

GUIDELINES FOR ELECTRICAL SAFETY IN MINES

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1. INTRODUCTION

With recent changes to the legislative regime in Victoria, the safety of electrical installations on mine sites is now covered by two separate Acts. These are the *Occupational Health and Safety Act 1985*, administered by the Minerals and Petroleum Regulation unit of the Department of Primary Industries under delegation from the Victorian WorkCover Authority, and the *Electricity Safety Act 1998*, administered by the Office of the Chief Electrical Inspector through cooperation with the Department of Primary Industries and Environment through the operation of a Memorandum of Understanding.

Designers, manufacturers, importers and suppliers (including hirers) of electrical plant and equipment have a duty under the *Occupational Health and Safety Act* to ensure that such plant and equipment is safe and without risks to health when properly used, has been appropriately tested and examined and is accompanied by adequate information regarding its safe use. The *Occupational Health and Safety Act* requires employers, including principal contractors, to provide and maintain for employees and independent contractors a working environment that is safe and without risks to health. This includes a duty to provide and maintain plant and systems of work that are safe and without risks to health. Compliance with these requirements includes ensuring that suppliers of electrical plant and equipment have provided all necessary safety instructions and information.

In addition to their duties under the *Occupational Health and Safety Act*, operators of a mine, registered electrical contractors and licensed electricians must comply with the *Electricity Safety Act*, the *Electricity Safety (Installations) Regulations*, and the Australian Standards incorporated by those Regulations. In particular, this includes compliance with AS/NZS 3000 and AS/NZS 3012.

Compliance with the provisions of this guideline will assist mine operators, designers, manufacturers, importers, suppliers (including hirers), electrical contractors and electricians to comply with occupational health and safety, and electrical safety legislation.

These guidelines have been produced to assist people at work in mines to implement the provisions of the *Electricity Safety Act 1998* and the relevant regulations, and provide appropriate advice regarding workplace electrical safety.

These guidelines are explanatory only and do not introduce any additional duties or responsibilities beyond the requirements of the legislation. The guidelines therefore provide clarification and do not form part of a legally enforceable framework, provisions for which are stated in the *Occupational Health and Safety Act 1985* and the *Electricity Safety Act 1998*.

The aim is to clarify the requirements in the following areas:

- electrical installations at the mine site;
- electrical plant and equipment used at the mine site;
- the use of residual current devices (RCDs) or 'safety switches' at the mine site.

To achieve this, the following issues will be explored, to assist in the interpretation of requirements in the *Electricity Safety Act 1998* and the *Electricity Safety (Installations) Regulations 1999*:

- identification, assessment and control of workplace electrical risks;
- maintaining and testing of workplace electrical plant and equipment according to the required standards;
- links to other relevant legislation and standards.

The advice in these guidelines should assist operators of a mine to design and develop workplace management systems, including training and supervision, in consultation with employees and contractors. Operators are responsible for ensuring that these systems are implemented to ensure their safety, the safety of their employees and the safety of any other person who may be affected by their work.

The very nature of some mines presents the potential for hazards of an electrical nature, so it is important that all personnel understand the associated risks and are aware of their obligations.

This publication has been designed for use by mine operators and mine workers. It provides essential information on electrical safety, aimed to assist mine safety and reduce the risk of electrical incidents. However, operators of a mine, registered electrical contractors and licensed electrical workers have a duty of care under the Electricity Safety Act 1998, and need to ensure that they meet all relevant legislative requirements.

This document has been prepared in conjunction with the Minerals and Petroleum Regulation unit of the Department of Primary Industries (DPI), and in consultation with a range of mining industry representatives in Victoria.

1.1 MEMORANDUM OF UNDERSTANDING BETWEEN DPI AND OCEI

A Memorandum of Understanding (MOU) is in place between the DPI and the Office of the Chief Electrical Inspector (OCEI) to ensure effective co-operation between the parties, and to minimise duplication of effort in assisting mining operations to achieve high levels of workplace electrical health and safety. The MOU will result in the sharing of information, a single point for reporting of incidents, joint investigations where appropriate, and mutual assistance (including training).

1.2 ELECTRICITY SAFETY MANAGEMENT SCHEMES (ESMSs)

Where the operator of a mine is operating an approved ESMS then these guidelines could be used to assist compliance with the ESMS, operating under the Electricity Safety (Management) Regulations 1999.

2. DEFINITIONS

For the purpose of this document, the following definitions, taken from the Electricity Safety Act 1998, the Electricity Safety (Installations) Regulations 1999, the Mineral Resources Development Act 1990 and the Occupational Health and Safety (Mines) Regulations 2002 apply:

“**AS/NZS 3000**” means Australian/New Zealand Wiring Rules, AS/NZS 3000:2000.

“**Blue Book**” means Code of Practice on Electrical Safety For Work On Or Near High Voltage Electrical Apparatus.

“**chief mining inspector**” means the Director of Mines appointed under the Mineral Resources Development Act 1990 Part 4.

“**connect**”, in relation to an electrical installation or electrical equipment, includes make capable of receiving electric current.

“**construction and demolition site**” means a site where work in accordance with Clause 1.1 of AS/NZS 3012: 2003.

“**current collecting systems**” means the use of trolley wires or similar overhead systems to provide a continuous supply of electrical power to electric locomotives or electric vehicles.

“**electrical connection work**” means connecting or disconnecting electrical equipment to or from a supply of electricity.

“**electrical equipment**” means any appliance, wire, fitting cable, conduit or apparatus that generates, uses, conveys or controls (or that is intended to generate, use, convey or control) electricity.

“**electrical inspection work**” means testing, inspection or certification of electrical equipment.

“**electrical installation**” means electrical equipment that is fixed or to be fixed in, on, under or over any land.

“**electrical installation work**” means installation, alteration repair or maintenance of an electrical installation.

“**electrical installation worker**” means a person who carries out electrical installation work.

“**electrical work**” means electrical connection work, electrical inspection work or electrical installation work.

“**electrical worker**” means a person who carries out electrical work.

“**ES Act 1998**” means the Electricity Safety Act 1998 as amended.

“**ES (Inst) Regs 1999**” means the Electricity Safety (Installations) Regulations 1999. (*Note, and includes Electricity Safety (Installations)(Amendment) Regulations 2001*).

“**extra low voltage**” means a voltage not exceeding 50V a.c. or 120V ripple-free d.c.

“**high voltage**” means a voltage exceeding low voltage.

“**inspector**” means a licensed electrical inspector working on behalf of the Office of the Chief Electrical Inspector, or an inspector of mines employed under Mineral Resources Development Act 1990 section 90(1)(b).

"licensed electrician" means an electrical installation worker holding an electrician's licence under regulation 302.

"licensed electrical inspector" means a person who has the required licence issued by the OCEI to carry out inspection of electrical work.

"live" means in relation to an object, the condition of having a potential difference between that object and earth.

"live part" means a conductor or conductive part intended to be energised in normal use, including a neutral conductor and conductive parts connected to a neutral conductor.

"low voltage" means a voltage exceeding extra-low voltage but not exceeding 1000 V a.c or 1500 V d.c.

"mine" means any land on which mining is taking place under a licence issued under the Mineral Resources Development Act 1990.

"mineral" means any substance which occurs naturally as part of the earth's crust –

- a) including –
 - i) oil shale and coal; and
 - ii) hydrocarbons and mineral oils contained in oil shale or coal or extracted from oil shale or coal by chemical or industrial processes; and
 - iii) any substance specified in Schedule 4 of the Mineral Resources Development Act 1990;
- b) excluding water, stone, peat or petroleum.

"mining" means extracting minerals from land for the purpose of producing them commercially, and includes processing and treating ore.

"operator" in relation to a mine, means the employer in management and control of the mine

"OCEI" means the Office of the Chief Electrical Inspector.

"point of supply" means (a) in relation to a low voltage electric line, means--
(i) in the case of an underground line (unless sub-paragraph (iii) applies), the point at which that line crosses the boundary of the land; and (ii) in the case of an overhead line (unless sub-paragraph (iii) applies), the first point of connection of that line on the land, being either--

(A) if the line is carried onto the land by one or more poles, the first pole on the land carrying that line;

(B) if the line is connected directly to premises on the land, that connection to the premises; or

(C) if it is not possible to determine a point of supply in accordance with sub-sub-paragraph (A) or (B), the point at which the line crosses the boundary of the land; and
(iii) in the case of a line connected to company assets, the point at which the line is connected to the company assets; and

(b) in relation to a high voltage electric line, means the point agreed between the relevant distribution company or the relevant transmission company and the customer supplied by that electric line.

"portable appliance" means either an appliance which is intended to be moved while in operation or an appliance, other than a fixed appliance, having a mass less than 18kg.

"portable appliance: hand held appliance" means an appliance intended to be held in the hand during normal use, the motor, if any, forming an integral part of the appliance.

"registered electrical contractor" means an electrical contractor who holds a registration under Part 2 of the Electricity Safety (Installations) Regulations 1999.

“serious electrical incident” means an incident involving electricity which causes or has the potential to cause--

- (a) the death or injury to a person; or
- (b) significant damage to property; or
- (c) a serious risk to public safety.

"underground-wiring" means a system of fixed wiring in which cables are buried either directly or in a wiring enclosure beneath the surface of the ground in accordance with the appropriate requirements and AS/NZS 3000:2000.

Note: Underground wiring systems **do not** include those, which are:

- embedded in a concrete floor, slab or pad; or
- laid on the surface of the ground either within a building or in outdoor locations; or
- enclosed in a ventilated cable tunnel; or
- enclosed in a trough with removable covers where air circulation is not restricted.

Note: It is important to note that Acts, Regulations, Standards and Codes of Practice are amended from time to time.

3. GENERAL RESPONSIBILITIES

All personnel associated with a mining operation have duties and responsibilities with regard to electrical safety.

3.1 OPERATORS OF A MINE

3.1.1 Legal requirements

The operator of a mine needs to establish, implement and maintain procedures to identify and have access to all the legal requirements that are directly applicable to the health and safety issues related to its mining activities. The operator must keep this information up to date, and communicate any relevant information to the employees.

The operator is responsible for knowing what Acts, Regulations, Codes of Practice, Standards and Guidelines have relevance to the activities at the mine.

In Victoria the relevant legislation is available on the government webpage at www.dms.dpc.vic.gov.au under "Law Today".

3.1.2 Responsibilities

It is the responsibility of the operator to:

- Ensure that all electrical work is carried out only by Registered Electrical Contractors or Licensed Electrical Workers.
- Provide and maintain safe systems for carrying out electrical work.
- Ensure that each electrical worker holds a current licence in respect of the specific class of work carried out by that worker.
- Ensure that all employees and contractors have and maintain the appropriate knowledge and skills regarding electrical installations including - electrical lines and equipment for them to carry out their work.
- Take timely and appropriate action when electrical incidents occur or unsafe electrical equipment is identified.
- Ensure that all electrical equipment is maintained in a safe condition.
- Ensure that all employees and contractors comply where appropriate with the ES Act 1998 and the ES (Inst) Regs 1999.

3.2 REGISTERED ELECTRICAL CONTRACTORS AND LICENSED ELECTRICAL WORKERS

Registered Electrical Contractors and Licensed Electrical Workers must:

- Apply safe systems of work when carrying out electrical installation work.
- Carry out electrical installation work to comply with AS/NZS 3000 (Wiring Rules) as amended by the Regulations.
- Ensure that they perform electrical installation work in accordance with the conditions applicable to their registration or licence.
- Ensure that they test work in accordance with the ES (Inst) Regs 1999
- Ensure that a Certificate of Electrical Safety is completed as required by the ES (Inst) Regs 1999.

- Ensure that completed prescribed work is inspected by an appropriately Licensed Electrical Inspector prior to connection to electricity supply or reconnection as appropriate.
- Report all electrical incidents, hazards or potential hazards, and take appropriate action to control risks.
- Check the operation of portable Residual Current Devices (Safety Switches) before each use.

Registered Electrical Contractors must also:

- Keep a register of licensed electrical workers who are employed (directly or as sub-contractors) by the contractor.
- Not permit a person to carry out on the contractor's behalf or direct a person to carry out electrical installation work that does not comply with the ES Act 1998 or ES (Inst) Regs 1999.

3.3 OTHER WORKERS

Mine employees must:

- Be aware of the location of and safe clearances to overhead power lines, underground cables and electrical equipment;
- Report all electrical incidents, hazards or potential hazards;
- Check the operation of portable Residual Current Devices (Safety Switches) before each use;
- Testing of RCD's must take place in accordance with the manufacture's instructions and section 7.4 of this document.

4. ELECTRICAL WORK IN MINES

4.1 WORK ON OR NEAR LIVE ELECTRICAL EQUIPMENT

Electrical workers in mines are required to adhere to the requirements of the ES Act 1998 and ES (Inst) Regs 1999 when working on or near live electrical equipment. The operator of a mine must ensure that safe access/egress system is in place and appropriate procedures are used for any work in the vicinity of or on electrical equipment.

Some of the elements of a safe access/egress system are:

- appropriate training of employees such that they have the knowledge and skills appropriate for their work;
- formal authorisation of employees to carry out specified activities;
- site induction of employees;
- planning and risk assessment;
- awareness of and adherence to safe limits of approach as defined in the 'Blue Book';
- use of appropriate tools, equipment, barriers and Personal Protective Equipment (PPE);
- isolation from all sources of supply;
- earthing procedures;
- use of warning tags;
- issuing of work permits;
- procedures for restoring supply.

For low voltage installations, work should be carried out in accordance with the Code of Practice for Safe Electrical Work Low Voltage Installations and AS/NZS 4836: 2001(Safe Working on Low Voltage Installations).

For high voltage installations, work must be carried out to meet the requirements of regulation 417 of the ES (Inst) Regs 1999, which includes the Code of Practice on Electrical Safety For Work On or Near High Voltage Electrical Apparatus 1998 (the "Blue Book") as amended on reprint from time to time.

4.2 LICENSED ELECTRICAL WORKERS

All electrical work must be carried out only by appropriate electrical workers who are licensed, or authorised under an electricity safety management scheme which has been approved by the Governor in Council, to perform the particular class of electrical work.

The classes of electrical work are:

- electrical installation work;
- electrical inspection work; and
- electrical connection work;

Refer to Division 2, Section 38 of the Electricity Safety Act 1998.

The ES Act 1998 requires that electrical installation work complies with the Act and regulations and be tested before it is placed into service. Refer to Section 44 of the Act.

4.3 ACTIONS WHEN ENGAGING A REGISTERED ELECTRICAL CONTRACTOR

Mine operators should take the following actions when engaging the services of a Registered Electrical Contractor:

- Ensure the contractor is currently registered, by checking the expiry date on the contractor's Registered Electrical Contractor's card (coloured gold).
- Ensure that the contractor has appropriate levels of public liability and workers' compensation insurance.
- Review previous experience by the contractor in regard to working in mines.
- Check and ensure that the contractor is issuing a Certificate of Electrical Safety for each job performed.
- Should any of the above requirements not be satisfied, seek further advice from the OCEI.

4.4 SAFETY OF ELECTRICAL INSTALLATIONS

All electrical wiring in mines must comply with the ES Act 1998 and ES (Inst) Regs 1999, including AS/NZS 3000 (Wiring Rules). Other appropriate standards are incorporated in the regulations in accordance with the requirements of regulation 6 of the Subordinate Legislation Regulations 1994.

The ES Act 1998 precludes the installation of unsafe electrical equipment, and requires the occupier/owner of the premises to take action to remove the unsafe electrical equipment.

Where there is any unsafe electrical equipment, the operator of the mine must cause it to be removed from the site or to be made safe. Refer to section 43 of the ES Act 1998.

4.5 CERTIFICATE OF ELECTRICAL SAFETY

It is a requirement of the ES Act 1998 that a Certificate of Electrical Safety (COES) is issued for all completed electrical installation work.

The person who is responsible for carrying out electrical installation work must ensure that a COES is completed and given to the operator of the mine and a copy provided to the OCEI, within the required times. For prescribed electrical work, a copy of the certificate must be given to the Licensed Electrical Inspector (LEI) after the licensed electrical worker has certified that the work complies with the ES Act 1998 and the ES (Inst) Regs 1999.

Refer to Section 45A of the Act.

There are two types of electrical installation work - **prescribed** and **non-prescribed**, and these are defined in Appendix 1.

There are three types of certificates:

- **Prescribed:** used for prescribed electrical installation work - cost \$20
- **Non-prescribed:** used for non-prescribed electrical installation work - cost \$5
- **Periodic:** used for multiple and unlimited non-prescribed electrical installation work - cost \$500 and lasts for 3 months.

A copy of each completed COES should be kept on site or at the registered office.

Further information regarding the use of Certificates of Electrical Safety is contained in Appendix 2.

4.6 INSPECTION OF ELECTRICAL INSTALLATION WORK

The ES Act 1998 requires that prescribed electrical installation work is inspected by a licensed electrical inspector with the appropriate class of licence, before being placed into service.

Refer to Section 45 of the Act.

4.7 CONSTRUCTION AND DEMOLITION SITES

Any electrical work carried out in relation to construction or demolition works shall comply with AS/NZS 3000 (Wiring Rules) and AS/NZS 3012: 2003 (Electrical Installations - Construction & Demolition Sites). Reference should be made to the agreed industry standard (*Industry Standard for Electrical Installations on Construction Sites*) for construction and demolition sites in Victoria.

4.8 HAZARDOUS AREAS

Mines commonly contain hazardous areas (eg. explosives and fuel storage areas), which may affect the selection and installation of electrical equipment. In general, the operator of the mine, as the occupier, would be responsible for classifying (or ensuring that a classification) of hazardous areas is conducted. Where this is not clear, the operator of the mine should obtain advice from a consultant with appropriate expertise, and then discuss the implications for electrical work with the Registered Electrical Contractor and/or licensed electrical worker. A list of suitable consultants is available from the OCEI.

It should be noted that electrical work in hazardous areas is prescribed electrical installation work and thus requires the issue of a prescribed Certificate of Electrical Safety and inspection by a licensed electrical inspector with a 'H' Class licence. However, it should be noted that prescribed electrical work does not include –

- a) repair or maintenance of a single component part of an electrical installation; or
- b) the replacement of a single component part of an electrical installation by an equivalent component part at the same location.

(Refer to regulation 13 of the Electricity Safety (Installations)(Amendment) Regulations 2001, which make amendment to regulation 406)

5. NON-ELECTRICAL WORK NEAR ELECTRIC LINES/EQUIPMENT

5.1 CLEARANCES TO OVERHEAD POWER LINES, UNDERGROUND CABLES & EQUIPMENT

When working under or near overhead power lines, particularly with heavy mining or earthmoving equipment or cranes, it is essential to stay clear of the overhead power lines using the “No Go Zone” principles or the limits of approach as specified in the ‘Blue Book’.

For overhead power lines on poles, the No Go Zone is anywhere above the power line and within 3m each side of, and 5m underneath, the power line (refer to Diagram 1).

For overhead power lines on towers, the No Go Zone is anywhere above the power line and within 8m each side of, and 10m underneath, the power line (refer to Diagram 2).

If a trained and qualified Spotter is present at all times, work may be carried out between the edge of the No Go Zone and the following clearances within each side of, and underneath, the power line:

- 6.4m for powerlines on poles; and
- 10m for powerlines on towers.

A Spotter is defined as a safety observer who is a person competent for the sole task of observing and warning against unsafe approach to overhead power lines and other electrical equipment. A Spotter must have successfully completed the Spotter Training course, which is a 1-day course covering electrical safety requirements and demonstrated competency in the particular type of plant. A list of approved training providers is available from the OCEI. The pre-requisites for attendance at the Spotter Training course are:

- an appropriate first aid certificate (equivalent to Level 2 plus an electrical component); and
- a Certificate of Competency in the plant or the demonstration of competency in the plant.

Work is permitted in the No Go Zone, but only when all of the following special provisions have been met:

- a Spotter is provided; and
- the power authority has been notified before commencing work; and
- written permission has been obtained from the power authority; and
- a pre-start site/job meeting and a risk assessment have been completed.

It is to be noted that overhead power lines may be owned and operated by the mine (in this situation the mine operator is the power authority), hence compliance to the ES Act 1998 and ES (Inst) Regs 1999, which includes the requirements of the Code of Practice on Electrical Safety For Work On or Near High Voltage Electrical Apparatus 1998 (Blue Book) is required.

The mine operator may operate to the requirements of the "Blue Book" which also specifies clearances to electrical equipment. The "Blue Book" specifies clearances for authorised electrical workers as well as the ordinary person (which is defined as a person with no specific training etc).

Diagram 1: Overhead Power Lines on Poles

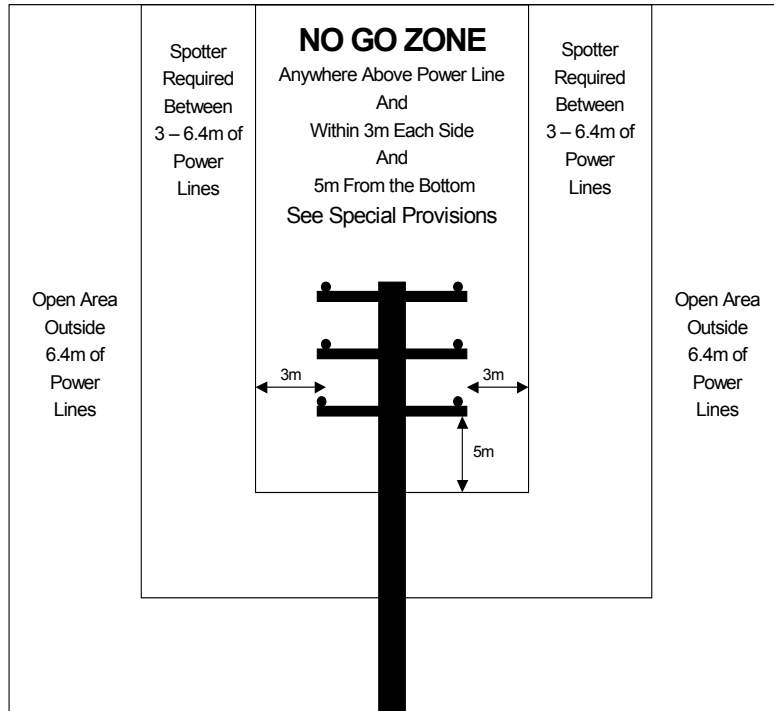
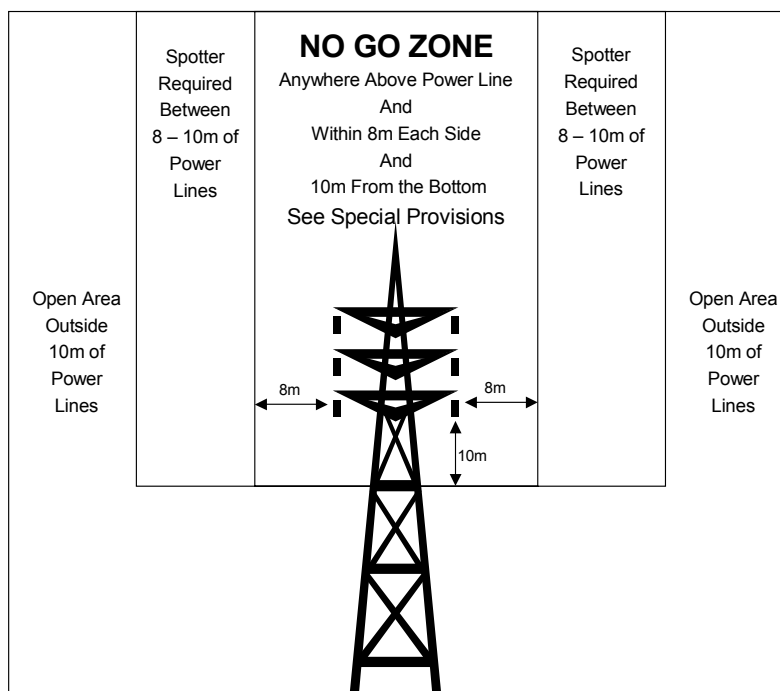


Diagram 2: Overhead Power Lines on Towers



5.2 EXCAVATING

The ES (Inst) Regs 1999 (refer to regulation 434) require an inspection of the records of the route of underground cables and the location of any underground cables in the vicinity, for excavations greater than 300 mm deep. The ES (Inst) Regs 1999 also prohibit the excavation of material so as to endanger the stability of an installation or reduce the depth below safe minimums.

In the case of high voltage underground cables, excavation work must not reduce the depth of the underground cable below 750 mm measured from the top of the cable or wiring enclosure to the surface.

In the case of low voltage underground cables, excavation work must not reduce the depth of the underground cable below 500 mm measured from the top of the cable or wiring enclosure to the surface. Refer to clause 3.11.1 of AS/NZS 3000.

Note: Since the ES (Inst) Regs 1999 were implemented on 3 May 1999 it has been required under Regulation 404 to record the route of underground lines being installed.

5.3 STOCKPILING

The ES (Inst) Regs 1999 prohibit the placing of material above ground level below an overhead line or next to an electrical installation so as to reduce clearances below safe minimums.

For high voltage lines, the minimum ground clearances are contained in the following table:

MINIMUM HV GROUND CLEARANCES (REFER TO ELECTRICITY SAFETY (INSTALLATIONS) REGULATIONS, REGULATION 419)

Type of Aerial Line Nominal Voltage ('U')	MINIMUM DISTANCE		
	Carriageway of roads	Ground traversable by vehicles	Other ground or the surface of any water not accessible to boats with masts
1kV < U ≤ 33kV	6.7 m	5.5 m	5.0 m
33kV < U ≤ 132kV	6.7 m	6.7 m	5.5 m
132kV < U ≤ 275kV	8.7 m	6.7 m	6.7 m
275kV < U ≤ 330kV	9.7 m	6.7 m	6.7 m
330kV < U ≤ 500kV	11.4 m	10.7 m	10.7 m

For low voltage lines, the minimum ground clearances are contained in the following table:

MINIMUM LV GROUND CLEARANCES (REFER TO AS/NZS 3000, CLAUSE 3.12.3)

Type of Aerial Conductor	MINIMUM DISTANCE	
	Over Areas Used by Vehicles	Over Areas Not Used by Vehicles
Bare live conductors	5.5 m	5.0 m
Insulated live conductors	4.5 m	3.0 m
Neutral-screened cable	4.5 m	3.0 m

For high voltage lines, the minimum horizontal clearances are contained in the following table:

MINIMUM HV HORIZONTAL CLEARANCES (REFER TO ELECTRICITY SAFETY (INSTALLATIONS) REGULATIONS, REGULATION 437)

NOMINAL VOLTAGE ('U')	MINIMUM DISTANCE
1kV < U ≤ 33kV	2.1 m (See Note 1)
33kV < U ≤ 132kV	3.0 m
132kV < U ≤ 275kV	4.6 m
275kV < U ≤ 330kV	5.5 m
330kV < U ≤ 500kV	6.4 m

NOTE 1: For timber and other flammable material, this clearance is increased to 3.0m.

For low voltage lines, the minimum horizontal clearances are contained in the following table:

MINIMUM LV HORIZONTAL CLEARANCES (REFER TO AS 3000, CLAUSE 3.12.3)

Type of Aerial Conductor	MINIMUM DISTANCE
Bare live conductors	2.0 m
Insulated live conductors	1.0 m
Neutral-screened cable	1.0 m

Refer to AS/NZS 3000 Table 3.8 for other clearances.

Penalties apply for breaches of these requirements.

5.4 BLASTING AND FIRES

Blasting near electrical installations presents the risk of damage by flying debris as well as the risk of inadvertent operation of sensitive electrical protection equipment. The ES (Inst) Regs 1999 (refer to regulation 432) prohibit blasting, the lighting of fires or the installation of equipment likely to create explosions in the vicinity of a relevant installation.

Note that a relevant installation means –

- a low voltage electrical installation operating on alternating current on public land; or
- a high voltage electrical installation; or
- the supply network of a small gauge railway or tramway system.

6. INCIDENT RESPONSE AND REPORTING

6.1 INCIDENT RESPONSE

The following actions serve as a guide to an appropriate response in the event of an electrical incident:

- do not put yourself at risk;
- switch off the source of electricity supply if this can be done safely;
- administer first aid;
- call an ambulance if required;
- make the site safe, without disturbing any evidence needed for a thorough investigation;
- advise DPI (who will advise OCEI) of the incident;
- assist relevant authorities (police, coroner, OCEI, DPI, WorkSafe Victoria) in their investigations;
- for minor incidents, carry out an investigation of the incident.

It is important that the incident has been investigated before the circuit involved is re-energised, for safety reasons as well as assisting the investigation.

6.2 INCIDENT REPORTING

The ES (Inst) Regs 1999 require that electric shocks and serious electrical incidents be reported to the OCEI. This point of reporting has been delegated to DPI - Minerals and Petroleum Regulation Unit via a Memorandum of Understanding between the OCEI and DPI.

Serious electrical incidents must be verbally reported as soon as practicable, providing all known details. This must be followed up by a written report, which must be sent within 20 business days after the incident.

Other incidents involving accidental contact with any electrical installation or electric shock must be reported in writing within 20 business days after the incident.

It should be noted that there are requirements under Occupational Health and Safety (Incident Notification) Regulations 1997, which Mine Operators should be familiarised with.

The initial verbal report should be made to the DPI, who will immediately advise the OCEI. The written report (which should take the form of the Electrical Incident Report Form contained in Appendix 4) should also be submitted to the DPI who will forward it to the OCEI.

The DPI contact details are as follows:

Ballarat

- Inspector of Mines and Quarries
Tel: 5333 6727 (BH)
Mobile: 0409 947 602
Fax: 5333 6516
Address: State Government Offices
Cnr Main & Doveton Streets, Ballarat Victoria 3350

Benalla

- Inspector of Mines and Quarries
Tel: 5761 1501(BH)
Mobile: 042 854 1169
Fax: 5761 1628
Address: PO Box 124
35 Sydney Road, Benalla Victoria 3672

Bendigo

- Inspector of Mines and Quarries
Tel: 5430 4692 (BH)
Mobile: 0418 541 160
Fax: 5448 4982
Address: Cnr Midland Highway and Taylor Street, Epsom Victoria 3551
- Chief Mining Inspector, Regional Mining Engineer
Tel: 5430 4689 (BH)
Mobile: 0408 334 751
Fax: 5448 4982
Address: Cnr Midland Highway and Taylor Street, Epsom Victoria 3551

Melbourne

- Chief Inspector of Quarries, Regional Mining Engineer
Tel: 9412 5083(BH)
Mobile: 0418 506 172
Fax: 9412 5152
Address: 8/250 Victoria Parade, East Melbourne Victoria 3002

Gippsland

- Regional Mining Engineer
Tel: 5172 2158 (BH)
Mobile: 0419 375 842
Fax: 5172 2100
Address: 71 Hotham Street, Traralgon Victoria 3844

Second Response

In the event that the Regional Officer is not available, one of the following officers should be contacted:

- Chief Mining Inspector, Regional Mining Engineer
Tel: 5444 6695 (BH)
Mobile: 0408 334 751
Fax: 5444 6698
Address: 57 View Street, Bendigo Victoria 3550
- Chief Inspector of Quarries, Regional Mining Engineer
Tel: 9412 5083(BH)
Mobile: 0418 506 172
Fax: 9412 5152
Address: 8/250 Victoria Parade, East Melbourne Victoria 3002

The OCEI contacts are as follows:

Fatal and serious electrical incident to be reported on 1800 000 922 (24 hours) or 9203 9781 (Back-up 24 hours).

7. PROTECTION AND TESTING

7.1 RESIDUAL CURRENT DEVICES (RCDs)

Registered Electrical Contractors and Licensed Electrical Workers, when carrying out electrical installation work, must refer to AS/NZS 3000 (Wiring Rules) Clause 2.5 "Protection Against Earth Leakage Current" to ensure the correct protection is installed. Particular reference should be made to Clause 2.5.3.3, which requires that socket outlets, where there is an increased risk of electric shock to the user, be protected by RCDs. Such situations include workshops and wet areas.

In general, testing of RCDs must be carried out in accordance with section 7.4 of this guideline.

7.2 PROTECTION ON HIGH VOLTAGE EQUIPMENT

All electrical equipment operated at high voltage must be fitted with protection systems such as:

- an interlocking system which ensures that it is not possible to remove the key opening the switch boxes without isolating the source of supply;
- an earth leakage trip system on switch gear which disconnects the supply when a fault current exceeds determined levels as per safe system design;
- a shunt trip on all switch gear operated by a lock-out switch installed adjacent to the electrical equipment which is more than 60m from the main switch gear.

7.3 HRC FUSES

The mine operator must ensure that fuses are of a replaceable high rupture capacity type.

7.4 INSPECTION AND TESTING

The mine operator must ensure that electrical equipment is inspected and tested in accordance with AS/NZS 3000 and AS/NZS 3760.

Cord extension sets, power boards, appliances connected by a flexible cord, portable isolation transformers and RCDs must be inspected and tested:

- prior to initial introduction to service (except where the equipment is new and there is written evidence of compliance with AS/NZS 3760);
- before return to service after repairs;
- prior to each hire (for hire equipment, inspection only) and additionally tested at not greater than monthly intervals; and
- at intervals not exceeding those specified in the following table.

INSPECTION & TESTING INTERVALS

LOCATION	INTERVAL BETWEEN INSPECTION AND TESTS						
	Protectively earthed equipment	Double insulated equipment	RCDs				Cord extension sets & power boards
			Push Button Test (by User)		Operating time RCD tester		
			Portable	Fixed	Portable	Fixed	
Office where equipment or supply cord is subject to flexing in normal use OR is open to abuse OR is in a hostile environment.	12 months	12 months	3 months	6 months	2 years	2 years	12 months
Office where equipment or supply cord is NOT subject to flexing in normal use and is NOT open to abuse and is NOT in a hostile environment.	5 years	5 years	3 months	6 months	2 years	2 years	5 years
Tea Rooms, Office Kitchens	12 months	12 months	3 months or before every use, whichever is the longer	6 months	2 years	2 years	12 months
Weighbridge Fixed Plant Mobile Plant	6 months	12 months	Daily or before every use, whichever is the longer	6 months	12 months	12 months	6 months
Mine Works Area	3 months	6 months	Daily or before every use, whichever is the longer	3 months	6 months	6 months	3 months

Inspection and testing should be carried out by a competent person, and should cover the activities contained in Appendix 4.

Equipment which has passed the inspection and test shall be fitted with a durable, non-reusable, non-metallic tag, which shall include:

- the name of the person or company performing the tests; and
- the test or re-test date – Refer to AS/NZS 3760:2001.

7.5 OPERATION OF FUSES, CIRCUIT BREAKERS OR RCDs

After a fuse, circuit breaker or RCD has operated, every effort must be taken to determine the cause of the fault prior to restarting the plant or equipment.

8. ACCESS AND DESIGN

8.1 ACCESS TO TRANSFORMERS AND SWITCH ROOMS

The operator of a mine should ensure that:

- transformer enclosures are locked and accessible only by Registered Electrical Contractors, Licensed Electrical Workers or other authorised persons; and
- switch rooms and motor starter rooms are kept locked, and no-one may enter them except in the presence of a Registered Electrical Contractor or Licensed Electrical Worker or other authorised person, if they do not comply with the preceding dot point.

8.1.1 Access for Operation

The operator of a mine must ensure that:

- If access is required for operating purposes, into switch rooms and motor starter rooms, all switch gear, conductors and other apparatus are totally enclosed.

8.2 ISOLATING SWITCHES

The operator of a mine must ensure:

- that isolating switches are:
 - fitted to all electrically operated fixed and mobile equipment; and
 - manually operated; and
 - installed in a readily accessible place; and
- that isolating switches fitted to motors with multi-stage starting are of a mechanical lockout control type; and
- that emergency stop buttons are of a mechanical lockout type.

8.3 SAFETY SIGNS

The operator of a mine must ensure that notices are clearly exhibited in every lunch room, switch room and motor starter room and that the notices:

- contain directions as to:
 - resuscitation of persons suffering from electric shock; and
 - the procedures in case of fires associated with electric cables and equipment; and
- contain directions warning unauthorised persons not to touch or to interfere with fallen, broken or damaged cables or electrical equipment, but to report such to the mine operator or other appropriate person.

The operator of a mine must ensure that:

- signs are placed on the outside of external doors to switch rooms and electrical enclosures marked with the word “DANGER” and the highest voltage in the switch room or enclosure; and

- the signs required by this clause conform to AS 1318: 1985 (Industrial Safety Colour Code) and AS 1319: 1994 (Safety Signs for the Occupational Environment); and
- signs required by this clause are maintained in a serviceable condition at all times.

8.4 HIGH VOLTAGE POWER LINES

The mine operator must ensure that high voltage supply lines, which are not connected to the National Electricity grid, are:

- fitted with appropriate lightning arrestors;
- located where there is no possibility of fouling or falling on plant, vehicles, machinery or buildings;
- fitted with a main switch near the entry point of the power supply line; and
- reference should be made to Australian Standards, ESAA publication HBC(b)1 on construction of overhead power lines.

8.5 EARTH CONDUCTORS

The mine operator must ensure that:

- all metal and conductors which are to be earthed are connected by an earthing conductor.
- the resistance of the earthing conductor is low enough to permit the passage of current necessary to operate the protective device (the maximum resistance of the protective earthing conductor depends on the type and rating of the protective device and the impedance of the live conductors that comprise the circuit).
- the resistance of the main earthing conductor shall not be more than 0.5 ohms.
- Refer to AS/NZS 3000 clause 1.11.2.2.
- Reference should be made to AS/NZS 3007 for HV requirements.

8.6 UNDERGROUND CABLES

Underground cables must be installed in accordance with AS/NZS 3000 clause 3.11, including appropriate marking and physical protection. The route of the cable should be selected to minimise the risk of excavation or damage. Consideration should be given to the installation of above ground markers to clearly show the position of the cables.

The location of all underground cables must be recorded as specified in Section 10.1. A sample diagram is shown in Appendix 5. Further reference should be made to Regulation 404 in the ES (Inst) Reg1999.

Note: Cables installed on the surface of the underground mining tunnel are not considered to be underground cables within the definition of the Wiring Rules.

8.7 PROGRAMMABLE LOGIC CONTROLLERS

Documentation should be kept on site for the written control philosophy of the sequence of operations for devices with Programmable Logic Controllers (PLCs), and a risk assessment carried out to assess the impact and likelihood of a failure or malfunction of the device.

8.8 ELECTRICAL EQUIPMENT IDENTIFICATION & LABELLING

Operators of a mine should ensure that:

- Cables within cabinets are labelled to clearly identify their destination.
- All motor starters, circuit breakers and cabinets are clearly identified.
- Control start batteries are identified at the operator control console.

8.9 FIRE MANAGEMENT

Operators of a mine should ensure that switch rooms are fitted with appropriate fire extinguishers in readily accessible positions, or an appropriate fire management system, and that site personnel are trained to act accordingly.

Underground switchrooms and sub-stations must have the fire extinguishers and/or fire protection system controls and telephone installations located in readily accessible positions on the fresh air side of the installation.

8.10 CABINET MAINTENANCE

Operators of a mine should ensure that cabinets:

- Are kept free from dust and moisture or have the appropriate IP rating for the area which the cabinet is to be installed.
- Contain no redundant equipment.
- Contain signage and labelling that is current and suitable.

9. RECORDS

9.1 ELECTRICAL EQUIPMENT LOCATION

The operator must keep at the mine plans to an appropriate scale, showing:

- all electrical equipment; and
- a wiring diagram of all switchboards; and
- the location of all underground wiring.

Consideration should be given to displaying plans in prominent locations so that it is readily accessible to employees.

9.2 TESTS AND INSPECTIONS

Test and inspection records should be kept for a period of 7 years and be available on site. The records should include:

- a register of all electrical equipment; and
- a record of formal inspection and tests (covering the equipment, the type of inspection or test, the date and the results); and
- a repair register (covering the equipment, the date, the nature of the repair and who carried out the repair); and
- a record of all faulty equipment and equipment removed from service (covering the equipment, the date reported as faulty or removed from service, who reported the faulty equipment, the action taken and the date the fault was rectified).

9.3 OPERATION OF MAIN FUSES OR MAIN CIRCUIT BREAKER

A record must be kept, for a period of 7 years, of every instance of operation of the main fuses or main circuit breaker under a fault condition, including the reasons for the operation and the action taken.

9.4 VOLTAGE DROP

Voltage drop between the point of supply and any point of the electrical installation shall not exceed 5% of the nominal voltage at the point of supply unless the electrical installation is specifically designed to operate under reduced voltage conditions. The operator of a mine is required to apply to the OCEI for consideration to operate at an alternative voltage drop to 5%, as required by clause 1.8.4 of AS/NZS 3000: 2000, by providing details of how the electrical installation is adequately designed.

10. PARTICULAR PROVISIONS FOR OPEN-CUT MINES

10.1 RESPONSIBILITIES OF THE OPERATOR OF A MINE

The operator of a mine must take all reasonable steps to ensure that:

- a) electrical installations at the work site are designed, installed and maintained to minimise the potential for electric shock, burns, injury, explosion, fire, overheating or mechanical damage; and
- b) suitable inspection and testing of electrical installations at the work site are carried out at the time of installation and then periodically in order to identify any deficiencies and have them corrected. Inspections should be carried out at least every six months; and
- c) electrical installations at the work site comply with the requirements of the ES Act 1998, ES (Inst) Regs 1999, which includes compliance with AS/NZS 3000 as amended from time to time.

It should be noted that all licensed electricians also have responsibilities under the requirements of the ES Act 1998 and the ES (Inst) Regs 1999. All licensed electricians are required to certify, upon completion of electrical installation work, that the work complies with the requirements of the ES Act 1998 and the ES (Inst) Regs 1999, which includes carrying out the appropriate test.

10.2 TRAILING CABLES

Trailing cables should comply with AS/NZS 2802 Electric Cables - Reeling & Trailing for Mining and General Use (other than underground mining) and AS 1747 - 1993 Reeling, trailing and feeder cables used for mining - repair and testing, and must be protected from mechanical injury in an appropriate manner.

The operator of a mine must ensure that trailing cables are:

- examined every day for abrasion and other defects; and
- their condition is reported daily in the mine operator's report.

The frequency of inspection and reporting can be reduced to a monthly basis for trailing cables in circuits that contain an appropriate earth leakage protection system.

11. PARTICULAR PROVISIONS FOR UNDERGROUND MINES

11.1 ELECTRICAL WORK & RESPONSIBILITIES OF THE OPERATOR OF A MINE

11.1.1 Inspectors, instructions and orders

- (1) A mine's inspector may instruct an operator or worker in connection with any matter or thing to be done to ensure the safe use of electricity at a work site or in a mine.
- (2) A mine's inspector may issue instructions in writing regarding the installation or operation of electrical equipment.
- (3) A mine operator or worker must comply with an instruction or order issued by an inspector.

11.1.2 Communications

The operator of a mine must ensure that effective means of communication are established and maintained between the surface and each below ground electrical distribution centre.

11.1.3 Transformer and switch room enclosures

The mine operator must ensure that transformer enclosures and switch rooms containing exposed conductors are locked when plant and machinery are operating, unless access for operating purposes is required.

11.1.4 Access to switch and motor rooms

- (1) If access for operating purposes is required in switch and motor rooms the mine operator must ensure that--
 - (a) all switch gear, conductors and other apparatus are totally enclosed and locked to prevent accidental contact with live apparatus; and
 - (b) access to switch gear is restricted to a licensed electrician or a competent person authorised by the mine operator.
- (2) The mine operator must ensure that every room, chamber or enclosure housing electrical transformers or switchgear--
 - (a) be kept clear of moisture and debris; and
 - (b) is supplied with sufficient appropriate fire fighting equipment; and
 - (c) is fitted with warning notices to the satisfaction of a mine's inspector.

11.1.5 Maximum voltage

The licensee must not transmit electrical energy underground in any mine at a voltage exceeding 11 000 volts.

11.1.6 Protection of circuits

In addition to the protection requirements specified in section 8 of this document, the following measures are required:

The mine operator must ensure that--

- (a) every circuit is protected against overload and short circuit; and

- (b) all non lighting circuits above extra low voltage outgoing from a switchboard are protected at the switchboard by an earth leakage circuit breaker; and
- (c) earth leakage circuit breakers are set to operate at leakage currents not exceeding--
 - (i) 30 milliamperes on circuits supplying portable hand held tools and apparatus; and
 - (ii) 30 milliamperes on circuits supplying mobile or transportable apparatus that is handled while energised and that is not provided with automatic earth continuity protection or earth fault current limitation; and
 - (iii) 1 ampere on low voltage circuits; and
 - (iv) 5 amperes on high voltage circuits.

11.1.7 Unauthorised operation

A person who is not a licensed electrician must not operate the switchgear controlling electrical power to the mine unless authorised to do so in writing by the mine operator who accepts that the person is competent to undertake that task.

11.1.8 Fuses

The operator of a mine must ensure that--

- (a) fuses or circuit breakers are installed to protect apparatus and all people in the mine; and
- (b) all fuses are of a replaceable high rupture capacity type.

11.1.9 Access to live apparatus

The operator of a mine must not allow a person, who is not an electrical worker, to have access to live apparatus.

11.1.10 Earth leakage protection

The licensed electrician must ensure that the electrical installation is installed so that--

- (a) the operation of low voltage earth leakage equipment is automatic and instantaneous; and
- (b) if high capacitance circuits or high voltage circuits or cases of selective operation are involved, the total delay time of earth leakage equipment does not exceed 3 seconds and the grading interval between circuit breakers does not exceed 400 milliseconds; and
- (c) inspections of earth leakage equipment effectiveness are made and recorded at intervals of not more than 3 months or more frequently if directed by a mines inspector; and
- (d) any defect found in earth leakage equipment is corrected before the protected equipment is used.

11.1.11 Earthing electrodes

The operator of a mine must ensure that the main earthing electrodes associated with the mine are at the surface.

The operator of a mine must ensure that earthing conductors are not used to carry any circuit current other than a monitoring circuit current.

11.1.12 Motors and generators

The licensed electrician must ensure that Table 1 is complied with for the installation and operation of motors and generators.

TABLE 1 – MOTORS AND GENERATORS

1. Motors, generators and other rotating electrical machinery must be--
 - (a) totally enclosed; or
 - (b) totally enclosed pipe ventilated; or
 - (c) totally enclosed fan cooled.
2. Equipment operating at low voltages must be provided with an accessible isolating switch or controlling device positioned adjacent to the equipment.
3. If a motor is operated by means of remote control and is stopped from any point, the circuit must be so arranged that the motor cannot start again until released from the point where it was stopped. Remote control by a pull wire must be installed and operated in accordance with clause 2;
4. Every generator other than electric winder generators of the Ward Leonard type must be provided with a main circuit breaker or a switch and fuse on each active pole between generator and busbars; and
5. Instruments for measuring current and voltage must be permanently installed at each generator.

11.1.13 Apparatus voltage limits

The operator of a mine must ensure that--

- (a) portable apparatus is operated within the limits of low voltage and has earth leakage circuit breaker protection; and
- (b) mobile or transportable apparatus is operated at a voltage not exceeding low voltage unless approved in writing by the chief mining inspector.

11.1.14 Cables and conductors

The licensed electrician must ensure that the electrical installation is installed so that-

- (a) except where otherwise provided all cables and conductors are covered with a continuous insulating material in good repair; and
- (b) cables and insulators are selected, used and properly maintained as designed for each task; and
- (c) cables are protected from the possibility of damage during blasting; and
- (d) high voltage cables used underground are armoured or screened.

11.1.15 Trailing cables

- (1) The operator of a mine must ensure that trailing cables for electrically operated transportable or mobile apparatus conform to AS/NZS 2802 or AS/NZS 1802.
- (2) The operator of a mine must ensure that flexible cables for portable apparatus and transportable lights conform to or exceed AS/NZS 5000 or AS 3178.

- (3) The operator of a mine must ensure that trailing cables and flexible cables are selected used and properly maintained as appropriate for each task.
- (4) The operator of a mine must ensure that all trailing cables are examined at least each week.

11.1.16 Remote circuits

The licensed electrician must ensure that if high voltage switchgear is operated by a remote circuit it does not exceed low voltage.

11.1.17 High voltage apparatus

- (1) The licensed electrician must ensure that trailing cables used in connection with high voltage mobile and transportable apparatus are equipped with earthing conductors and pilot conductors and comply with AS/NZS 2802, 2000.
- (2) The licensed electrician must ensure that trailing cables are provided with a load breaking isolator.
- (3) The licensed electrician must ensure that high voltage apparatus is equipped with a lockable earthing facility interlocked with the main isolator.

11.1.18 Battery electric locomotives

- (1) The operator of a mine must ensure that any part of a mine used for charging or repairing battery electric locomotives is screened or lined with non-flammable materials.
- (2) The operator of a mine must ensure that the charging area described in sub-regulation (1) is not used for charging unless adequate ventilation is provided.
- (3) A person (other than the licensed electrician, or a competent person authorised by the mine operator) must not perform any repair work on battery electric locomotives.
- (4) The licensed electrician must ensure that work performed on battery electric locomotives occurs only in the charging or repair station.
- (5) The operator of a mine must ensure that locomotive traction batteries are contained in a secure and vented nonflammable container.
- (6) The licensed electrician must ensure that every locomotive traction battery is controlled and protected by a circuit breaker or magnetic contactor in each pole or by a circuit breaker or magnetic contactor in one pole and a combination switch or high rupture capacity fuse in the remaining hole.

11.1.19 Current collecting systems

- (1) The operator of a mine must ensure that current collecting systems are installed at least 2.2 metres above the railhead or in the case of unguarded systems at least 2.6 metres above the railhead.
- (2) A person must not, without the operator's approval, enter on foot an area that contains unguarded current collecting systems which are live.
- (3) The licensed electrician must ensure that the voltage in current collecting systems does not exceed low voltage.
- (4) The operator of a mine must not allow current collecting systems to be installed in hazardous areas.

11.1.20 Tracks and rails

- (1) The operator of a mine must ensure that haulage system tracks, which use a rail return, are bonded at every rail opening and cross-bonded every 60 metres.
- (2) The operator of a mine must ensure that all switches and frogs in the haulage system tracks are bonded to provide a continuous return.
- (3) The licensed electrician must regularly test the bonding of the haulage system tracks for continuity and make a report in the record book and report the results to the mine operator.
- (4) The operator of a mine must ensure that water is able to drain away from haulage system tracks.
- (5) The operator of a mine must ensure that any haulage system installed provides at least 300mm clearance above the highest part of a locomotive or vehicle.
- (6) The operator of a mine must not allow a haulage system to be used until the installation has been inspected by an inspector.

11.1.21 Lighting

- (1) A person (other than the licensed electrician or a competent person authorised by the operator) must not carry out the installation and replacement of electric lamp bulbs.
- (2) The operator of a mine must not allow lamps to be used underground at other than extra low or low voltage.
- (3) The operator of a mine must ensure that all electric hand lamps used underground--
 - (a) do not operate at a voltage exceeding extra low voltage; and
 - (b) conform to AS/NZS 3118.
- (4) The operator of a mine must ensure that effective emergency lighting is readily available, tested and maintained.
- (5) The licensed electrician must ensure that the load of any underground lighting sub-circuit does not exceed 15 amps unless protected by a circuit breaker.
- (6) The licensed electrician must ensure that an effective protective guard is fitted to each light fitting.

11.1.22 Insulation

- (1) The licensed electrician must ensure that the insulation resistance between phase conductors and between outer conductors or between conductors and earth is not less than--
 - (a) 1 megohm in the case of low voltage circuits; or
 - (b) 1 megohm, plus 1 megohm for each 1000 volts in excess of low voltage.
- (2) The licensed electrician must ensure that the resistance of trailing cables is not less than specified in sub-regulations (1)(a) and (b) when measured--
 - (a) between conductors; and
 - (b) between conductors and earth screen, or where the cable has no earth screen, between the conductors and surrounding water in which the cable has been immersed for at least 6 hours.

11.2 TRAILING CABLES

The mine operator must ensure that trailing cables are:

- examined every day for abrasion and other defects; and
- their condition is reported daily

The frequency of inspection and reporting can be reduced to a monthly basis for trailing cables in circuits that contain an appropriate earth leakage protection system.

12. FURTHER INFORMATION

Further information is contained in the following documents:

- Electricity Safety Act 1998 (may be accessed on Website www.dms.dpc.vic.gov.au)
- Electricity Safety (Installations) Regulations 1999 (may be accessed on Website www.dms.dpc.vic.gov.au)
- AS/NZS 3000: 2000 (Wiring Rules)
- AS /NZS 3012: 1995 (Electrical Installations - Construction and Demolition Sites)
- AS/NZS 3760: 2001 (In-service Safety Inspection and Testing of Electrical Equipment)
- AS/NZS 2802: 2000 (Electric Cables - Reeling & Trailing for Mining and General Use (other than underground mining))
- AS 1318: 1985 (Industrial Safety Colour Code)
- AS 1319: 1994 (Safety Signs for the Occupational Environment)
- AS/NZS 4836: 2001 (Safe Working on Low Voltage Electrical Installations)
- AS 1747: 1993 (Reeling, trailing and feeder cables used for mining - Repair and Testing)
- Code of Practice for Safe Electrical Work Low Voltage Installations - OCEI [available on the OCEI Website (Trades People - Electrical - Safety of Electrical Installations - Code of Practice for Safe Electrical Work)]
- Code of Practice on Electrical Safety For Work On or Near High Voltage Electrical Apparatus 1999 (the "Blue Book")
- Guidelines for the Application of the Electricity Safety (Installations) Regulations 1999 (as amended) - Prescribed Electrical Installation Work [available on the OCEI Website (What's New - Guidelines for Changes to Electricity Safety (Installations) Regulations)]
- The Certificate of Electrical Safety System Explained - OCEI [available on the OCEI Website (Trades People - Electrical - Certificates of Electrical Safety)]
- Rules for Operating Near Overhead Power Lines for Cranes, Concrete Placing Booms and Excavating Equipment - OCEI [available on the OCEI Website (Trades People - Electrical - No Go Zone)]
- Further information can be obtained from the OCEI Website www.ocei.vic.gov.au.

APPENDIX 1: DEFINITIONS - PRESCRIBED/NON-PRESCRIBED

1. PRESCRIBED ELECTRICAL INSTALLATION WORK

For the purposes of section 45 of the Electricity Safety Act 1998, “**prescribed electrical installation work**” means any work on all or part of any of the following electrical installations if they are ordinarily operated at low voltage or a voltage exceeding low voltage:

- consumers mains, main earthing systems, consumers terminals connection devices and those parts of main switchboards that are related to the control of installations and the protection against the spread of fire;
- sub-mains, earthing systems and any distribution boards related to the control of individual occupiers’ portions of multiple installations unless the occupier has immediate and unimpeded access to the main switch or switches controlling the whole of the multiple installation;
- electrical equipment installed in a hazardous area described in clause 7.9.2.2 of the Australian/New Zealand Wiring Rules and electrical equipment associated with the protection of such a hazardous area but not installed within the hazardous area;
- high voltage installations except high voltage electrical equipment that is-
 - (i) associated with an electric discharge lighting system; or
 - (ii) associated with X-ray equipment; or
 - (iii) associated with high frequency equipment; or
 - (iv) within self contained equipment supplied at low voltage;
- wiring systems, switchgear, controlgear and accessories installed to provide control and protection of standby generation or co-generation electricity supply systems;
- electric fences used for security purposes but not including electric fences intended primarily for the control or containment of animals;
- wiring systems, switchgear, controlgear and accessories installed to provide control and protection of stand alone power systems;
- fixed electrical equipment installed in body-protected or cardiac-protected electrical areas of hospitals and medical and dental practices.

The Electricity Safety (Installations) Regulations 1999 were amended on 1 February 2001, and Regulation 406 (2) states:

*“For the purposes of section 45 of the Act, “**prescribed electrical installation work**” does not include -*

- (a) the repair or maintenance of a single component part of an electrical installation; or*
- (b) the replacement of a single component part of an electrical installation by an equivalent component part at the same location.”*

Any electrical installation work covered by Regulation 406(2) does not require the responsible person to have the work inspected before use and re-connection to electricity supply by a licensed electrical inspector; however, a Certificate of Electrical Safety for non-prescribed electrical installation work must be issued at the completion of that work. Refer to the OCEI Guidelines for the Application of the Electricity Safety (Installations) Regulations 1999 (as amended) - Prescribed Electrical Installation Work.

2. NON-PRESCRIBED ELECTRICAL INSTALLATION WORK

Non-prescribed electrical installation work is all work other than that listed as prescribed electrical installation work.

APPENDIX 2: USE OF CERTIFICATES OF ELECTRICAL SAFETY (COES)

	PRESCRIBED	NON-PRESCRIBED
When to use	See back of the Prescribed COES or page 3 of the booklet " <i>The Certificate of Electrical Safety System Explained</i> " for a definition of prescribed work. Refer also to the OCEI Guidelines for introduction of "like for like" electrical installation work.	All other work on fixed wiring above ELV (50V AC or 120V ripple-free DC). Refer to the OCEI Guidelines for "like for like" electrical installation work.
What an REC must do (or other Responsible Person)	<ol style="list-style-type: none"> 1. Purchase COES. 2. Ensure COES is completed, signed & issued to LEIWs for all work. 3. Obtain copy of completed COES from LEIWs. 4. Arrange for inspection by a licensed electrical inspector. 5. Lodge required information on COES into IVR. 6. Provide copies of COES to customer, inspector, OCEI, Distribution Business (electricity supplier). 7. Keep 'Responsible Person' copy of COES. 	<ol style="list-style-type: none"> 1. Purchase COES. 2. Ensure COES is completed, signed & issued to LEIWs for all work. 3. Obtain copy of completed COES from LEIWs. 4. Lodge required information on COES into IVR. 5. Provide copies of COES to customer & OCEI (Electricity Supplier may request a copy at times). 6. Keep 'Responsible Person' copy of COES.
What an LEIW must do	<ol style="list-style-type: none"> 1. Ensure work complies with the regulations and standards and is tested. 2. Complete and sign a COES for all work to certify compliance. 3. Provide completed COES to REC (or other responsible person). 	
When to complete & sign	<u>Within 4 business days</u> of completing the work.	
When to register on the IVR	<u>Within 2 business days</u> of completing the certificate of compliance.	
When to arrange inspection	<u>Inspection must occur w/n 8 business days</u> of completing COES.	<u>Not applicable.</u>
When to issue certificate to customer and other parties	<u>Within 4 business days</u> of receiving certificate of inspection.	<u>Within one month</u> of completing the COES.
Special comments & tips	<ul style="list-style-type: none"> • A certificate may be required even if changing a switchboard as planned and the Electricity Distribution Business is not advised/involved. (A truck appointment may apply) Refer to the OCEI Guidelines for "like for like" electrical installation work. • Need to issue a certificate even if work is inspected and found to have defects (defects can be recorded on the certificate). • Where defects are found, need to issue new COES and refer to the original COES number at Item 5. 	<ul style="list-style-type: none"> • If you require a licence to complete the work, you must issue a certificate. • Issue a new certificate each time a circuit or equipment is put into service and made available to the customer for use. • Where defects are found during an OCEI audit, need to issue a new COES and refer to the original COES number at Item 5.
Help & More Information	Refer to the booklet " <i>The Certificate of Electrical Safety System Explained</i> ", " <i>OCEI Guideline for 'like for like' electrical installation work</i> " and to the Electricity Safety Act and Regulations.	

Notes:

1. This is a practical guide only and is not intended to cover all situations. Refer to the Electricity Safety Act 1998 and the Electricity Safety (Installations) Regulations 1999 for full details.
2. This guide assumes that the Registered Electrical Contractor is the person responsible for the work. Where there is no REC responsible, the electrician in charge is the responsible person and takes on responsibility for the tasks listed for RECs in this guide. This may mean that the LEIW is responsible for both REC and LEIW tasks listed above.

FREQUENTLY ASKED QUESTIONS

Do certificates have to be issued in all cases?

Yes, RECs and responsible persons are required by law to issue certificates for prescribed and non-prescribed electrical installation work to help ensure the safety of the public and workers. The certificate also indicates to the customer that the work has been carried out by a registered electrical contractor or a licensed person rather than an unlicensed person. Electrical installation work is “installation, repair, alteration and maintenance”.

When is a job considered completed?

- When any circuit is reactivated (put into service) or made available to the customer for use.
- In practice, this means that you should provide a certificate at the completion of each days work or part thereof if the circuit has been put into service or made available to the customer to use.
- This is not necessarily the same time you invoice the customer (see below).

Can I complete and sign a certificate?

Licence type	Answer – Can I complete and sign a certificate?
Apprentice	No**
E – Electrician	Yes – for his/her own work and that of the person they are supervising
ES – Electrician (supervised)	No** – except for disconnect/re-connect for primary task
L – Supervised worker	No** – except for disconnect/re-connect for primary task
D – Disconnect/re-connect	Yes – related to the primary task
O – Occupiers	Yes
I – Inspectors	No – except for the certificate of inspection on the prescribed certificate.

** If no, the ‘E’ electrician who is providing the effective supervision is to sign the certificate.

Do certificates for non-prescribed electrical work have to be registered on the OCEI IVR telephone system?

Yes, the same as for certificates for prescribed electrical work.

Can non-prescribed electrical work be included on a certificate for prescribed electrical work?

- Only when the non-prescribed electrical work is completed at the same time as the prescribed electrical work
- Note that a new certificate for non-prescribed work is required following a temporary / permanent supply pole for each case where additional non-prescribed work is carried out (e.g. convert single GPO to multiple GPOs within an installation)

Is changing a switchboard as planned work prescribed or non-prescribed work?

- This changing of a switchboard assembly is prescribed electrical work and requires a prescribed certificate of electrical safety.

- Reference should also be made to the OCEI Guidelines for “like for like” electrical installation work.

What is the difference between “Date of Completion of Work” and “Date Certified” on a certificate?

- The date of completion is the actual date the electrical work on the certificate was completed.
- The date certified is the date the COES was completed and certified in writing (signed).

What restrictions apply to the work that can be carried out by supervised workers, apprentices and trades assistants?

(Note – the following table is a simple summary guide only – it does not include all details of electrical work and restrictions on work by these parties)

Description	Restrictions on Work	Notes
Electrician (Supervised) (ES) (B grade licence under old system) OR Supervised Worker (L)	<ul style="list-style-type: none"> • <u>Must be supervised</u>** when carrying out electrical work other than disconnect/re-connect work • Can perform electrical installation work under supervision • Can NOT connect the work to supply • Can NOT sign off on certificates of electrical safety [except for disconnect/reconnect for primary task] 	<ul style="list-style-type: none"> • The supervising licensed electrician must test, connect and sign off on Certificates for work conducted by these workers • These workers need to complete and sign certificates of electrical safety for disconnect/re-connect electrical work
Apprentice	<ul style="list-style-type: none"> • <u>Must be supervised</u>** when carrying out electrical work • Can perform electrical installation work under supervision** • Can NOT connect the work to supply • Can <u>NOT</u> sign off on certificates of electrical safety of any kind <p>** Refer to Regulation 105 for definition of “effective supervision”</p>	<ul style="list-style-type: none"> • The supervising licensed electrician must test, connect and sign off on Certificates for work conducted by apprentices • Upon completion of an apprenticeship, the person has 3 months to obtain a licence, during which time they can continue to work under supervision. After the 3 months, no electrical work can be carried out unless licensed
Trades Assistant	<ul style="list-style-type: none"> • Can <u>NOT</u> carry out electrical work (even if supervised), except: • Work on wiring supports and enclosures under supervision of a licensed electrician • Can <u>NOT</u> install or connect cables • Can dig holes or cart goods/tools 	<ul style="list-style-type: none"> • Need to use other licensed workers or an apprentice to carry out electrical work

APPENDIX 3: ELECTRICAL INCIDENT REPORT FORM

 **ELECTRICAL INCIDENT ON-SITE (INVESTIGATION) FORM**

Incident Number (Communications Number)

Date of Incident

___/___/___

Time of Incident

_____ (00:00 hrs)

Temperature

Weather Conditions (*Rainy, hot, dusty, humid, foggy, fine, cold, etc*)

Address of Incident

Suburb

Postcode

Date of attendance

___/___/___

Time of attendance at incident scene

_____ (00:00 hrs)

1. LEAD OCEI INVESTIGATOR

Name

Date Investigation starts

___/___/___

2. OTHER OCEI INVESTIGATORS

Name

Name

3. OTHER PERSONS INVESTIGATING ON BEHALF OF OCEI

Name

Phone No

() _____

Company

Name

Phone No

() _____

Company

4. POLICE / MEDICAL OFFICER DETAILS – (If applicable)

Name of attending officer

Phone No

() _____

Rank and identification number

Station

Name of attending doctor

Phone No

() _____

Clinic or hospital address

Suburb

Postcode

5. OTHERS ATTENDING SITE – (If applicable)

Name

Company

Phone No

() _____

Name

Company

Phone No

() _____

6. INCIDENT CATEGORY & DETAILS

(a) Category:

- Fatality
- Serious Injury (requiring hospital attendance) – indicate injuries and treatment details below
- Minor Injury (not requiring hospital attendance) – indicate injuries and treatment details below
- Significant Property Damage (requiring attendance of police, ambulance, fire authority or emerg.svcs)
- Minor Property Damage (NOT requiring attendance of police, ambulance, fire authority or emerg.svcs)
- Highly Unsafe Situation (risking fatality, serious injury or significant property damage)
- Technical Defect situation (low risk)
- Other (specify): _____

(b) Type of Premises & Location specifics:

(tick **one** box only)

- | | | | |
|---------------------------------------|--------------------------------------------|-------------------------------------------------|---------------------------------------|
| <input type="checkbox"/> Residential | <input type="checkbox"/> Industrial | <input type="checkbox"/> Commercial | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Agricultural | <input type="checkbox"/> Public Open Space | <input type="checkbox"/> Other (specify): _____ | |

Specific location of incident (bathroom, garage ...)

Name of owner of premises

(c) Was there a Fire?

- Yes No

Provide details of the location of any fire below:

7. VICTIM, INJURY & TREATMENT DETAILS (If applicable)

[Attach additional sheets if there is more than one victim]

(a) Victim Details:

Victim Name	Age	Sex	Phone No () _____
-------------	-----	-----	-----------------------

Residential address

Suburb	Postcode	Fax	Email
--------	----------	-----	-------

(b) Victim Injury Details (tick more than one if appropriate):

Injury Type:

- | | | | |
|----------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------|---------------------------------------------|
| <input type="checkbox"/> Electric Shock | <input type="checkbox"/> Electrical Burns | <input type="checkbox"/> Flash Burns | <input type="checkbox"/> No shock or Injury |
| <input type="checkbox"/> Resulting from fall <input type="checkbox"/> Other (specify): _____ | | | |

Severity of injury / shock:

- Slight Strong Severe

Part of body injured (tick more than one if appropriate):

- | | | | | | |
|-------------------------------|-------------------------------|-------------------------------------------------|--------------------------------|-------------------------------|--------------------------------|
| <input type="checkbox"/> Head | <input type="checkbox"/> Eyes | <input type="checkbox"/> Neck | <input type="checkbox"/> Trunk | <input type="checkbox"/> Arms | <input type="checkbox"/> Hands |
| <input type="checkbox"/> Legs | <input type="checkbox"/> Feet | <input type="checkbox"/> Other (specify): _____ | | | |

(c) Treatment provided to Victim

- Medical treatment Resuscitation Hospitalisation No Treatment

8. ANIMAL INVOLVEMENT *(If applicable)*

Was an Animal involved in the incident? Yes No

Type of animal involved _____

Number of animals injured or killed _____

Did animal cause the incident? Yes No

9. WORK RELATED INCIDENT

Did the incident occur in the course of work? Yes – provide details below: No

Occupation of Victim (tick more than one category if appropriate):

- NWO Electrical Worker
- Licensed Electrician
- Electrical Apprentice
- Registered Electrical Contractor
- Licensed Electrical Inspector
- Other Apprentice

License/REC Number _____

Other Non-Electrical Worker (Specify occupation below)

What work was the victim required to perform?

Employers name _____ Phone No (____) _____

Employers address _____

Suburb _____ Postcode _____ Fax _____ Email _____

10. ELECTRICAL INSTALLATION OR P.O.E.L.

Was a private overhead electric line associated with the incident? Yes No

Which part of the POEL was involved?

- Cross arm
 - Steel
 - Wood
- Pole
 - Wood
 - Concrete
 - Steel
 - Other – Specify _____
- Guy Wire
- Conductor
 - Insulated
 - Copper
 - Aluminium
 - Uninsulated
 - Copper
 - Aluminium
- Insulator
- Pole Mounted Equipment installed at the P.O.E.L.

If yes, give details:

If no, was fixed wiring of a premises associated with the incident? Yes No – **go to 11**

Give details (damaged insulation, faulty switches, uncovered junction box, exposed wire, manufacturer, type, etc...)

Which parts of the installation were involved in the incident?

- Switchboard
- Consumer Mains
 - Underground
 - Overhead
- Fixed Wiring
 - Power
 - Lighting
- Construction Wiring
- Other – Specify _____

Was a safety switch (RCD) installed on the circuit associated with the incident? Yes No

Manufacturer _____ Model No _____

Did the RCD operate? Yes No Don't know

Would you expect the RCD to have operated? Yes No Don't know

If an RCD was NOT installed, would a RCD have prevented the incident? Yes No Don't know

Details of party who undertook electrical work that may have contributed to the incident (NOT victim)

Work undertaken by REC - Name _____ REC No _____ Phone No
() _____

Work undertaken by LEIW - Name _____ LEIW No _____ Phone No
() _____

Work undertaken by LEI - Name _____ LEI No _____ Phone No
() _____

Unlicensed Person's Name _____ Phone No
() _____

Address _____

Suburb _____ Postcode _____

11. ELECTRICITY SUPPLY

(a) Please Select who owns the asset,

- Generation Transmission Distribution Traction

(b) Please indicate which parts of the network were involved in the incident,

- Overhead Conductors
 - Service line
 - Service conductor Al Cu
 - Service type N/S TW ABC Open Other – specify _____
 - LV reticulation
 - Reticulation Conductor Al Cu
 - Conductor Type
 - Insulated
 - Uninsulated
 - ABC
 - If voltage was 22KV tick the appropriate boxes
 - Conductor Type
 - Insulated
 - Uninsulated
 - ABC
- Underground Conductors
 - Service line
 - Mains line
 - HV line
- Public Street lighting circuit
- Tram Trolley wire
- Train overhead wire, positive feeder, catenary, contact
- Pole
 - Wood
 - Concrete
 - Other – Specify _____
- Guy Wire
- Crossarm
 - Type
 - Steel
 - Wood
 - Insulator
 - Polymer
 - Pin
 - Post
 - Disc
 - Other – Specify _____
- Substation
 - Pole mounted Substations
 - Pad mounted Equipment / Kiosk Substation
 - Ground Substation
 - Zone Substation

- Tower
- Switchyard
- Terminal Station
- Power Stations
 - Turbine
 - Boilers
 - Mine
 - Auxiliary System
 - Fuel Handling System

(c) Did the incident involve any of the following? (tick each applicable item)

- Damaged by Tree
- Vehicle hit pole
- HV Injection
- Reversed Polarity
- Tree Pruning
- Lightning

(d) Details of party who undertook electrical work that contributed to the incident (NOT victim)

- Worker
- Contractor
- Sub Contractor
- Other

Specify (eg:-line worker...) _____

Name _____ Phone No
() _____

Address _____ Postcode

Work undertaken:

16. OTHER CONTRIBUTING FACTORS

Briefly describe cloths worn by victim (long/short sleeve shirt, trousers/shorts, overall, dress, skirt, etc...)

Condition of footwear

- Good
- Average
- Poor
- Unknown

Type of footwear

- Bare footed
- Insulated
- Non Insulated
- Unknown

Lighting (or visibility) conditions
Type of floor

- Good
- Poor
- Bad
- Conductive
- Non Conductive
- Dry
- Wet

17. RELEVANT PARTS OF ACTS, REGULATIONS, CODES, STANDARDS

18. WITNESS DETAILS – (if applicable)

Name of first witness _____ Phone No
() _____

Residential address _____

Suburb _____ Postcode _____ Fax _____ Email _____

Name of second witness _____ Phone No
() _____

Residential address _____

Suburb _____ Postcode _____ Fax _____ Email _____

19. ACTION TAKEN BY AND WHOM

Lead Investigator signature _____ Date
____/____/____

Please use the space below for any additional information, diagrams or sketches that may be relevant (record any additional details as necessary in your inspection/investigation book)

APPENDIX 4: INSPECTION AND TESTING

INSPECTION

- Check that cables and equipment are free from external damage.
- Check that live equipment is protected against direct contact.
- Check for any damage or component defects in the accessories, connectors, plugs or outlet sockets.
- Check that any controls are in good working order i.e. they are secure, aligned and appropriately identified.
- Check that covers, guards and the like are secured in the manner intended by the manufacturer or supplier.
- Check that safety facilities and devices are in good working order.
- Check that ventilation inlets and exhausts are unobstructed.
- Check that appropriate items are labelled.
- Check that flexible cords are effectively anchored.
- Check that flexible cords do not have exposed or twisted inner cores or damaged external sheaths.

TESTING

- Test the continuity of the earthing conductor for all protectively earthed equipment.
- Carry out an insulation resistance test.
- Test portable isolation transformers.
- Test the operation of fixed and portable RCDs.
- For electric motors, test the no load current and the full load current.
- Test the operation of emergency stops.
- Test the operation and installation of lanyard systems.

APPENDIX 5: SAMPLE UNDERGROUND CABLE DIAGRAM

