

GUIDELINES FOR ELECTRICAL SAFETY IN QUARRIES



Natural Resources
and Environment

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1 INTRODUCTION

With recent changes to Regulations, quarries in Victoria are now covered by the Electricity Safety Act 1998 and the Electricity Safety (Installations) Regulations 1999. The very nature of quarries presents the potential for risks of an electrical nature, so it is important that all personnel understand the risks and are aware of their obligations.

This publication has been designed for use by quarry managers and quarry workers. It provides essential information on electrical safety, aimed at making quarries safer and reducing the risk of electrical incidents. However, quarry managers, 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 legislative requirements.

This document has been prepared in conjunction with the Department of Natural Resources and Environment (DNRE), and in consultation with the Construction Material Processors Association and the Extractive Industries Association of Victoria Inc. Special thanks are due to Gordyn and Palmer Pty Ltd for their assistance.

1.1 Memorandum of Understanding Between DNRE and OCEI

A Memorandum of Understanding (MOU) is in place between the DNRE and the OCEI to assist workplaces to achieve best levels of health and safety, ensure effective co-operation between the parties and to minimise duplication of effort. 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).

2 DEFINITIONS

For the purpose of this document, the following definitions, taken mainly from the Electricity Safety Act, apply:

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

“**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;

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

“**low voltage**” means between 50 volts and 1000 volts for AC and between 120 volts and 1500 volts for DC;

“**OCEI**” means the Office of the Chief Electrical Inspector;

“**quarry**” means an open-air site for the extraction of materials such as limestone, gravel, clay, etc.;

“**quarry manager**” means a person appointed by the work authority holder in accordance with Part 4 of the Extractive Industries Development Act 1995;

“**registered electrical contractor**” means an electrical contractor who holds a licence 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; and

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

3 RESPONSIBILITIES

All personnel associated with a quarry have responsibilities with regard to electrical safety.

3.1 Quarry Managers

Quarry Managers must:

- 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 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 Electricity Safety Act and the Electricity Safety (Installations) Regulations.

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 work.
- Carry out electrical wiring work to comply with AS/NZS 3000 (Wiring Rules) as amended by the Regulations.
- Ensure that they perform electrical work only of the type for which they are registered or licensed.
- Ensure that they test work in accordance with the regulations.
- Ensure that a Certificate of Electrical Safety is completed as required by the Regulations.
- Ensure that completed prescribed work is inspected by a 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 Act or Regulations.

3.3 Other Workers

Other workers 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.

4 ELECTRICAL WORK IN QUARRIES

4.1 Work On or Near Live Electrical Equipment

Electrical workers in quarries may be called upon to work on or near live exposed electrical equipment. The quarry manager must ensure that an appropriate safe access 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 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
- use of appropriate tools, equipment, barriers and safety apparel
- 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 (Safe Working on Low Voltage Installations).

For high voltage installations, work must be carried out to meet the requirements of the Code of Practice on Electrical Safety For Work On or Near High Voltage Electrical Apparatus 1999 (the “Blue Book”).

4.2 Licensed Electrical Workers

All electrical work must be carried out only by a Registered Electrical Contractor or Licensed Electrical Worker who is licensed, or is authorised under an accepted

electricity safety management scheme, 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 Electricity Safety Act 1998 requires that electrical installation work comply with the Act and regulations and be tested before it is placed into service. Refer to Section 44 of the Act.

Penalties apply for breaches of these requirements.

4.3 Actions When Engaging a Registered Electrical Contractor

Quarry managers 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 quarries.
- 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 quarries must comply with the Electricity Safety Act and Electricity Safety (Installations) Regulations, including AS/NZS 3000 (Wiring Rules). Other appropriate standards are mandated through the adoption of AS/NZS 3000.

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

Where there is any unsafe electrical equipment, the quarry manager must cause it to be removed from the site or to be made safe. Refer to Section 43 of the Act.

Penalties apply for breaches of these requirements.

4.5 Certificate of Electrical Safety

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

The person who is responsible for carrying out electrical installation work must ensure that a certificate of electrical safety is completed and given to the quarry manager and a copy provided to the OCEI, within the required times. For prescribed work, a copy of the certificate must be given to the Licensed Electrical Inspector.

Refer to Section 45A of the Act. Penalties apply for breaches of these requirements.

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

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

A copy of each Certificate of Electrical Safety should be kept on site or at the registered office.

4.6 Inspection of Electrical Installation Work

The Electricity Safety Act 1998 requires that prescribed electrical installation work is inspected by a Licensed Electrical Inspector before being placed into service.

Refer to Section 45 of the Act. Penalties apply for breaches of these requirements.

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 (Electrical Installations - Construction & Demolition Sites). Reference should be made to the agreed industry standard for construction and demolition sites in Victoria.

4.7 Hazardous Areas

Quarries commonly contain hazardous areas (eg. “blue bay”/fuel storage area), which affects the selection and installation of electrical equipment. In general, the quarry manager, as the occupier, is responsible for classifying hazardous areas. Where this is not clear, the quarry manager should obtain advice from a consultant with appropriate expertise, and then discuss the implications for electrical work with the Registered Electrical Contractor. A list of suitable consultants is available from the OCEI.

It should be noted that electrical work in hazardous areas is prescribed electrical work and thus requires the issue of a prescribed Certificate of Electrical Safety and inspection by a Licensed Electrical Inspector.

5 NON-ELECTRICAL WORK NEAR ELECTRIC LINES/EQUIPMENT

5.1 Clearances to Overhead Power Lines

When working under or near overhead powerlines, particularly with heavy equipment or cranes, it is essential to stay clear of the overhead power lines using the “No Go Zone” principles.

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 powerline:

- 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 1 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.

Diagram 1: Overhead Power Lines on Poles

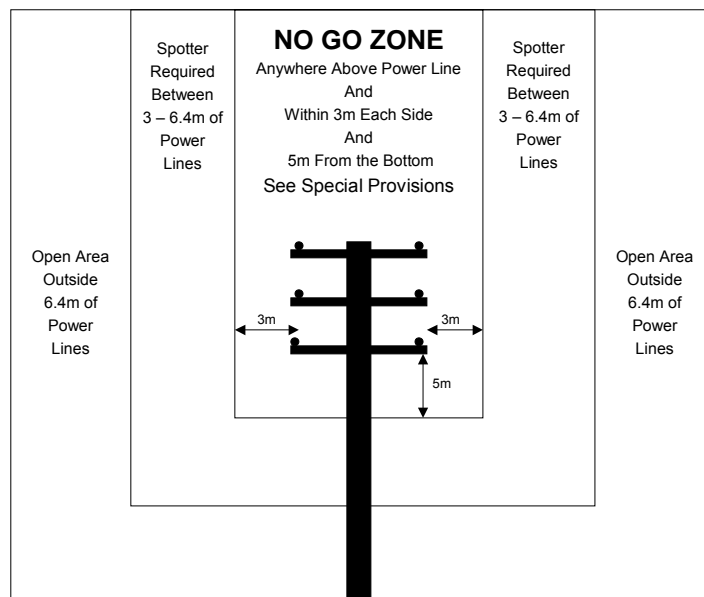
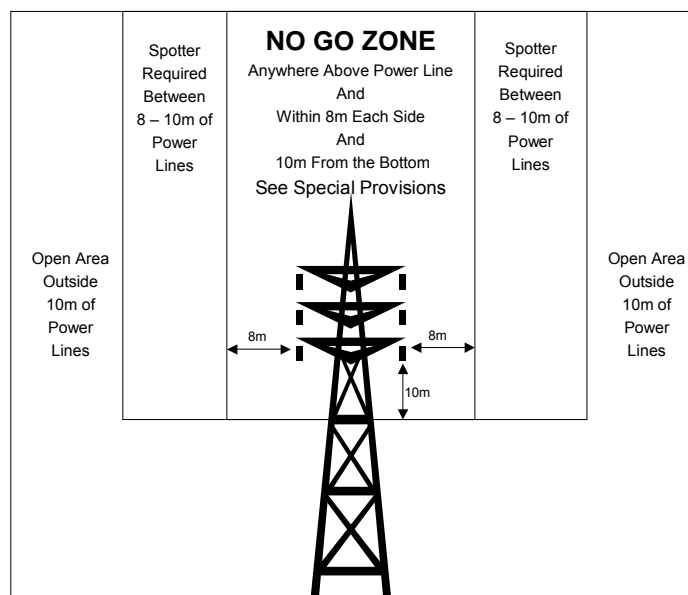


Diagram 2: Overhead Power Lines on Towers



5.2 Excavating

The Electricity Safety (Installations) Regulations (refer 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 regulations 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.

Penalties apply for breaches of these requirements.

5.3 Stockpiling

The Electricity Safety (Installations) Regulations 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 Electricity Safety (Installations) Regulations prohibit blasting, the lighting of fires or the installation of equipment likely to create explosions near an electrical installation. Refer to Regulation 432. Penalties apply for breaches of these requirements.

6 TRAILING CABLES

Trailing cables must comply with AS/NZS 2802 (Electric Cables - Reeling & Trailing for Mining and General Use (other than underground mining)) and be protected from mechanical injury in an appropriate manner.

The quarry manager must ensure that trailing cables are:

- examined every day for abrasion and other defects; and
- their condition is reported daily in the manager'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.

7 INCIDENT RESPONSE AND REPORTING

7.1 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 DNRE (who will advise OCEI) of the incident
- assist relevant authorities (police, coroner, OCEI, DNRE, 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.

7.2 Incident Reporting

The Electricity Safety (Installations) Regulations require that electric shocks and serious electrical incidents be reported to the Office of the Chief Electrical Inspector.

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.

Penalties apply for breaches of these requirements.

It is sufficient for the initial verbal report to be made to the Department of Natural Resources and Environment, who will immediately advise the OCEI. The written report (which should take the form of the Electrical Incident Report Form contained in Appendix 4) may also be submitted to the DNRE who will forward it to the OCEI.

The DNRE contact details are as follows:

DNRE First Response Officer:

Hayden Cater Health and Safety Coordinator
Tel: 94125147 (BH)
Mobile: 0418130121
Home: 98993865

DNRE Second Response Officer:

John Mitas Chief Inspector of Quarries, Regional Mining Engineer
Tel: 94125083 (BH)
Mobile: 0418506172
Home: 93314313

In the event that neither of these officers is available, contact should be made with the Manager Minerals Petroleum Regulation: -

Robert King Manager Minerals & Petroleum Regulation
Tel: 9412 5069 (BH)
Mobile: 0419 135 264
Home: 93752986

8 PROTECTION AND TESTING

8.1 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.

Quarry managers should discuss the location and types of RCD with their Registered Electrical Contractor, and discuss the retro-fitting of RCDs to existing installations.

A residual current device (RCD) may be non-portable (on the switchboard at the origin of the final sub-circuit or at the socket supplying the appliance) or portable (in a portable device connected to a socket-outlet and which supplies the appliance).

In general, testing of RCDs must be carried out in accordance with Clause 6.3 of AS/NZS 3000 (Wiring Rules), and in particular, Clause 6.3.4.3.

8.2 Protection on High Voltage Equipment

All electrical equipment operated at high voltage must be fitted with the following protection:

- an interlocking system which ensures that it is not possible to remove the key opening the switch boxes without isolating the source of supply; and
- an earth leakage trip system on switch gear which disconnects the supply when a fault current exceeds 10 amps; and
- 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.

8.3 HRC Fuses

The quarry manager must ensure that fuses are of a replaceable high rupture capacity type.

8.4 Inspection and Testing

The quarry manager must ensure that 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

Inspection and testing should be carried out by an external party such as a Registered Electrical Contractor or Licensed Electrical Worker, and should cover the activities contained in Appendix 4. The quarry manager should work with the Registered Electrical Contractor to develop a pro forma for inspection and testing.

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.

8.5 Operation of Fuses or Circuit Breakers

After a fuse or circuit breaker has operated, the cause of the fuse or circuit breaker operating must be determined prior to restarting the plant or equipment.

9 ACCESS AND DESIGN

9.1 Access to Transformers and Switch Rooms

The quarry manager must ensure that:

- transformer enclosures are locked and accessible only by Registered Electrical Contractors, Licensed Electrical Workers or other authorised persons; and
- if access is required for operating purposes, into switch rooms and motor starter rooms, all switch gear, conductors and other apparatus are totally enclosed; 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.

9.2 Isolating Switches

The quarry manager 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.

9.3 Safety Signs

The quarry manager 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 quarry manager or other appropriate person.

The quarry manager 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 (Industrial Safety Colour Code) and AS 1319 (Safety Signs for the Occupational Environment); and
- signs required by this clause are maintained in a serviceable condition at all times.

9.4 High Voltage Power Lines

The quarry manager must ensure that high voltage supply lines which are not connected to the National Electricity grid are:

- fitted with appropriate lightning arrestors; and
- located where there is no possibility of fouling or falling on plant, vehicles, machinery or buildings; and
- fitted with a main switch near the entry point of the power supply line.

9.5 Earth Conductors

The quarry manager must ensure that:

- all metal and conductors which are to be earthed are connected by an earthing conductor; and
- 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.

9.6 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 Electricity Safety (Installations) Regulations.

9.7 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 mal-operation of the device.

9.8 Electrical Equipment Identification & Labelling

Quarry managers must 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.
- There is a documented procedure for plant sequences at start up, and operators are suitably trained in that procedure.

9.9 Fire Management

Quarry managers must 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.

9.10 Cabinet Maintenance

Quarry managers must ensure that cabinets:

- Are kept free from dust and moisture.
- Contain no redundant equipment.
- Contain signage and labelling that is current and suitable.

10 RECORDS

10.1 Wiring Diagrams

The quarry manager must keep at the quarry a plan 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 the plan in prominent locations so that it is readily accessible to employees. The siting of such locations should be discussed by the quarry manager with the Registered Electrical Contractor.

10.2 Tests and Inspections

Test and inspection records must 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).

10.3 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.

11 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 (Wiring Rules)

AS /NZS 3012 (Electrical Installations - Construction and Demolition Sites)

AS/NZS 3760 (In-service Safety Inspection and Testing of Electrical Equipment)

AS/NZS 2802 (Electric Cables - Reeling & Trailing for Mining and General Use (other than underground mining))

AS 1318 (Industrial Safety Colour Code)

AS 1319 (Safety Signs for the Occupational Environment)

AS/NZS 4836 (Safe Working on Low Voltage Electrical Installations)

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)]

NOTE: 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

	<i>Prescribed</i>	<i>Non-Prescribed</i>
<i>When to use</i>	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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
<i>What an REC must do (or other Responsible Person)</i>	<ol style="list-style-type: none"> Purchase COES Ensure COES is completed, signed & issued to LEIWs for all work Obtain copy of completed COES from LEIWs Arrange for inspection by a licensed electrical inspector Lodge required information on COES into IVR Provide copies of COES to customer, inspector, OCEI, Distribution Business (electricity supplier) Keep ‘Responsible Person’ copy of COES 	<ol style="list-style-type: none"> Purchase COES Ensure COES is completed, signed & issued to LEIWs for all work Obtain copy of completed COES from LEIWs Lodge required information on COES into IVR Provide copies of COES to customer & OCEI (Electricity Supplier may request a copy at times) Keep ‘Responsible Person’ copy of COES
<i>What an LEIW must do</i>	<ol style="list-style-type: none"> Ensure work complies with the regulations and standards and is tested Complete and sign a COES for all work to certify compliance Provide completed COES to REC (or other responsible person) 	
<i>When to complete & sign</i>	<u>Within 4 business days</u> of completing the work	
<i>When to register on the IVR</i>	<u>Within 2 business days</u> of completing the certificate of compliance	
<i>When to arrange inspection</i>	<ul style="list-style-type: none"> <u>Inspection must occur w/n 8 business days</u> of completing COES 	<ul style="list-style-type: none"> <u>Not applicable</u>
<i>When to issue certificate to customer and other parties</i>	<ul style="list-style-type: none"> <u>Within 4 business days</u> of receiving certificate of inspection 	<ul style="list-style-type: none"> <u>Within one month</u> of completing the COES
<i>Special comments & tips</i>	<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
<i>Help & More Information</i>	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 <i>the Act and Regulations</i>	

- Notes:
- 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.
 - 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.
- (Version current as at 9 May 2001)*

FREQUENTLY ASKED QUESTIONS

1. 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”.

2. 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).

3. 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.

4. 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.

- Notes:
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 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.

(Version current as at 9 May 2001)

5. 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)

6. 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.

7. 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).

- 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.

(Version current as at 9 May 2001)

8. 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
<p>Electrician (Supervised) (ES) (B grade licence under old system) OR Supervised Worker (L)</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Must be supervised** when carrying out electrical work other than disconnect/re-connect work <input type="checkbox"/> Can perform electrical installation work under supervision <input type="checkbox"/> Can NOT connect the work to supply <input type="checkbox"/> Can NOT sign off on certificates of electrical safety [except for disconnect/reconnect for primary task] 	<ul style="list-style-type: none"> <input type="checkbox"/> The supervising licensed electrician must test, connect and sign off on Certificates for work conducted by these workers <input type="checkbox"/> These workers need to complete and sign certificates of electrical safety for disconnect/re-connect electrical work
<p>Apprentice</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Must be supervised** when carrying out electrical work <input type="checkbox"/> Can perform electrical installation work under supervision** <input type="checkbox"/> Can NOT connect the work to supply <input type="checkbox"/> Can NOT 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"> <input type="checkbox"/> The supervising licensed electrician must test, connect and sign off on Certificates for work conducted by apprentices <input type="checkbox"/> 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
<p>Trades Assistant</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Can NOT carry out electrical work (even if supervised), except: <input type="checkbox"/> Work on wiring supports and enclosures under supervision of a licensed electrician <input type="checkbox"/> Can NOT install or connect cables <input type="checkbox"/> Can dig holes or cart goods/tools 	<ul style="list-style-type: none"> <input type="checkbox"/> Need to use other licensed workers or an apprentice to carry out electrical work

- 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.
- (Version current as at 9 May 2001)

APPENDIX 3: ELECTRICAL INCIDENT REPORT FORM



ELECTRICAL INCIDENT REPORT FORM

for reporting of electrical incidents reported under regulation 414 of the
Electricity Safety (Installations) Regulations 1999

NOTE:

Complete all details known
Unless otherwise indicated, tick as many boxes as are relevant
Where space is insufficient please attach separate sheets.

Office of the Chief Electrical Inspector
PO Box 262 Collins Street West
MELBOURNE VIC 8007
Facsimile: (03) 9686 2197

1) PERSON ATTENDING THE INCIDENT

Name

Company

Date of incident

Time of incident
am/pm

Date reported to Network Operator

Date attended by Network Operator

2) LOCATION DETAILS OF INCIDENT

Incident address

Suburb/Town

Postcode

Type of premises (tick **one** box only)

Residential Industrial Commercial

Construction

Other, Specify _____

Specific location (bathroom, garage ...)

Name of owner of premises

3) PERSONAL DETAILS OF INJURED PERSON (if applicable)

Surname

Given name

Age

Sex

Phone or Mobile phone

Residential address

Suburb/Town

Postcode

4) INCIDENT CATEGORY

Minor Serious Fatal Property damage or Safety issues

5) INJURIES and TREATMENT DETAILS

Electric shock Electrical burns Flash burns No shock or injury
 Resulting from fall Other - Specify _____

Severity of injury / shock

Slight

Strong

Severe

Part of body

Head

Eyes

Neck

Trunk

Arms

Hands

Legs

Feet

Other - Specify _____

Treatment

Medical treatment

Resuscitation

Hospitalisation

6) ELECTRICAL INSTALLATION

Was fixed wiring of a premises associated with the incident? Yes No, **Go to 7**

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

Was a safety switch (RCD) installed on the circuit associated with the incident?

Yes

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

12) OTHER CONTRIBUTING FACTORS

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

Type of shoes <i>(cold, etc...)</i>	Condition of shoes	Weather condition (<i>Rainy, hot, dusty, humid, foggy, fine,</i>
_____	_____	_____

Lighting (or visibility) conditions	<input type="checkbox"/> Good	<input type="checkbox"/> Poor	<input type="checkbox"/> Bad
Type of floor	<input type="checkbox"/> Conductive	<input type="checkbox"/> Non conductive	<input type="checkbox"/> Dry
			<input type="checkbox"/> Wet

13) WORK RELATED INCIDENT

Did the incident occur in the course of work? Yes No, **Go to 14**

Occupation

Victim was Distribution Company Worker Other Electrical Worker Non-Electrical Worker
 Other - Specify _____

What work was the victim required to perform?

Employer's name	Phone or Mobile phone
_____	_____
Employer's address	Suburb/Town
_____	_____
	Postcode

14) WITNESS DETAILS - (if applicable)

Name of the first witness	Phone or Mobile phone
_____	_____
Residential address	Suburb/Town
_____	_____
	Postcode

Name of the second witness	Phone or Mobile phone
_____	_____
Residential address	Suburb/Town
_____	_____
	Postcode

15) POLICE/ MEDICAL OFFICER DETAILS - (If applicable)

Name of attending officer	Phone or Mobile phone
_____	_____
Rank and identification number	Station
_____	_____
Name of attending doctor	Phone or Mobile phone
_____	_____
Clinic or hospital address	Suburb/Town
_____	_____
	Postcode

16) CONTACT PERSON FOR THE REPORT

Name	Phone or Mobile phone
_____	_____

17) PERSON SUBMITTING DETAILS

Name	Phone or Mobile phone
_____	_____
Title	Company
_____	_____
Signature	Date
_____	_____

Please use the space below for any additional information, diagrams or sketches that may be relevant.

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

