



**NSW  
Resources  
Regulator**

**COMPETENCY FRAMEWORK**

# **ELECTRICAL ENGINEER**

**of underground mines other than coal mines**

Work Health and Safety (Mines and Petroleum Sites Regulation) 2014

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# 1. Introduction

This document should be read in conjunction with the framework for competencies of statutory functions requiring practising certificates.

# 2. Legislation

Extract from the NSW WHS (Mines and Petroleum Sites) Regulation 2014, Schedule 10, clause 28:

*The statutory functions of electrical engineer are:*

*(a) to develop and review the standards and procedures for the installation, commissioning, maintenance and repair of electrical plant and installations at the mine, and*

*(b) to supervise the installation, commissioning, maintenance and repair of electrical plant and installations at the mine.*

*This Statutory Function is only required if total connected power at mine is greater than 1,000 kilowatts or if high voltage is utilised.*

# 3. Competencies for electrical engineer of underground mines other than coal

The competencies of statutory functions in the framework are generally described below and specific details for this function are found in the following sections.

Situational  
Awareness and  
Risk Assessment

This competency covers the practitioners' actions to identify and assess risks, hazards or other issues that may affect the safe functioning of the mine. It involves gathering information, analysing emerging issues and seeking objective evidence to draw conclusions, so as to eliminate or minimise undesirable consequences.

The electrical engineer of underground mines other than coal is to apply a broad theoretical and specialised technical knowledge and skills in the assessment of hazards and potential risks, in a range of contexts, to demonstrate autonomy, judgement and defined responsibility when:

- developing electrical engineering standards and procedures through investigation and analysis
- reviewing risk assessments and controls for the electrical plant and controls
- verifying to the specified requirements including risk controls
- reviewing by measuring the effectiveness of the electrical engineering standards and procedures, in particular the electrical engineering control plan.

Behavioural tendencies and skills to support the demonstration of Situational Awareness and Risk Assessment:

- Investigate and analyse data and information to support the development of the electrical engineering standards and procedures.
- Identify how to access various sources of information and evaluate its merit.
- Analyse and interpret reports and information available under the SMS to identify how and why a hazard can be present in the mine, the likelihood and potential consequences of the risk.
- Plan how an event or process may occur after its parts or steps are moved or rearranged.
- Assist in the development and maintenance of the electrical control plan, principal hazard management plans and other principal control plans.
- Monitor electrical operations and verify compliance with legislation.
- Review and evaluate audit outcomes on the effectiveness of the SMS against its electrical performance standards and procedures.
- Participate in management of risk, including risk assessment processes and particularly those involving principle hazards.

A blue circular icon with the text "Effective communication" inside.

This competency refers to the practitioners' responsibility in using appropriate, clear and effective communication to ensure instructions, hazards, risks, safety plans and other technical and non-technical issues are effectively communicated at all levels, taking into account the knowledge, expectations, requirements, interests and terminology of the intended audience. Methods of communication and ensuring the communication has been delivered and understood forms part of this competency.

The electrical engineer of underground mines other than coal is expected to transfer complex information and communicate technical advice on electrical plant and installations at any time for WHS, to a variety of audiences within the specific type of mine. This includes:

- supporting the communication and documentation of the electrical standards and procedures
- explaining processes to others, including the results of their analysis of data, information and review outcomes
- engaging in consultation processes when required including developing the electrical engineering standards and procedures.

Behavioural tendencies and skills to support the demonstration of Effective Communication:

- Use appropriate verbal and non-verbal communication and communication channels to explain technical information in an articulate and clear manner, and listen actively to others (i.e. when communicating information to technical and non-technical professionals within the mine).

- Supervise the implementation of risk assessments and electrical engineering control plan including consideration of selection of controls based on the hierarchy of controls.
- Present as a credible source of information.
- Control barriers of communication, supporting others to understand and implement electrical standards and procedures.
- Report information effectively, maintaining written and verbal reporting requirements.
- Seek to clarify information or reports by asking questions and actively listening to others' input.
- Ensure others follow guidance when implementing or applying electrical standards and processes.
- Leverage own and others' knowledge, experience, and credibility to confidently influence others in managing incidents.

#### Collaboration

This competency covers the practitioners' competency to collaborate, provide support and leadership, facilitate the gathering and dissemination of information and knowledge for mine compliance. It includes behaviours and mechanisms that support the supervision, training and support of workers.

The electrical engineer of underground mines other than coal is expected to support the collaboration and supervision of others, supporting the safe and compliant operation of the mine. This includes:

- providing supervision on specific task related to the electrical installation, commissioning, maintenance and repair
- providing advice and instructions on implementation of electrical standards, processes and systems, and on how risks should be managed as per electrical standards and relevant legislation
- identifying key internal and external stakeholders, and collaborating through participation in consultation
- supporting information, training and instruction when required
- providing supervision on how risks are managed as per electrical standards and relevant legislation.

Behavioural tendencies and skills to support the demonstration of Collaboration:

- Cooperate with others to support the implementation of the electrical engineering standards and procedures.
- Cooperate with external stakeholders, such as electrical supply authorities and their contractors.
- Develop mine standards and procedures for the management of contractors and their management plans.

- Support consultation and training.
- Supervise the installation, commissioning, maintenance and repair of electrical plant and installation at the mine.
- Provide general supervision and to a lesser extent direct supervision, as required.
- Assist in the application and monitoring of the SMS.
- Support others to remain focused during stressful situations.

Operational  
decision making  
and initiative

This competency covers the practitioners' operational decision-making ability to initiate, plan, lead or manage the resolution of hazards and risks that have been identified to support safe mining operations. It includes the ability to respond to issues in a decisive manner, applying their knowledge and using their experience from previous situations.

The electrical engineer of underground mines other than coal is to apply a broad theoretical and technical knowledge and skills to make decisions and respond to hazards and potential risks for electrical plant, understanding its impact in a variety of contexts, and demonstrating autonomy, judgement and defined responsibility in the decision-making process. This includes:

- referring to evidence and objective information when establishing electrical standards and procedures
- considering available evidence and objective information when reviewing the effectiveness of the electrical engineering standards and procedures
- supporting the implementation of electrical engineering controls and management of risks
- supporting the management of emerging issues in the electrical plant and installation.

Behavioural tendencies and skills to support the demonstration of Operational Decision Making and Initiative:

- Demonstrate autonomy, judgement and responsibility when making decisions and defining courses of action in regards of the electrical engineering standards and procedures.
- Incorporate required changes in electrical standards, processes and plans as per risk assessment results and auditing outcomes and recommendations.
- Use an objective evidence-based approach to decision-making around safety matters.
- Take the initiative to incorporate improvements in the electrical engineering standards, and installation.
- Integrate and combine different set of information, from different sources to form general conclusions.

Organised and  
disciplined

This competency covers the practitioners' abilities in planning and organising their work and the work of others, to support processes being followed, tasks prioritised, and inspections and checks are completed in a systematic manner as per legislation. It includes supporting systems, plans and procedures that are implemented, maintained and updated as required.

The electrical engineer of underground mines other than coal is to apply a broad theoretical and technical knowledge and skills to manage WHS issues in an organised and systematic manner. This includes:

- planning and organising activities, as prescribed by relevant regulation and the SMS, when developing electrical standards and procedures
- reviewing compliance in a systematic, organised and timely manner
- supporting others to implement activities in a systematic and consistent manner as per electrical standards and procedures
- reviewing the electrical engineering control plan or supervise a person who is doing so periodically, per timing specified in the SMS (e.g. in response to events).

Behavioural tendencies to support the demonstration of Organised and Disciplined:

- Work in a systematic manner when developing and reviewing electrical standards, and procedures.
- Plan and schedule actions to be implemented in compliance with legislation, electrical standards and procedures.
- Support the implementation and application of electrical standards by defining step by step actions, monitoring fit for purpose, and expected performance outcomes.
- Ensure systems and electrical standards are implemented appropriately for control of risk.
- Arrange activities or resources in a certain order per a specific rule or set of rules when developing electrical standards and procedures.
- Prioritise their activities and the activities of others per risks levels and as per legislation.
- Apply the legislative requirements and SMS for gathering, recording, evaluating, reviewing data and information.
- Use planning tools and systems as appropriate.

Driven by  
safety and  
integrity

This competency refers to the practitioners' capability to act so as to comply with legislation, as well as supporting others to adhere to legislation. It includes their ability to persist with challenging tasks through sustained commitment and effort whilst maintaining standards, and their ability to model high standards of behaviours for others through own behaviour.

The electrical engineer of underground mines other than coal is to apply a broad theoretical and technical knowledge and skills to act consistently in accordance to legislation, electrical standards and procedures, and support others to adhere to those principles consistent with existing legislation. This includes:

- acting in a way that do not contravene existing legislation, electrical standards and procedures even in situations of considerable internal or external pressure
- identifying situations where legislation and safety electrical standards are contravened
- providing instruction and guidance to others on how to comply to existing legislation, electrical standards and procedures in underground mines where total connected power is greater than 1000 kilowatts or if high voltage is used
- setting, upholding and monitoring the health and safety expectations in line with the electrical standards.

Behavioural tendencies to support the demonstration of Driven by Safety and Integrity:

- Act in accordance to legislation, processes and electrical standards at all times.
- Identify and act on non-compliance, by challenging situations to ensure safety and compliance.
- Verify compliance requirements and remain objective in its execution.
- Verify electrical engineering standards and procedures in principal hazard management plans and principal control plans.
- Fulfil responsibilities to the highest professional and ethical electrical standards.
- Evaluate the effectiveness of the SMS against electrical standards and procedures.
- Review risk assessments and electrical controls to ensure they refer to the appropriate electrical standards, where applicable, and control the risks from hazards.
- Consider relevant external information sources, such as original equipment manufacturer, regulator and other safety and health type alerts.
- Challenge on areas of concern and communicate these internally and to appropriate agency if required.
- Put the safety and health of people at the forefront of decisions making to make a 'correct safety' decision, in the face of other challenges and priorities.

Responsiveness  
to change

This competency refers to the practitioners' capability to use and apply their relevant knowledge of legislation and standards, previous experience and skills to respond to changing circumstances in the mine they operate in.



The electrical engineer of underground mines other than coal is to apply a broad theoretical and technical knowledge and skills and specific experience to consider and incorporate contingencies plans to accommodate change. This includes:

- reviewing (or supervise a person to do so) electrical standards, processes, including the electrical engineering control plan, to institute change where necessary, as per changes in conditions
- updating and realigning electrical standards to changing or emerging circumstances, without compromising compliance
- supporting others to respond effectively during stressful situations and to implement changes as required.

Behavioural tendencies to support the demonstration of Responsiveness to Change:

- Support change management in the electrical engineering standards to accommodate changing conditions.
- Navigate uncertain, novel situations or ill-defined problems to identify when changes are required.
- Accommodate changing conditions in the electrical engineering standards and control plans.
- Use available evidence, information, and expertise to reassess decisions based on new information.
- Amend electrical standards and processes while ensuring safety is not compromised.
- Consult, advise and support the implementation of the most optimal course of action.

Technical  
knowledge  
and skills

This refers to the practitioners' capability to demonstrate technical skills and specific knowledge to be able to act or apply the requirements of legislation, standards, systems, procedures and processes.

The electrical engineer of Underground mines other than coal is expected to demonstrate a broad theoretical and technical knowledge and skills, in a range of contexts, to demonstrate autonomy, judgement and defined responsibility within the underground mine within the scope of their statutory function. The technical skills and knowledge include:

- mining and WHS systems
- legislation
- emergency management
- general WHS topics
- general knowledge to support the demonstration of technical skills incorporating associated non-technical skills.

## Technical knowledge and skills required

### Mining and WHS systems

#### Safety management system (SMS)

- Understand their obligations in reviewing the performance of the standards and procedures for electrical plant and installation against the specified standards of the EECP.
- Develop electrical standards and procedures, and evaluate these for the EECP.
- Demonstrate specialised theoretical and technical knowledge and skills in electrical engineering, including:
  - design principles for the management of human factors
  - engineering design electrical standards
  - fire protection
  - maintenance electrical standards
  - hazardous areas and equipment
  - management of high voltage systems and equipment
  - earthing systems and techniques
  - protection
  - lightning.
- Design and installations
  - design, installation and commissioning, operation, maintenance and Decommissioning
  - procedures and instructions for the safe operation of plant
  - electrical integrity of plant
  - control of abnormal operations and emergency shut down or decommissioning.
- Operational planning
  - Operational planning, including the scope, boundaries and performance objectives of electrical standards, as well as monitoring and review of the SMS effectiveness.
  - Critical electrical systems, devices and maintenance requirements relevant to the underground mine.
- Ability to identify gaps relevant for the SMS for the mine.

- Identify non-compliance to processes and high risks activities within their assigned area of electrical operations as prescribed by the WHS (M&PS) Regs 2014.
- Maintenance requirements within the scope of statutory function.
- Review work practices, regarding their compliance to electrical standards and processes.
- Review the performance of the SMS against electrical standards and procedures.
- Mine specific risks.

**Principal hazards (catastrophic fatal hazards) as listed in schedule 1 - Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013***

- Support the development and implementation of the principal hazard management plans for all applicable prescribed principal hazards in WHS (M&P) Regs 2014, clause 5 and any other relevant to electrical standards.
- Set the electrical engineering standards for principal electrical hazard management plans.
- High level of understanding of the nature of harm that could be caused by a hazard in the underground mine, how serious the harm could be and the likelihood of it happening.

**Principal control plans as listed in schedule 2 - Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013***

- Fully understand the electrical engineering control plan.
- Set the standards for the development, implementation and review of the electrical engineering control plan.
- Support others to implement the elements of the electrical engineering control plan as instructed.
- Review that the electrical engineering standards have been met.
- Support the development and implementation of other control plans (e.g. ventilation, mechanical and emergency) relating to electrical engineering standards.

**Specific control measures in Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013***

	<ul style="list-style-type: none"> <li>• Ensure that each electrical control measure is adequately supported by relevant systems within the SMS and electrical standards, within the specific area of the underground mine.</li> <li>• Support the implementation of specific control measures .</li> <li>• Advanced contingency planning.</li> <li>• Emerging health and safety issues in underground mines other than coal.</li> <li>• System for monitoring the performance of control measures.</li> <li>• Performance indicators to identify effectiveness and failure of control measures.</li> <li>• Corrective actions in the event of failure of controls and in the event of the indicators not meeting performance targets.</li> <li>• Follow-up action items to close any gaps.</li> <li>• Relevant equipment as per activities to be undertaken in the mine, such as firefighting.</li> </ul>
<p><b>Legislation</b></p>	<p>Apply a broad theoretical and technical knowledge of acts, regulations, approved codes of practice, electrical standards, and guidelines relevant to the execution of their function, such as:</p> <ul style="list-style-type: none"> <li>• <i>Work Health and Safety Act 2011</i> and Work Health and Safety Regulations 2017.</li> <li>• <i>Work Health and Safety (Mines and Petroleum Sites) Act 2013</i> and Work Health and Safety (Mines and Petroleum Sites) Regulations 2014.</li> <li>• <i>Explosives Act 2003</i> and Explosives Regulation 2013.</li> <li>• approved codes of practice under the <i>Work Health and Safety Act 2011</i> <ul style="list-style-type: none"> <li>○ international and Australian/New Zealand Electrical Standards.</li> </ul> </li> </ul>
<p><b>Emergency management</b></p>	<ul style="list-style-type: none"> <li>• Emergency preparedness and response systems, evacuation, withdrawal, notification and response.</li> <li>• Health and safety issues relevant to emergencies.</li> <li>• Procedures and conditions under which persons at the mine or a part of the mine are to be withdrawn to a place of safety.</li> <li>• Think quickly and flexibly when required in the face of new events.</li> <li>• Causes and prevention of mine incidents for the underground mine.</li> <li>• Support the investigation of incidents and manage system, including reporting and investigation procedures, and tracking remedial actions.</li> </ul>

## General WHS topics

- Demonstrate an ability to apply knowledge of relevant topics included in the guide of maintenance of competence scheme for statutory functions requiring practicing certificate.

## General knowledge to support the demonstration of technical skills incorporating associated non-technical skills

- Advanced risk management processes and tools relevant to the underground mine.
- Advanced analytical processes and tools, auditing processes and techniques.
- Types of adverse environmental conditions that may exist across the underground electrical operation.
- Incident investigation processes.
- Communication channels, systems, conventions and requirements for written or verbal communications, including means of communication between different teams.
- Document control and procedures for documenting relevant communications within the electrical engineering standards.
- Resources, tools and processes required to achieve electrical standards.
- Conflict resolution processes in a high-risk situation.
- Planning tools and resources .
- Processes, techniques and examples of continuous improvement for WHS activity at a mine.
- Contingency planning.
- Conditions and interactions that may impact safety.
- Change management strategies to implement new or revised electrical standards or procedures.