

## 1. Module details

**Module name**

**Electrical Systems for Mines**

**Suggested structured learning time**

A learner possessing the prerequisite skills and knowledge should achieve the module purpose in 36 to 40 hours.

**Module code**

NUE602

**Discipline code**

0703110

## 2. Module purpose

This module provides an introduction to, and overview of electrical reticulation and operating equipment and safety systems in mines. The module considers general electrical control as well as the sensing and control of dangerous gases. Winding and traction equipment is also surveyed. Reticulation, control and communication systems are considered in the context of Australian Standards and Codes of Practice.

## 3. Learning pathway

**Intended use in the structured learning program**

This module is intended to support supervised experience in installing and maintaining mining electrical systems. In particular it focuses on electrical equipment and arrangement significant in mining operation.

Therefore before undertaking this module a learner should have an understanding of general electrical system and safety requirements.

**Recommended prerequisites**

For the most effective learning this module should be undertaken only after module NUE057 have been completed.

## 4. Relationship to competency standards

This module provides part of the underpinning knowledge and skills in the 'Evidence Guide' of specific units of competency in the National Electrotechnology Training Package and provides similar support, where mapped, to equivalent units in the National Metals and Engineering Competency Standards. For details refer to the module to unit maps, available from NUEITAB.

## 5. Content

### 1. Mine reticulation

- Substations
- Transmission lines
- Switchgear
- Earthing
- Trailing cables - handling, storage, testing

2. Electrical control and protection
  - Control systems
  - Cabling
  - Standards, codes of practice legislation
3. Ventilation fans
  - Types
  - Installation methods
  - Protection requirements
4. Static electricity
  - Sources
  - Containment methods
5. Gas sensing devices
  - Types
6. Battery powered vehicles
  - Drive types
  - On site battery charging
7. Communication and control equipment
  - Types
8. Mine winder and package systems
  - Operation
9. Codes of practice
  - Australian standards
  - Codes of practice
  - Regulations
10. Ore extraction machinery
  - Safe handling
  - Operation

**6. Assessment strategy**

<b>Assessment methods</b>	Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.
<b>Conditions of assessment</b>	Learning and assessment will take place in an environment that is conducive to a learner's development.
<b>7. Learning outcome details</b>	
<b>Learning outcome 1</b>	Demonstrate knowledge of indoor and outdoor substations.
<b>Assessment criteria</b>	<ul style="list-style-type: none"><li>1.1 Describe the types and characteristics of transformers used in both indoor and outdoor substations in a mining installation.</li><li>1.2 List the requirements of transmission lines supplying a mining operation.</li><li>1.3 Develop an earthing installation suitable for a mining situation.</li><li>1.4 Describe a bus installation for systems and switchgear in a mining operation.</li><li>1.5 List the common electrical faults encountered in a mining installation.</li><li>1.6 Describe isolation and safe working procedures applicable to a mining environment.</li><li>1.7 List the Australian Standards, Codes of Practice and legislation peculiar to mining operations.</li></ul>
<b>Learning outcome 2</b>	Demonstrate knowledge of standby generation requirements for mines.
<b>Assessment criteria</b>	<ul style="list-style-type: none"><li>2.1 List the various types of prime mover suitable for standby generation equipment in a mining environment.</li><li>2.2 List the types and operating principles of standby alternators encountered in a mining environment.</li><li>2.3 Describe regulation and speed governing systems suitable for standby generation systems.</li><li>2.4 Explain the requirements for paralleling standby generation equipment.</li></ul>

	2.5	Develop a suitable earthing system for a standby generation installation.
<b>Learning outcome 3</b>		Demonstrate knowledge of control and distribution systems.
<b>Assessment criteria</b>	3.1	Describe the control systems required for transformers in a mining installation.
	3.2	List the requirements for switchboards in a mining environment.
	3.3	Develop motor control layouts for a mining area.
	3.4	List the considerations necessary for cable selection within a mining installation.
	3.5	Describe low voltage isolation and safe working procedures required in a mining environment.
	3.6	List the Australian Standards, Codes of Practice and legislation peculiar to a mining installation.
<b>Learning outcome 4</b>		Demonstrate knowledge of mine reticulation.
<b>Assessment criteria</b>	4.1	List the precautions regarding trailing cables in a mine.
	4.2	Describe the types of cables suitable for power reticulation within a mine.
	4.3	Explain connection and disconnection of mine reticulation equipment.
	4.4	Describe the handling and storage requirements of mine reticulation equipment.
	4.5	List the examination and testing procedures of mine reticulation equipment.
<b>Learning outcome 5</b>		Demonstrate knowledge of ventilation fans.
<b>Assessment criteria</b>	5.1	List the types and installation methods of ventilation fans used in mines.
	5.2	Explain the protection requirements of ventilation fans used in mines.
	5.3	Describe the electrical interlocking of ventilation fans in mines.
<b>Learning outcome 6</b>		Describe precautions taken against the effects of static electricity.

<b>Assessment criteria</b>	6.1 Describe the sources of and containment methods for protecting against the build up of a static electrical charge in a mining environment.
<b>Learning outcome 7</b>	Demonstrate knowledge of gas sensing devices.
<b>Assessment criteria</b>	7.1 Describe the devices used for sensing the presence of; methane, hydrogen sulphide, oxides of nitrogen, carbon monoxide and carbon dioxide in a mining environment.
<b>Learning outcome 8</b>	Demonstrate knowledge of battery powered vehicles.
<b>Assessment criteria</b>	8.1 List the drive types, control of and braking methods (dynamic and regenerative) used in battery powered vehicles at a mine site.  8.2 Describing the methods of charging battery powered vehicles at a mine site.
<b>Learning outcome 9</b>	Demonstrate knowledge of communication and control equipment.
<b>Assessment criteria</b>	9.1 Describe common communications and control equipment used in a mining installation.
<b>Learning outcome 10</b>	Demonstrate knowledge of mines winders and haulage systems.
<b>Assessment criteria</b>	10.1 Describe winders and haulage systems for mines.
<b>8. Delivery of the module</b>	
<b>Delivery strategy</b>	Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective method to achieve this is by integration of theory and practice where students learn by experimentation, research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require learning outcome sequence other than that indicated in the module.
<b>Resource requirements</b>	Resources should be sufficient for students to carry out learning activities on an individual basis.  <i>Suggested Learning Resource:</i>  Jenneson, J. R. 1995, Electrical Principles for Electrical Trades, McGraw Hill, Sydney.

**Occupational health  
and safety requirements**

Where this module is used in an approved Traineeship or Apprenticeship program learners should be advised to obtain, where available, respective EEQSBA<sup>1</sup> **User Guides** (*these outline in detail what training and work performance the Learner is required to undertake for the program*).

A safe and healthy environment will be provided for learners and teachers. Safety procedures for the particular learning facilities shall be followed as part of the learning / teaching activity and assessment.

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<sup>1</sup> EEQSBA – ElectroComms and EnergyUtilities Qualifications Standards Body of Australia Ltd.