INTERPRETIVE GUIDELINES

Electricity in underground mines and tunnels

The relationship between the Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013 and the Electricity (Safety) Regulations 2010

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New Zealand Government

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These interpretive guidelines explain the regulatory requirements associated with the control of electricity in underground mines and tunnels.

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KEY POINTS

Electricity is a hazard in any mining or tunnelling operation.

Electrical safety requires a control plan.

Electrical safety is the responsibility of an Electrical Superintendent appointed by the Site Senior Executive.

Technical provisions are set out in the Electricity (Safety) Regulations 2010.

The requirements to maintain an electrically-safe workplace and control plan are set out in the HSE (Mining Operations and Quarrying Operations) Regulations 2013.

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INTRODUCTION

IN THIS SECTION:

The interpretive guidelines for the control of electricity in underground mines and tunnels explain the obligations and requirements of operators, and those who work with electricity in mines and tunnels, under the two associated sets of regulations.

1.1 PURPOSE

A new regulatory framework for the control of electricity in mining and tunnelling operations[1] came into force in December 2013.

The control of electricity in an underground mine or tunnel is covered under the Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013 (the Mining Regulations) and the Electricity (Safety) Regulations 2010 (as amended) (the Electricity Regulations).[2]

Both sets of regulations are designed to work together to ensure electrical safety in a mining or tunnelling operation. They provide separate but complementary responsibilities to achieve a safe system for managing the control of electricity underground.

These guidelines will assist with the understanding of obligations by explaining the general requirements under the two sets of regulations, and how the regulations work together.

1.2 SCOPE

Who do these guidelines apply to?

These guidelines apply to all coal and metalliferous underground mining operations and tunnelling operations as defined in the Health and Safety in Employment Act 1992 (the HSE Act).[3] They do not apply to surface mining or quarrying operations.

These guidelines have been developed as a valuable reference for a mine or tunnel operator, and any person who manages or works directly with electricity in an underground mine or tunnel.

What is covered in these guidelines?

These guidelines cover the relationship between the two sets of regulations, areas of overlap, and how a particular approach to controlling electricity underground can meet the requirements of both sets of regulations.

Personnel requirements, and the components of an Electrical Engineering Control Plan (EECP) which is a requirement under the Mining Regulations, are summarised.[4]

What isn't covered in these guidelines?

These guidelines do not cover specific technical requirements for electrical installations as these are covered in detail in the Electricity Regulations themselves.

Hazards general to every workplace are addressed in other health and safety guidance material and are not covered in these guidelines. Similarly, other guidance material specific to mining and tunnelling operations is not duplicated.[5]

[1] For the meaning of an alluvial, mining, quarrying and tunnelling operation refer to the Health and Safety in Employment Act 1992 sections 19L, 19M, 19N and 19O on the New Zealand Legislation website at www.legislation.govt.nz.

[2] See the New Zealand Legislation website at www.legislation.govt.nz for copies of the Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013 and the Electricity (Safety) Regulations 2010 (as amended).

[3] See the New Zealand Legislation website at www.legislation.govt.nz for a copy of the HSE Act 1992.

[4] The controls required for any hazard will depend on whether flammable gases may be present in a tunnel, metalliferous mine or coal mine. The presence, or potential presence, of a flammable gas should be determined before any approach or controls are developed.

It is the responsibility of the mine or tunnel operator and those working with electricity underground to ensure these guidelines are read alongside both sets of regulations to establish and understand all of the compliance requirements to be met.

[5] See the WorkSafe NZ website at www.worksafe.govt.nz for additional guidance material on these topics.

02/

LEGISLATION & REGULATIONS

IN THIS SECTION:

2.1 INTRODUCTION TO THE TWO REGULATORY FRAMEWORKS

The HSE Act

At the same time as the new Mining Regulations and amendments to the Electricity Regulations were promulgated in December 2013, changes were also made to the HSE Act that affect mining.

The changes include placing the new health and safety obligations under the regulations on mine operators and mine workers rather than on "employers" and "employees".

Mine operators are responsible for the health and safety of everyone who works at the operation and is exposed to hazards, regardless of whether they are employees, contractors or labour hire workers. The definition of mine workers includes those people who work in mines and tunnelling operations, including contractors.[6]

The HSE Act requires all practicable steps to be taken to ensure the safety of workers while at work. The new Mining Regulations support the HSE Act and require a safety management approach to principal hazards present in mining and tunnelling operations through the development, implementation and maintenance of principal hazard management plans (PHMPs) and principal control plans (PCPs). The plans are the foundation of the overall safety management system that is specific to each operation.

The Electricity Act

The Electricity Act 1992,[7] supported by the Electricity Regulations, is based on three safety pillars:

1. Determining the competency of people that may perform electrical work.
2. Providing limitations, mandatory practices, and recognised compliance pathways for the construction of equipment, installations and distribution systems.
3. Setting out requirements for the certification of compliance and verification of safety.

The Electricity Act establishes and defines in detail the safety regime for all electrical work, electrical equipment, power generation and distribution, design, and the application of electricity in mines and tunnels.

How the Legislation works together

Although the Electricity Regulations and the Mining Regulations both cover requirements for the control of electricity in an underground mine or tunnel, there are distinctions between the two.

The Electricity Regulations cover in detail the design standards required for the mine or tunnel's electrical system, and the responsibilities and competencies required for those installing and maintaining it.

In addition to the requirements of the Electricity Regulations, the Mining Regulations cover roles, responsibilities and competencies of electrical workers, the design of the electrical system, maintenance and certification requirements of equipment, and zoning of underground coal mining operations including the selection of electrical equipment for use in Explosion Risk Zones (ERZs).

The Mining Regulations also cover electricity control requirements through other relevant PHMPs and PCPs, such as the fire or explosion PHMP and the ventilation PCP.

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[6] For the purposes of compliance with the Mining Regulations, the Electricity Regulations, and these guidelines, contractors should be treated as though they are "employees".

[7] See the New Zealand Legislation website at www.legislation.govt.nz for a copy of the Electricity Act 1992.

See Appendix A on page 22 for a summary of the key differences between the Mining and Electricity Legislation and Regulations and Appendix B on page 24 for a diagram showing the relationship between them.

2.2 ABOUT THE MINING REGULATIONS

The new Mining Regulations replace the Health and Safety in Employment (Mining Administration) Regulations 1996 and the Health and Safety in Employment (Mining-Underground) Regulations 1999.

In addition to meeting new requirements in relation to appointing people to new safety-critical roles and making sure workers meet new competency requirements, the new regulations also require mine and tunnel operators to put in place health and safety management systems.

Health and safety management systems

Part 2 of the Mining Regulations requires all mines and tunnels to have in place a formal health and safety management system, which is developed, implemented and maintained by the Site Senior Executive (SSE).[8]

The health and safety management system must include a process to identify, appraise and assess all hazards present at the mine or tunnel, and the controls required to manage those hazards.[9] It should include PHMPs and PCPs which are unique to each mining or tunnelling operation.

Principal hazards

Principal hazards are those that could create a risk of multiple fatalities in a single accident, or a series of recurring accidents, and for which a particular process must be adopted to mitigate the risks presented. Principal hazards require a PHMP to manage them (for example, fire or explosion, ground or strata instability, inundation and inrush, or spontaneous combustion).

Principal Hazard Management Plans (PHMPs)

A PHMP brings together all of the risks associated with the principal hazard and outlines the approach to manage those risks in a systematic way. The PHMP outlines a suite of controls for the management of the hazard.

Principal Control Plans (PCPs)

Some controls may be applied to manage multiple hazards, which are called principal controls. The PCP outlines the approach to manage all of the hazards and associated risks using the principal control (for example, ventilation, emergency management, mechanical engineering or electrical engineering).

Requirement for an Electrical Engineering Control Plan (EECP)

Under the Mining Regulations, as part of the overall health and safety management system, there is a requirement for an EECP to be in place to manage multiple hazards through the control of electricity. The SSE is responsible for developing, implementing and maintaining the EECP.

See section 3 on page 12 for information on the EECP and its content and Appendix C on page 26 for information on reviews and audits of the EECP.

[8] See Regulation 52 - Mine operator must ensure health and safety management system developed, implemented, and maintained.

[9] See the WorkSafe NZ website at www.worksafe.govt.nz for other guidance on hazard management and safety management systems.

2.3 ABOUT THE ELECTRICITY REGULATIONS

The Electricity Regulations:

> state the generic rules and requirements about electrical safety, and what is deemed to be electrically safe and unsafe

> deal with the design, construction and use of works, installations, fittings and appliances

> deal with the importation and sale of fittings and appliances

> provide for installations to be designed and installed under AS/NZS 3000 Electrical installations (known as the Australian/ New Zealand Wiring Rules)

> set out in schedules all of the Standards applicable to the regulations, with a focus on the adoption of international Standards[10]

> define requirements relating to safety management systems (SMSs)

> provide for offences including infringement offences.

Requirements in relation to mines and tunnels

The amendments to the Electricity Regulations in December 2013 complement the new Mining Regulations by:

> ensuring the competency of those carrying out electrical work at a mining operation

> improving design requirements, periodic assessment and verification of safety requirements of electrical equipment in mining operations

> regulating technical requirements for underground mining operations and prescribing equipment, testing and maintenance obligations.

Requirements specific to mines and tunnels covered under the Electricity Regulations relate to Prescribed Electrical Work (PEW), design and audit, installation and maintenance, and day to day operations.

The Electricity Regulations specifically address:

Prescribed Electrical Work (PEW)

> the scope of PEW

> the specification that PEW is to be done by authorised workers

> the division of PEW into risk categories

> the requirement that certain other work must be performed by authorised people

> the competency of electrical workers, particularly those installing electrical equipment in an ERZ0 or ERZ1. (See section 3.4 on page 21 for more information on ERZs).

Design and audit

> designs, certification of work and documentation requirements aligned with the EECP requirements under the Mining Regulations

> provisions for the installation and use of electrical equipment in the hazardous zones of coal mines, including communication, monitoring, and safety systems[11]

> clarification of technical practices and equipment which are 'limited', 'not allowed' or 'deemed unsafe'.

Install and maintain

> the installation of technical Standards

> technical testing requirements

> technical verification requirements

> technical requirements for installation, maintenance and replacements

> installation certification requirements.

[10] See the Standards New Zealand website at www.standards.co.nz for more information about regulations and standards relevant to the electrical industry.

[11] The effectiveness of this equipment is critical. When the function of this type of equipment is compromised the mine will be deemed to be electrically unsafe.

Day to day operations

- technical requirements for the safety of fittings and appliances
- requirements for the safe use and repair of appliances
- requirements and obligations for ongoing safety verification
- unsafe practices and equipment
- obligations to retain and make documentation available.

See Appendix B on page 24 for a diagram showing the relationship between the Mining and Electricity Legislation and Regulations, including specific requirements under the Electricity Regulations.

03/

SPECIFIC REQUIREMENTS OF THE EECP

IN THIS SECTION:

The requirement for an EECP applies to all underground mines and tunnels regardless of operating type, size, or whether flammable gases are present.[12]

The Mining Regulations require the EECP to include the systems, procedures and equipment to ensure the safe use of electricity in an underground mine or tunnel and specifically address:

- roles, responsibilities and competencies of electrical workers
- design of the electrical system
- maintenance and certification requirements of equipment
- zoning of underground coal mining operations and selection of electrical equipment for use in ERZs.

The EECP should fit the context of the whole health and safety management system and to work with and complement other site-specific PHMPs and PCPs. It should include references to all other plans and Standards that it links to or refers to.

It is important the EECP is developed in the context of the whole health and safety management system and not in isolation from other PHMPs and PCPs that rely on the EECP as a control. This will ensure gaps and overlaps in information and procedures are identified and used in the implementation of suitable controls to minimise the potential likelihood and consequences of an electrical system failure taking place.

See Appendix D on page 28 for the prescribed requirements of the EECP under the Mining Regulations. Note: only regulations with requirements specific to the EECP are included in Appendix D.[13]

3.1 ROLES, RESPONSIBILITIES AND COMPETENCIES OF ELECTRICAL WORKERS

Roles

There are a number of roles required under the regulations covering responsibilities for electrical work in an underground mining or tunnelling operation. The roles and their associated responsibilities are designed to work together under both sets of regulations.

See Appendix B on page 24 for a diagram showing these roles and the relationships between them under the Mining and Electricity Regulations.

Site Senior Executive (SSE)

The SSE is appointed by the mine operator and is the most senior representative of the mine operator at the mining operation. The SSE is a statutory position under the Mining Regulations, with overall responsibility for the development and effective functioning of the EECP.

Mine or Tunnel Manager

The mine operator must appoint a person to manage the mining operation and supervise the health and safety aspects of the operation on a day to day basis. The mine or tunnel manager is a statutory position under the Mining Regulations with overall responsibility for operation of the mine and the appointment of workers and contractors.

[12] When flammable gases are present, the EECP should take these into account, and meet requirements specific to an underground coal mining operation.

[13] For all other compliance requirements associated with the control of electricity in underground mines and tunnels, see the Mining Regulations under the relevant PHMP or PCP requirements.

Electrical Engineer

The electrical engineer is a non-statutory position. WorkSafe NZ's view is that design work for the electrical system in an underground mine or tunnel should be undertaken by an electrical engineer who has the relevant competencies and experience to do such work.

Competent Designer (for the certified design)

The Electricity Regulations require a certified design for electrical work in an underground mine or tunnel. There is no statutory position under the Mining Regulations or Electricity Regulations for the person who develops the certified design but the design should be planned and developed by a competent designer. The competencies for the competent designer are specified under the Electricity Regulations.

The competent designer can be the same person as the electrical engineer however if the competent designer does not meet the competency requirements for an electrical engineer, the design should be certified by the electrical engineer.

Electrical Superintendent

An electrical superintendent must be appointed if an EECP is in place at the mine or tunnel. The electrical superintendent is a statutory position under the Mining Regulations, appointed by the SSE. The electrical superintendent has overall responsibility for the day to day operation of the electrical system at the mine or tunnel

Electrical Tradesperson (Electrician)

The electrical tradesperson (electrician) is responsible for physically installing and maintaining the electrical system in the mine or tunnel.

Responsibilities and competencies

SITE SENIOR EXECUTIVE (SSE)	
Responsibilities	**Competencies**
Development and maintenance of the health and safety management system, including: > developing, implementing and maintaining the EECP > appointing people who are suitably competent, qualified and experienced to undertake the work for which they are appointed: > an electrical superintendent.	> The SSE must hold a current certificate of competence[14] as an SSE and for the type of mining operation they are appointed to manage.

MINE OR TUNNEL MANAGER	
Responsibilities	**Competencies**

Management of the day to day operation of the mine in relation to electrical safety:
> appointing or engaging appropriate people[15] who are qualified and competent to manage the electrical system, including:
  > an electrical tradesperson
  > an electrical engineer.
> ensuring the effective implementation of the EECP through the electrical superintendent
> ensuring an electrical engineer is engaged for the design of all parts of the electrical system
> developing Standard Operating Procedures (SOPs) that set out specific instructions for workers to follow in relation to the electrical system
> ensuring the electrical tradesperson holds the relevant competencies from the Electrical Workers Registration Board (EWRB), and they are available at all times
> identifying training and assessment requirements and ensuring programmes are in place for electrical workers in relation to the control of electricity that include:
  > procedures and schedules for determining and ensuring ongoing competency
  > identifying and recording requirements for ongoing training
  > provision on ongoing training, development and assessments that support competency.
	> The mine or tunnel manager must hold a current certificate of competence[16] for the type of mining operation they are appointed to manage, either:
	  > a first-class coal mine or mine manager certificate, or
	  > an A-grade tunnel manager certificate.

[14] At the time of publication, the specific requirements for the SSE's certificate of competence under the Mining Regulations were being determined. See the WorkSafe NZ website at www.worksafe.govt.nz for further information about the development of the competencies.

[15] It is possible that one person may hold two or more roles if they have the appropriate qualification and competence.

[16] At the time of publication, the specific requirements for the mine or tunnel manager's certificate of competence under the Mining Regulations were being determined. See the WorkSafe NZ website at www.worksafe.govt.nz for further information about the development of the competencies.

ELECTRICAL ENGINEER	
Responsibilities	**Competencies**
Design and oversight of the electrical system and development of the EECP including: > all elements of the EECP that are linked to electrical system design factors > conducting independent reviews and audits of the system and its design > overall analysis and assessment of design requirements and suitability of particular design elements > determining design requirements for any changes to the electrical system > ensuring electrical supply and earthing is adequate and meets all applicable regulations and codes > selection and operation of power systems, electronics, control systems, signal processing and telecommunications systems > assisting with the investigation of incidents > advising the SSE of relevant Standards in relation to electrical installations and the supply of electrical power > providing ongoing oversight of the implementation of the EECP including review, revisions and independent audits of the operation of the EECP > signing off of design work completed by others working at the mine or tunnel.	> The electrical engineer does not have to be an employee of the mine operator (they can be a contractor or consultant) but they must be an engineering associate or a chartered professional engineer registered with the Institute of Professional Engineers New Zealand (IPENZ).[17] > The electrical engineer should be competent, qualified and experienced in the design and operation of electrical systems for a mining or tunnelling operation. > This includes a deep understanding of requirements in relation to explosion-protected equipment for use in ERZs (if these are present in the mine or tunnel). See section 3.4 on page 21 for more information on ERZs.

[17] IPENZ is the registration authority and professional body representing engineers in New Zealand. See the IPENZ website at www.ipenz.org.nz for more information.

COMPETENT DESIGNER (FOR THE CERTIFIED DESIGN)	
Responsibilities	**Competencies**
Development and implementation of a safe and certified design that addresses: > the control of earth potential rise > the use of relocatable equipment and cables > the performance of safety functions required for mining or tunnelling activities and mining or tunnelling plant and equipment > in respect of designs for underground coal mine operations, control of the ignition of methane > ensuring selection and installation of equipment is based on: > the protection of people and property from harmful effects > correctly functionality, and suitable for purpose > compatibility with the source of supply to which it is connected > safe operation, testing, inspection, and maintenance.	> The competent designer should demonstrate a suitable combination of: > academic qualification > registration to perform electrical work > up-to-date skills, training, knowledge and experience necessary for the design of the electrical installation, and selection of associated electrical equipment. > The competent designer should have a detailed understanding of: > relevant regulations and New Zealand and international Standards > establishing and maintaining electrical protection systems at low and high voltages (including the determination of protection settings) > the principles of risk management. > an understanding of communication, monitoring and mechanical plant protection systems > in respect of designs for an underground coal mining operation, an understanding of relevant protection concepts for electrical equipment for use in methane atmospheres (including ERZs and related certification systems). > The competent designer can be the same person as the electrical engineer however if the competent designer does not meet the competency requirements for an electrical engineer, the design should be certified by the electrical engineer (who is appointed by the mine manager). > Where the competency of a person is limited to one or more specific aspects of a design, the design may be a combination of contributions, or the preparation of separate designs, applying to part-installations of the mining operation. In such cases, the electrical engineer must certify all of the parts, and that they work together.

ELECTRICAL SUPERINTENDENT	
Responsibilities	**Competencies**
Day to day operation and maintenance of the electrical system in the mine, including: > operation of the EECP > management of the work activities of electricians.	> The electrical superintendent is required to hold the relevant certificate of competence for the type of mining operation they are appointed to manage.[18] > If the electrical superintendent supervises the technical aspect of the work of the electricians, the electrical superintendent must hold the same qualifications and registration as the electricians they are supervising. This registration is obtained from the Electrical Workers Registration Board (EWRB).[19]

ELECTRICAL TRADESPERSON (ELECTRICIAN)	
Responsibilities	**Competencies**

Correct installation and maintenance of electrical equipment in accordance with the certified design and the EECP.	> The electrical tradesperson must be a registered and licensed electrician with the EWRB.
	> For opencast mining and quarrying, tunnelling and underground metalliferous mining operations, the electrician must have:
	  > general mining competency and 3 years' experience.
	> For underground coal mining operations, the electrician must have:
	  > general mining competency and 3 years' experience
	  > specific qualifications, experience and demonstrated competencies to work on equipment in ERZs. This means the relevant qualifications under AS/NZS 4761.1:2008.[20]

[18] At the time of publication, the specific requirements for the electrical superintendent's certificate of competence under the Mining Regulations were being determined. See the WorkSafe NZ website at www.worksafe.govt.nz for further information about the development of the competencies.

[19] See the EWRB website at www.ewrb.govt.nz for more information.

[20] See the Standards New Zealand website at www.standards.co.nz for more information about regulations and standards relevant to the electrical industry.

3.2 DESIGN OF THE ELECTRICAL SYSTEM

In addition to the general requirements for the safe distribution and use of electricity, the certified design must address:

- the control of earth potential rise;
- the use of relocatable mining electrical equipment;
- the performance of safety functions required for mining and tunnelling activities, and mining and tunnelling electrical equipment;
- risk management; and
- if the certified design is for equipment in an underground coal mining operation, the control of the ignition of methane.

3.3 MAINTENANCE AND CERTIFICATION OF EQUIPMENT

General requirements

MAINTENANCE AND CERTIFICATION OF EQUIPMENT	
Mining Regulations	**Electricity Regulations**
> **Regulation 100 (1) (g)** of the Mining Regulations prescribes that the EECP should address the use of a maintenance management system that includes the keeping of commissioning, inspection, and test reports and certification documentation of electrical plant and installations throughout the life cycle of the plant and installations.	There are requirements in several areas of the Electricity Regulations that address maintenance programme requirements. These are referred to as periodic assessments and safety assessment programmes: > **Regulation 78G** and **78K** – establish and implement a safety assessment programme (open cast mines and underground mines and tunnels) to assess and verify electrical safety. > **Regulation 78K(2)(a)** - the safety assessment programme provides for periodic assessment. > **Regulation 78J(3)(a)(v)** and **(ix)** – the certified design must include periodic assessment. > **Schedule 8, Part 3, Rule 24(2)** and **Rule 39** require maintenance in accordance with AS 2290.1.

Good practice for compliance

The mine or tunnel manager should ensure:

a. A maintenance system is in place to ensure electrical equipment and installations are maintained in safe working order.

b. The maintenance system includes:

   i. Periodic assessment and testing of all equipment and cables at intervals as may be necessary to ensure safety.

   ii. Quarterly examination, testing and tagging of any portable apparatus that is normally used in heavy operating environments such as workshops, mining areas, processing areas, construction sites and similar places.

   iii. Routine testing of the effectiveness of the earthing system, the continuity of earthing conductors and the adequacy of electrical insulation.

   iv. Monthly testing of earth leakage protection devices and earth continuity protection devices required to be installed in an underground mine.

c. A tag referred to in (b) (ii) above includes the date of examination and testing, and the name of the person who carried out the examination and testing.

d. When any examination or test is carried out, either:

   i. The results are recorded in the electrical log book; or

   ii. an entry is made in the electrical log book describing where the results can be found.

e. All electrical equipment used in an ERZ is included in a preventative maintenance programme.

f. Maintenance requirements refer to and comply with the relevant Standard.

g. Repair, overhaul or modification of explosion protected electrical equipment is undertaken in accordance with AS/NZS 3800.

h. The repair of flexible reeling, trailing and feeder cables for use in an ERZ is undertaken only by a repair facility that can demonstrate all of the following through third party assessment:

   i. Quality accreditation of their management system.

   ii. Cable testing and repair processes in accordance with AS/NZS 1747.

   iii. Provision of equipment and facilities that enable testing and repair in accordance with AS/NZS 1747.

   iv. Competency of personnel undertaking each stage of the testing and repair process.

   v. The provision of a statement by a competent person employed by the cable repair facility attesting to repairs having been undertaken and completed in accordance with the requirements of AS/NZS 1747 prior to dispatch of each repaired cable.

3.4 EXPLOSION RISK ZONES (ERZs) AND SELECTION OF EQUIPMENT FOR USE IN ERZs

ERZs must be established in an underground coal mine. These may be a negligible ERZ (NERZ); or where flammable gas may be present, an ERZ1 or ERZ0.[21]

See Appendix E on page 33 for a Glossary of Terms used in this guidance, including definitions of ERZ, ERZ0, ERZ1 and NERZ.

Determining ERZs

The establishment of ERZs is the responsibility of the mine operator. In practice this may be undertaken by the ventilation officer,[22] who is appointed by the SSE.

The mine operator must ensure boundaries are set up in the mine between a NERZ and ERZ1, and between an ERZ1 and ERZ0.

The mine operator must ensure appropriate precautions are taken to ensure control of people and machines entering the restricted zone. Where a person or machine can physically pass through the boundary, the boundary must be clearly signposted.

See the Approved Code of Practice on Fire or Explosion in Underground Mines or Tunnels for an explanation of the process to determine ERZs[23].

Electrical equipment in all underground mines and tunnels

The type of electrical equipment required, and the installation of that equipment, is specified in the Electricity Regulations. However, if flammable gas is detected in a mine or tunnel that is not an underground coal mine, the mine or tunnel operator should establish ERZs as though the mine or tunnel is an underground coal mine.

The equipment used in the mine or tunnel must be appropriate for the ERZ that is established.

Electrical equipment in underground coal mines

The type of electrical equipment used will depend on whether it is to be installed in a NERZ, ERZ1 or ERZ0.

Requirements for the types of electrical equipment required in these zones are specified in the Electricity Regulations.

Use of gas detectors underground

The Mining Regulations include specific requirements in relation to the use of gas detectors underground. See the Approved Code of Practice on Fire or Explosion in Underground Mines or Tunnels for more detailed information about the location and setting of gas detectors in an underground environment.[24]

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[21] Refer to Regulation 3 of the Mining Regulations for a full definition.

[22] A ventilation officer is a statutory position for which a current certificate of competence must be held pursuant to Regulation 29 of the Mining Regulations.

[23] See the WorkSafe NZ website at www.worksafe.govt.nz for a copy of the Approved Code of Practice.

[24] See the WorkSafe NZ website at www.worksafe.govt.nz for a copy of the Approved Code of Practice.

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APPENDIX

KEY DIFFERENCES

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ELECTRICAL SAFETY IN AN UNDERGROUND MINE OR TUNNEL	
Mining Regulations	**Electricity Regulations**
Coverage	**Coverage**
The Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013, through the requirement for an EECP, cover: > roles, responsibilities and competencies of electrical workers > design of the electrical system > maintenance and certification requirements of equipment > zoning of underground coal mining operations and selection of electrical equipment for use in ERZs > offences and reporting/notification duties.	**The Electricity (Safety) Regulations 2010 cover:** > rules and requirements about electrical safety > design, construction and use of works, installations, fittings and appliances, in compliance with relevant Standards > importation and sale of fittings and appliances > applicable Standards[25] > requirements of safety management systems > offences including infringements.
Specific Requirements	**Specific Requirements**
The Mining Regulations specifically require: > the mine operator to appoint an SSE > the SSE to ensure there is an EECP for the mining or tunnelling operation that complies with the requirements of the Mining Regulations > an electrical superintendent to be appointed and responsible for the day to day operation of the electrical installation and equipment at the mine or tunnel > although not specified under the Mining Regulations, WorkSafe NZ's view is that design work for the electrical system in an underground mine or tunnel should be undertaken by an electrical engineer who has appropriate competence and experience > a maintenance management system.	**The Electricity Regulations specifically require:** > what electrical work in a mine or tunnel is PEW > electrical work in a mine or tunnel is to be undertaken to a certified design > the electrician undertaking the work is to be competent for the type of work being undertaken, and must hold the appropriate EWRB registration > compliance with applicable Standards > electrical equipment used in a mine or tunnel and the certification and maintenance requirements for the equipment is to be suitable for the particular location and compliant with relevant Standards > establish and implement a safety assessment programme to assess and verify electrical safety.

[25] See the Standards New Zealand website at www.standards.co.nz for more information about regulations and standards relevant to the electrical industry.

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APPENDIX

THE RELATIONSHIP BETWEEN THE MINING AND ELECTRICITY LEGISLATION

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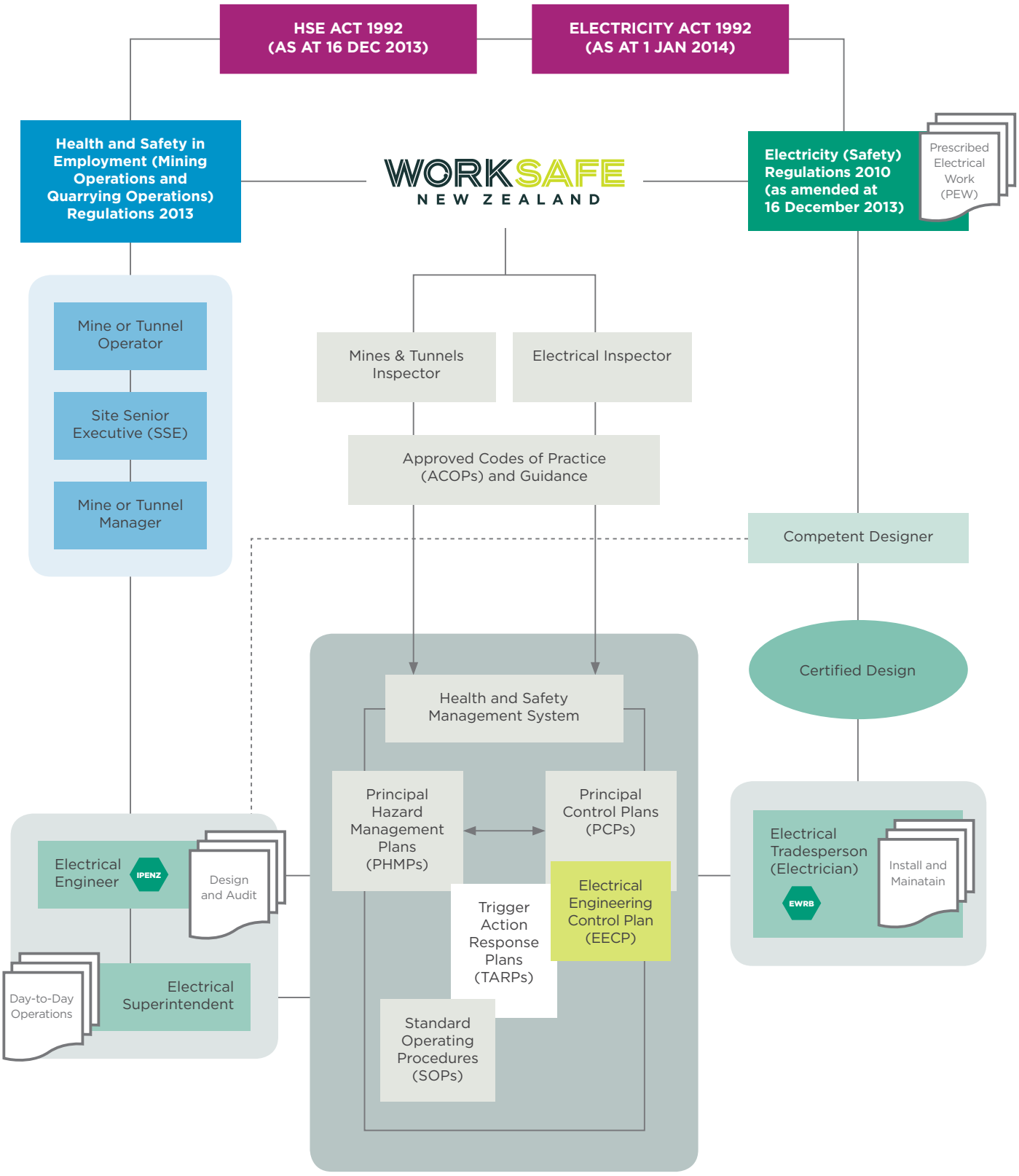

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APPENDIX

REVIEWS AND AUDITS OF PRINCIPAL CONTROL PLANS (PCPs)

REVIEWS AND AUDITS OF PRINCIPAL CONTROL PLANS (PCPs)

Roles

Under the Mining Regulations, in addition to requirements covering the review, audit, monitoring and maintenance of records relating to the health and safety management system, there are also requirements specific to reviews and audits of PCPs.

Reviews of PCPs

1. The SSE must ensure each PCP is reviewed:
    a. At least once every 2 years after the date the PCP is approved by the SSE.
    b. After:
        i. The occurrence of an accident at the mining or tunnelling operation involving any hazard that the PCP was intended to manage.
        ii. A material change in the management structure at the mining or tunnelling operation that may affect the PCP.
        iii. A material change in plant used or installed at the mining operation that may affect the PCP.
        iv. Any occurrence of any other event identified in a PCP as requiring a review of the plan.
2. The mine or tunnel operator should ensure:
    a. Records of all reviews and revisions of PCPs are kept for at least 12 months from the date on which the mining or tunnelling operation is abandoned.
    b. Records relating to a review of a PCP can be provided to an WorkSafe NZ inspector or a site health and safety representative on request.

Audits of PCPs

1. The mine operator must engage, and pay for, a competent person to carry out an independent external audit of all PCPs, and ensure that:
    a. External audits are carried out once every 3 years after the date the PCP is approved by the SSE.
    b. The external auditors are independent of the mining operation and were not involved in the development of the PCP being audited.
    c. The results of all audits of PCPs are kept for at least 12 months from the date on which the mining or tunnelling operation is abandoned.
    d. Audit methodologies follow the principles of AS/NZS 4801.[26]

[26] See the Standards New Zealand website at www.standards.co.nz for more information about regulations and standards related to the electrical industry.

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APPENDIX

MINING REGULATIONS SPECIFIC TO THE REQUIREMENTS OF THE EECP

MINING REGULATIONS SPECIFIC TO THE REQUIREMENTS OF THE EECP[27]

The Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013

Part 4 Principal Control Plans

Subpart 2 – Electrical engineering

Applicable to all mining and tunnelling operations

99 Application

This subpart applies to—

a. *any mining operation where 1 or more principal hazards have been identified that may involve hazards or controls of an electrical type; and*

b. *any underground mining operation or tunnelling operation*

100 Electrical engineering control plan

1. *The electrical engineering control plan must, at a minimum, address the following matters:*
    a. *the prevention of harm to people from sources of electrical energy:*
    b. *the prevention of fires being ignited by electrical energy:*
    c. *the prevention of electrical plant being unintentionally operated:*
    d. *the provision of electrical safeguards for electrical and non-electrical hazards with a probability of failure appropriate to the likelihood of the hazard occurring and the level of harm that could result:*
    e. *the competencies required of mine workers carrying out electrical work at the mining operation:*
    f. *the reliability of electrical plant, and installation used in the monitoring and control of hazards and of electronic communication equipment:*
    g. *the use of a maintenance management system, that includes the keeping of commissioning, inspection and test reports and certification documentation of electrical plant and installations throughout the lifecycle of the plant and installations:*
    h. *safe working practices for working on high voltage installations:*
    i. *any other requirements of these regulations relating to the management of the safety of electrical plant and installations and electrical engineering practices and any requirements of regulations made under the Electricity Act 1992 relevant to the use of electricity at the mining operation.*

[27] It is the responsibility of the mine or tunnel operator and those working with electricity in underground mines and tunnels to ensure both sets of regulations are read and understood in their entirety to establish all of the compliance requirements to be met.

Applicable to all underground mining or tunnelling operations

100 Electrical engineering control plan

2. *In the case of an underground mining operation or tunnelling operation, the electrical engineering control plan must, in addition to the matters in subclause (1), include provision for-*
    a. *the design, installation, operation and maintenance of electrical plant and installations at the mining operation, to minimise the potential impacts from voltage rise due to lightning, static electricity, voltage surges and other transient voltages to within acceptable limits, including:*
        i. *the prevention of the ignition of gas by a static charge:*
        ii. *the prevention of the effects of lightning being transferred to the underground parts of the mining operation:*
    b. *the safe operation of every electrical control system at the mining operation under all operating conditions, including instability or failure of the electricity supply:*
    c. *the isolation of the supply of electricity to all electrical plant or installations in the event of—*
        i. *unsafe electrical plant or installation being detected; or*
        ii. *unsafe electrical practices being detected:*
    d. *the isolation of the supply of electricity to any particular item of electrical plant, or to any installation in the event that a failure to maintain that electrical plant or installation in accordance with the electrical engineering control plan is detected:*
    e. *reasonable access to works by people undertaking installation, maintenance or emergency work for those works:*
    f. *the safety of any person undertaking installation, maintenance or emergency work on works:*
    g. *specific procedures for the following:*
        i. *use of electric welding plant:*
        ii. *use of electrical test equipment, including instruments:*
        iii. *work near overhead power lines and cables:*
        iv. *treatment of electric shocks and electric burns:*
    h. *the security and maintenance of the mining operation's electrical control system software and control circuits, including:*
        i. *controlling the modification of the software and circuits:*
        ii. *keeping records of any modifications:*
        iii. *the safe use of lasers, including fibre-optic equipment at the mining operation.*

Applicable to underground coal mining operations only

100 Electrical engineering control plan

3. *In the case of an underground coal mining operation, the electrical engineering control plan must, in addition to the matters in subclauses (1) and (2), provide for-*
   a. *the prevention of electrical energy acting as an ignition source for gas or coal dust explosions:*
   b. *for each explosion risk zone, ensuring the use only of electrical plant and installations, including cables and electrical plant on diesel vehicles, that are appropriate to the explosion risk zone in which they are located or being used:*
   c. *the approval system under which live electrical work may be carried out:*
   d. *the isolation of the supply of electricity to the underground parts of the mining operation, but not the supply to safety-critical equipment, in the event of the following circumstances:*
      i. *the presence of methane levels at or above:*
      (A) in an NERZ, 0.5%:
      (B) in an ERZ1, 1.25%:
      ii. *if ventilation falls below the specified quantity set by the electrical engineering control plan:*
   e. *the safe restoration of the supply of electricity to the underground parts of the mining operation by a competent person:*
   f. *the plant and procedures used to ensure that, in the event of a failure of the main ventilation system, the supply of electricity entering the underground parts of the mining operation (other than power to plant or installations that have been designed so that they are incapable of producing heat or sparks sufficient to ignite an explosive atmosphere)—*
      i. *is automatically and systematically isolated:*
      ii. *is incapable of being restored before the main ventilation system is repaired and restarted:*
      iii. *is not restored until a competent person determines it is safe to do so.*

Schedules

Schedule 8 Notifiable accidents

A notifiable accident is any of the following that occurs at a mining operation:

Electricity

1. *unintended contact of any mobile plant with conductors, whether overhead or underground*
2. *any occurrence of electrical arcing or electric shock*

Schedule 9 High-risk activities

Applies to	High-risk activity	Length of time between notification and when activity can be undertaken
Underground mining operations	*The use of voltages in excess of 1 200 V in ERZ1 for electrical plant other than electrical plant and cables associated with longwall mining*	*3 months*
Underground coal mining operations	*Live electrical work in an ERZ0 or ERZ1*	*7 days before first live electrical work covered by live electrical work approval system* *24 hours before each occasion of live electrical work thereafter*
Underground coal mining operations	*The use of voltages in excess of 4 000 V in an ERZ1 for electrical plant and cables associated with longwall mining*	*3 months*

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APPENDIX

GLOSSARY

GLOSSARY

Term	Definition
Electrical plant	a. Plant that utilises or is powered by electricity; and b. includes appliances and fittings.
Electrical system	a. An electrical system in which all the electrical plant is, or is capable of being, electrically connected to a common source of electrical energy; and b. includes the source and the plant.
Explosion protected	In respect of any plant or installation that the plant or installation is or includes features that are designed, manufactured, and maintained to prevent the plant or installation acting as an ignition source when exposed to an explosive atmosphere.
Explosion Risk Zones (ERZs)	**Explosion Risk Zone** An ERZ0, ERZ1, or a NERZ.
	ERZ0 An underground coal mining operation, or any part of it, where the general body concentration of methane is known to be, or is identified by a risk assessment as likely to be, greater than 1.25%. > If the general body concentration of methane in an NERZ or ERZ1 exceeds 1.25% that area becomes an ERZ0. > The mine operator may also temporarily designate any NERZ as an ERZ1 or ERZ0.
	ERZ1 An underground coal mining operation, or any part of it, where the general body concentration of methane is known to be, or is identified by a risk assessment as likely to be, greater than 0.25% but not more than 1.25%. The Mining Regulations specify specific situations in a mine or tunnel which are automatically designated as an ERZ1.[28]
	NERZ An underground coal mining operation, or any part of it, where the general body concentration of methane is demonstrated by means of continuous and recorded monitoring to be less than 0.25%.

[28] Refer to the Mining Regulations for a list of these included in the definition of an ERZ1.

Live electrical work[29]	a. Any work carried out on electrical plant in an ERZ0 or ERZ1, including testing or maintenance, that compromises the explosion protection techniques of that equipment; and b. includes the use of testing equipment that is not certified for use in the ERZ where it is, or is intended to be, used
Works	**FROM THE ELECTRICITY ACT:** *2 Interpretation* 1. *In this Act, unless the context otherwise requires,—* *works—* *a. means any fittings that are used, or designed or intended for use, in or in connection with the generation, conversion, transformation, or conveyance of electricity; but* *b. does not include any part of an electrical installation.*
Safety-critical equipment	Electrical plant critical to maintaining safe conditions at the mining operation and that is permitted to remain energised at times when the supply of electricity to plant or to a part or the whole of the mining operation is otherwise required to be isolated.
Trailing cable	A cable, other than a reeling cable, that is used or placed in position for the conveyance of electricity from an electrical system to mobile plant.

[29] Note 'live electrical work' does not mean 'hot work'. See the Mining Regulations for the meaning of 'hot work'.

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APPENDIX

KEY DATES FOR COMPLIANCE WITH THE MINING AND ELECTRICITY REGULATIONS

KEY DATES FOR COMPLIANCE WITH THE MINING AND ELECTRICITY REGULATIONS

What	When
Compliance with the Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013	New operation: 16 December 2013
	Existing operation: 1 January 2015
Appoint an SSE	1 July 2014
For coal mines and other mines and tunnels containing flammable gases: Determine ERZs	1 January 2015
Develop and have in place an EECP	1 January 2015
Establish and implement a safety assessment programme to assess and verify electrical safety (Electricity Regulations, Regulation 78K)	1 January 2015
Provide notices advising how to isolate the supply of electricity (Electricity Regulations, Schedule 8, Rule 4)	1 January 2015
Develop appropriate maintenance programmes	1 January 2015
Approval of procedure for “live work” in ERZs	1 January 2015
Appoint an electrical superintendent	1 March 2015
SSE to obtain a certificate of competence	1 January 2016
Electrical superintendent to obtain a certificate of competence	1 January 2016
For coal mines and other mines and tunnels containing flammable gases: Electrical tradespeople registered by the EWRB have competencies required by AS/NZS 4761.1 (Electricity Regulations, Schedule 8, Rule 38)	1 January 2016
Review and audit programmes developed and implemented	1 January 2016
SOPs and other systems developed as required for the operation of the EECP	As part of the EECP
Procedures and policies determined for the ongoing development of electrical workers’ competencies	As part of the EECP
Services engaged of a suitably qualified electrical engineer	As required

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