Equal Employment Opportunity and Disability Discrimination legislation
<p>Mine power supply systems include:</p>	<ul style="list-style-type: none"> • from extra low through to high voltage switching and distribution systems on mines as well as mine earthing systems, UPSs, generators/alternators
<p>Electrical protection system for mine sites will include:</p>	<ul style="list-style-type: none"> • over current and earth fault protection systems • earth continuity monitoring systems and devices • earth leakage protection systems and devices • earth fault current limitation systems • frozen contactors (loss of vacuum) systems and devices
<p>Electrical protection systems in mines shall include, but not be limited to:</p>	<ul style="list-style-type: none"> • protection against short-circuit • over-current • earth fault • earth leakage
<p>Mine cables may include:</p>	<ul style="list-style-type: none"> • feeder • trailing and reeling cables • all other cabling used for power reticulation, control, data and signalling in the mining environment
<p>Hazards may include:</p>	<ul style="list-style-type: none"> • electric shock • burns • electric arcing and explosions • electric ignition of flammable gases and dusts • transient over-voltage

	<ul style="list-style-type: none"> • lightning • uncontrolled operation of machinery • loss of communications • failure of protection systems • hazardous area electrical equipment for mines, including certified explosion protected electrical equipment for underground and surface mines
<p>Communications systems may include:</p>	<ul style="list-style-type: none"> • Telephone • Radio • PED • microwave and • hardwired systems for voice and data communications
<p>Control systems are systems that automatically control equipment such as:</p>	<ul style="list-style-type: none"> • winders • wash plant • other related operational production systems / processes • mobile machinery • conveyors • longwall
<p>Remote control systems include systems used to operate fixed, transportable and mobile mining machinery from a distance. They may be:</p>	<ul style="list-style-type: none"> • radio controlled • infra red control • umbilical control
<p>Safe electrical work procedures may include:</p>	<ul style="list-style-type: none"> • identification and classification of hazardous areas • restoration and removal of power • isolation • electrical testing • welding • electric shock protocols • purging

Unit Sector(s)

Resources and Infrastructure

Competency field

Refer to Unit Sector(s).

Co-requisite units

Not applicable.