

Office of the Chief Electrical Inspector

L I C E N S E D E L E C T R I C A L I N S P E C T O R

M A N U A L



Inspection and testing of electrical installation work

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Review Process for this Manual

These Guidelines were developed by the OCEI to facilitate the inspection of electrical installation work as required by the Electricity Safety Act 1998 and the Electricity Safety (Installations) Regulations 1999.

Suggestions for improvements of these guidelines, in writing and addressed to Bill te Wierik, Senior Compliance Officer, Office of the Chief Electrical Inspector, PO Box 262 Collins Street West, Victoria 8007, are welcome.



1. DEFINITIONS

ACT	Electricity Safety Act 1998
AUDIT	Electrical testing and inspection of non-prescribed electrical installation work as required by the OCEI audit program
CEI	Chief Electrical Inspector
COES	Certificate of Electrical Safety
ELECTRICAL EQUIPMENT	Any appliance, wire, fitting, cable, conduit or apparatus that generates, uses, conveys or controls electricity
ELECTRICAL INSPECTION WORK	Testing, inspection or certification of electrical equipment
ELECTRICAL INSTALLATION	Electrical equipment that is fixed or to be fixed in, on, under or over any land
IVR	Interactive Voice Response
LEI	Licensed Electrical Inspector
LEIW	Licensed Electrical Installation Worker
NPEIW	Non-Prescribed Electrical Installation Work
OCEI	Office of the Chief Electrical Inspector
PEIW	Prescribed Electrical Installation Work
REGULATIONS	Electricity Safety (Installations) Regulations 1999
RP	Responsible Person (REC, Person or Worker) as defined in section 41A of the Act

2. SCOPE

This document is to provide guidance to all LEIs engaged in electrical inspection work and/or audit ensuring that electrical installation work complies with the requirements of the Act and Regulations.

A LEI is a person who has the qualifications, experience and demonstrated competence and proficiency in electrical inspection and is licensed to carry out electrical inspection work of any or all of the classes prescribed in Part A of Schedule 4 of the Regulations.

The guidelines should enable effective electrical inspection work and audit of the various classes of electrical installation work to be achieved with the aim of meeting uniform electrical inspection standards in Victoria.

Note: These inspection guidelines are limited to the more common classes of prescribed electrical installation work.

Note: These guidelines intend to maintain inspection and audit at the level previously carried out in accordance with the Victorian Electricity Supply Industry (VESI) 'Installations Manual' procedures and work instructions.

3. INTRODUCTION & APPLICATION

Objective:

The overall objective of these guidelines is to enable LEIs to test and inspect electrical installation work in a safe and responsible manner that complies in all respects with the standards required by the OCEI and in accordance with the requirements of the Regulations and Part 3 Division 3 of the Act.



General:

Electrical inspection work must be performed by a LEI holding the relevant class of licence appropriate to the type of electrical installation work. Refer to Appendix 'E' & 'F' for the LEI class eligible to test and inspect the relevant type of prescribed electrical installation work.

Electrical inspection work includes the completion of a certificate of inspection (forming part of the COES) details and other associated paperwork, i.e.; notification, and other relevant information pertaining to the installation.

An audit may be based on a LEIW previous performance, and may be selected by the OCEI using information from the COES system. In general, all LEIW's shall be subject to an audit.

A person who is responsible for the carrying out of prescribed electrical installation work must ensure that work is inspected by a licensed electrical inspector in accordance with the regulations before the electrical installation is connected to the electricity supply, or if the electrical circuits or electrical equipment handled in the course of the work were not disconnected from the electricity supply, before the work is first used after it is completed.

Application:

These guidelines apply to the following,

- **Inspection:** *The inspection of the prescribed electrical installation work described on the certificate of electrical safety must include the inspection and those tests required by the Electricity Safety (Installations) Regulations 1999.*
- **Audit:** *An audit shall include the inspection and tests required by the OCEI (as described in Section 15 of these guidelines) of all non-prescribed electrical installation work described on the certificate of electrical safety.*
- **Other:** *To investigate and report on electrical safety matters following an OCEI request. This may include instances where the electrical safety of an installation may have been compromised and may result in imminent danger to any person or property.*

Note: The OCEI reserves the right to inspect and test any electrical installation work.

4. OBLIGATION OF A LICENSED ELECTRICAL INSTALLATION WORKER

For the purposes of section 44(1)(b) of the Electricity Safety Act 1998 and Regulation 405 of the Electricity Safety (Installation) Regulations 1999, electrical installation work must be tested after it is completed and before inspection or certification under the Act to verify that the installation work complies with regulation 401. Regulation 401 of the Electricity Safety (Installation) Regulations 1999 requires compliance with the Australian/New Zealand Wiring Rules.

The following tests, mandated in the Australian/New Zealand Wiring Rules, shall be carried out on the electrical installation:

- (a) *Continuity of the earthing system (earth resistance of the main earthing conductor, protective earthing conductors and bonding conductors).*
- (b) *Insulation resistance*
- (c) *Polarity*
- (d) *Correct circuit connections.*

If the electrical installation fails a test, that test and any preceding tests that may have been influenced by the fault indicated shall be repeated after the fault has been rectified.



5. OBLIGATIONS OF A RESPONSIBLE PERSON

Section 45(1) of the Act states that,

a person who is responsible for the carrying out of prescribed electrical installation work must ensure that that work is inspected by a licensed electrical inspector in accordance with the Regulations before the electrical installation is connected to the electricity supply, or if the electrical circuits or electrical equipment handled in the course of the work were not disconnected from the electricity supply, before the work is first used after it is completed.

Penalty: *In the case of a natural person, 40 penalty units (\$4,000)
In the case of a body corporate, 200 penalty units (\$20,000)*

Regulation 407(1) of the Regulations states that,

for the purposes of Section 45(1) of the Act prescribed electrical installation work must be inspected by a licensed electrical inspector within 8 business days after the completion of that work.

A Responsible Person, as defined in Section 41A of the Act, is the person who is responsible for the carrying out of electrical installation work and being a reference –

- (a) to a registered electrical contractor, if the registered electrical contractor is engaged to carry out the work ; or*
- (b) to a person in a prescribed class of persons, if that person is engaged to carry out the work;*
- (c) if paragraphs (a) and (b) do not apply and the work is carried out by a licensed electrical installation worker under the supervision of another licensed electrical installation worker, to the licensed electrical installation worker who supervised the work;*
- (d) if paragraphs (a), (b) and (c) do not apply, to the licensed electrical installation worker who carried out the work.*

The person who is responsible for the carrying out of the electrical installation work must, in accordance with the regulations, give electronic notification of completion of the certificate of compliance (other than a certificate of compliance that is part of a periodic certificate of electrical safety) to the OCEI within 2 business days after that completion – refer Regulation 412 of the Electricity Safety (Installations) Regulations 1999.

Note: *If the Certificate of Electrical Safety is filled out on day 5, the Certificate must be lodged before the end of day 5.*

6. OBLIGATIONS OF A LICENSED ELECTRICAL INSPECTOR

Regulation 407(2) of the Regulations states,

The inspector must not inspect prescribed electrical installation work unless the inspector has a copy of the certificate of compliance for that electrical installation work

Regulation 407(4) of the Regulations states,

The licensed electrical inspector inspecting the prescribed electrical installation work must not be the licensed electrical installation worker who carried out the work or any other person referred to in section 41A of the Act who is responsible for the carrying out of the work.

Section 45(4) of the Act states that an LEI must not sign a certificate of inspection for any prescribed electrical installation work unless the certificate –

- describes the work;
- states that the LEI has inspected the work;
- states whether or not the work complies with the Act and the Regulations; and
- contains any other details in relation to the work required by the Regulations.

Note: *The description of the work should be accurate to enable the actual work to be clearly identified.*

The LEI inspecting the prescribed electrical installation work must, if satisfied that the work is not installed in compliance with the Act or the Regulations, include the relevant defect codes on the certificate of inspection and notify the electrical contractor or electrical installation worker who was responsible for the carrying out the work describing the defects relating to that work.



A LEI who carries out an inspection of prescribed electrical installation work must within 4 business days after the completion of the inspection, give to the person who is responsible for the carrying out of the work a signed certificate of inspection in respect of that work and give electronic notification of completion of the certificate of inspection to the OCEI.

The LEI must retain a copy of the certificate of inspection for 3 years after the date the LEI signed the certificate.

7. OBLIGATIONS OF ELECTRICITY SUPPLIERS

Section 45(2) of the Act states that,

before an electricity supplier first connects an electrical installation to an electricity supply, the electricity supplier must ensure that a certificate of inspection of the prescribed electrical installation work in relation to that installation has been issued by a licensed electrical inspector in accordance with this section.

Penalty: *In the case of a natural person, 40 penalty units (\$4,000)*
In the case of a body corporate, 200 penalty units (\$20,000)

8. PROCEDURES FOR DATABASE ACCESS

Refer to the OCEI's handbook (*The Certificate of Electrical Safety System – Explained*) for instructions on accessing the COES database. This will permit the submitting of all electrical inspection work details including the relevant defect codes as required by the Act and/or Regulations by using the IVR system.

9. SAFETY OF ELECTRICAL INSTALLATIONS

The Act defines the responsibilities imposed on persons installing electrical equipment, or on occupiers and owners of premises which contain electrical equipment and/or which may form part of an electrical installation.

Section 43 (1) (2) & (3) of the Act states that,

(1) *a person must not install any electrical equipment which the person knows or should reasonably be expected to know is unsafe or will be unsafe if connected to an electricity supply,*

Penalty: *40 penalty units (\$4,000)*

(2) *the occupier of any premises in which there is unsafe electrical equipment must-*

- (a) *cause the electrical equipment to be removed from the premises or to be made safe; or*
- (b) *in the case of electrical equipment forming part of an electrical installation, notify the owner of the premises of the unsafe electrical installation.*

Penalty: *40 penalty units (\$4,000)*

(3) *an owner of premises who is notified under sub-section (2) must cause the electrical installation to be removed from the premises or to be made safe.*

Penalty: *In the case of a natural person, 40 penalty units (\$4,000)*
In the case of a body corporate, 200 penalty units (\$20,000)

10. UNSAFE ELECTRICAL INSTALLATIONS

From time to time situations may arise where a LEI may be confronted with unsafe or potentially dangerous electrical installation work or equipment. In some cases this may not directly relate to the inspection or audit work being carried out.



The following actions should be considered:

Where the occupier/owner agrees,

arrange for,

- isolation and safe disconnection of any defective circuit wiring or equipment from the source of electrical supply, e.g. switchboard, junction box, accessory or other location; or
- insulation and protection of any live exposed sources of electrical supply; or
- installation of appropriate barriers or mats; or
- other actions as deemed necessary to achieve satisfactory safety outcomes; and
- confirmation in writing, to the occupier/owner, of the:
 - (i) *details relating to the unsafe circuit wiring or equipment; and*
 - (ii) *occupier/owner's responsibilities under section 43 of the Act.*

Where the occupier/owner does not agree,

- notify the occupier/owner verbally and advise that you will immediately follow up in writing:
 - (i) *the details relating to the unsafe circuit wiring or equipment; and*
 - (ii) *the occupier/owner's responsibilities under section 43 of the Act; and*
 - (iii) *that you will be disclosing this information to the OCEI for the purpose of alerting the appropriate person/s regarding the existence of unsafe electrical installations.*
- notify the OCEI immediately by telephone and follow up in writing all details without delay. The details should include the date, occupier/owner's name, contact details, location address and the precise nature of the unsafe defect/s.

Note: Refer to Appendix I for a pro-forma letter that may assist in formally notifying the occupier/owner of the defects and their statutory obligations under the Act. This letter is available on the OCEI's Internet Website at < www.ocei.vic.gov.au >.

Licensed Electrical Inspectors do not have the power of entry to enter any premises unless authorised as an enforcement officer by the Office of the Chief Electrical Inspector.

11. DOCUMENTATION, EQUIPMENT & SAFETY APPAREL

The basic list of documentation and minimum equipment deemed necessary to carry out electrical inspection and auditing work, in a safe and effective manner, are listed below. It is recognised that inspection of some classes of prescribed electrical installation work may require additional documentation, equipment and safety apparel to that listed.

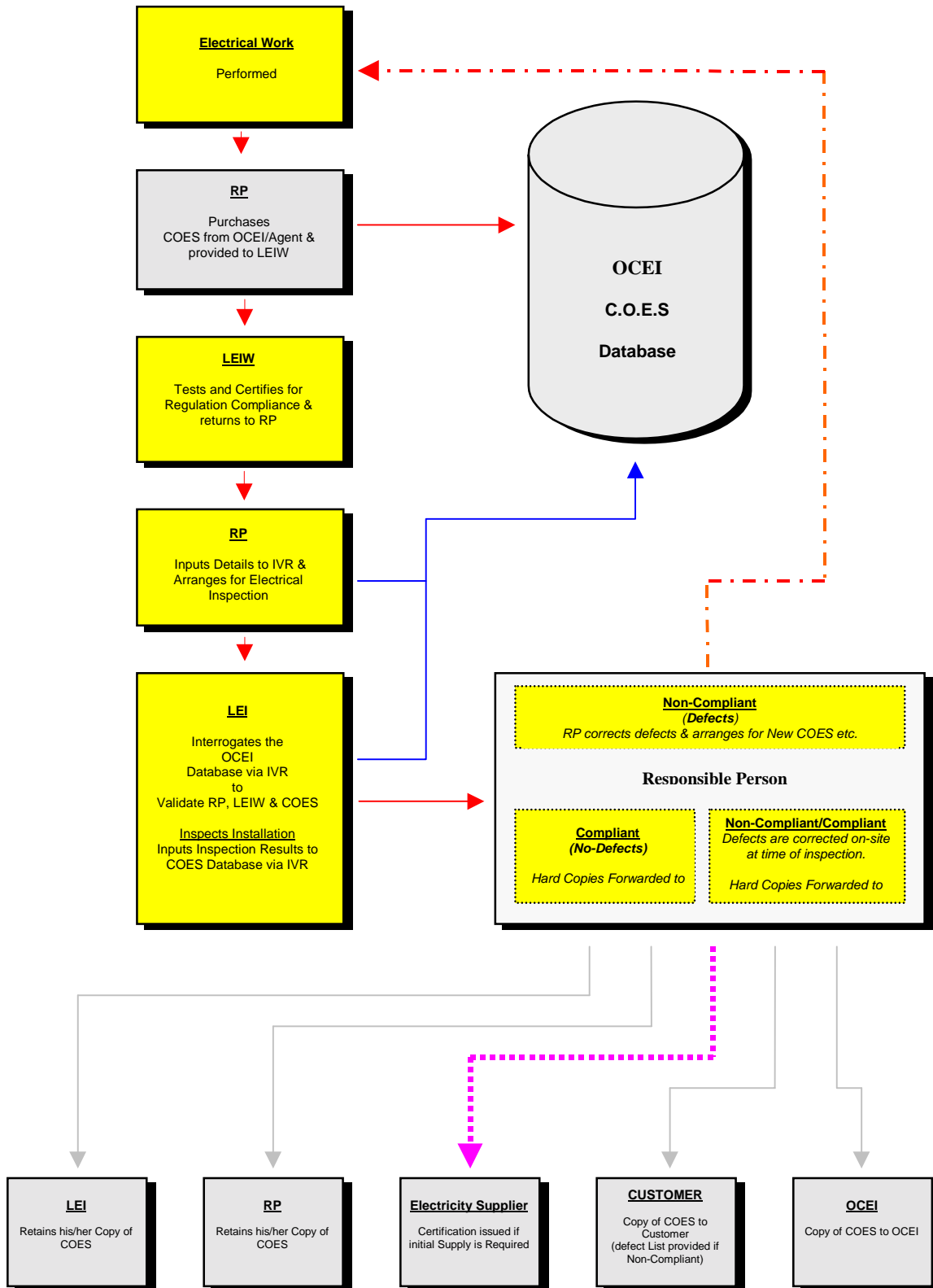


Identification	Inspectors Licence (Identity Details)
Act	Electricity Safety Act 1998 (as amended from time to time)
Regulations	Electricity Safety (Installations) Regulations 1999 (as amended from time to time) Electricity Safety (Network Assets) Regulations 1999 (as amended from time to time) Note: <i>Legislation and Regulations are updated from time to time and current versions may be found on the Victorian Court Internet Website < www.dms.dpc.vic.gov.au/12d/index.html > under "Victorian Law Today".</i>
Standards	AS/NZS 3000 – Electrical Installations – Buildings, Structures and Premises (Wiring Rules) AS/NZS 3001 - Electrical Installations – Moveable Premises (incl Caravans & their Site Installations) AS/NZS 3008.1.1 – Electrical Installations – Selection of Cables AS/NZS 3012 - Electrical Installations – Demolition & Constructions Sites AS/NZS 3017 - Electrical Installations – Testing Guidelines AS 3002 - Electrical Installations – Shows & Carnivals AS 3004 - Electrical Installations – Marinas & Pleasure Craft at Low Voltage AS 3010.1 - Electrical Installations – Supply by Generating Set
Codes of Practice	Safe Electrical Work for Low Voltage Electrical Installations Electrical Safety for Work On or Near High Voltage Electrical Apparatus (The Blue Book)
Listings	Registered Electrical Contractors details (<i>available from OCEI</i>) OCEI Defect Listing Details (<i>hard copy available from OCEI or via the OCEI's Internet Website < www.ocei.vic.gov.au ></i>)
Test Equipment	<p>The requirements for test equipment should include,</p> <ul style="list-style-type: none">• 'Danger – Installation Under Test' Signs• Insulation Resistance Tester (<i>the insulation resistance tester used shall be able to maintain its terminal voltage within +20%, -10% of the nominal open circuit terminal voltage, when measuring a resistance of 1MΩ on the 500 volt range or 10MΩ on the 1,000 volt range</i>)• Circuit Continuity Tester (<i>of accuracy Class 5 or better – Class 5 denotes an accuracy of 5% full scale deflection</i>)• Multi-meter• 415/240volt Voltage Tester (3 Neon Tube Tester)• Lead & Reel Earth Set (Trailing Lead) or Resistor Block Tester• Tong Tester (Preferably with residual current (mA) range)• Earth Loop Impedance Tester (<i>may be required</i>)• RCD Tester (<i>may be required</i>) <p>The above testing equipment should be subjected to routine calibration and effectiveness, on a regular basis, to ensure its accuracy and suitability is maintained at all times.</p>
Safety Apparel (<i>appropriate to Australian Standards</i>)	<ul style="list-style-type: none">• Eye Protection• Safety Footwear• Safety Gloves (Insulated - Electrical)• Noise/hearing protection• Safety Clothing• Safety Belt/Harness• Safety Helmet
General	<ul style="list-style-type: none">• Ladder (Non-conductive)• Step-ladder (Non-conductive)• Street / Location Maps – Melways• VicRoads, CFA maps (<i>may be required</i>)

LEIs should understand that all documentation must be kept up to date and current and in a legible form, this includes all amendments. All equipment and safety apparel must be maintained in a safe and operable condition.

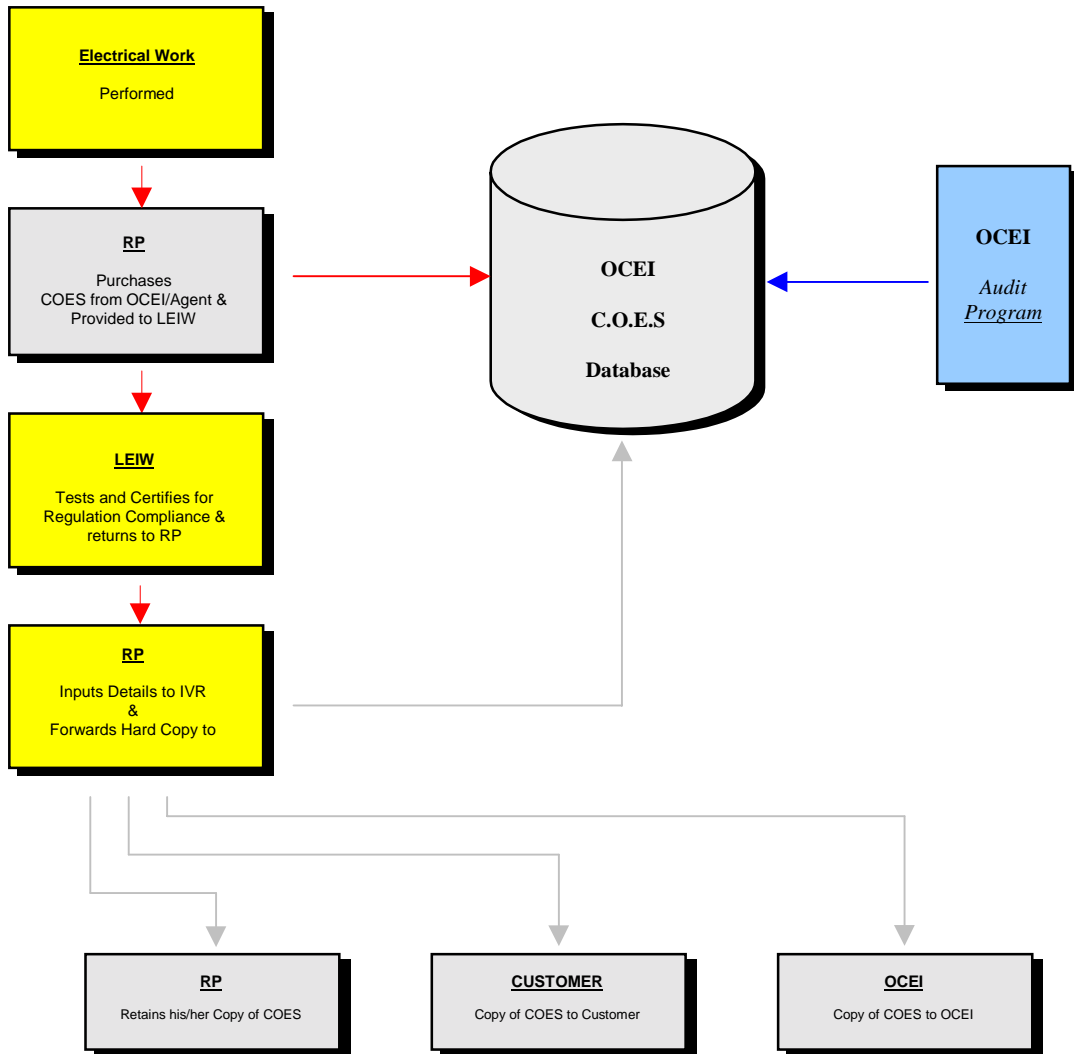


12. FLOW CHART – PRESCRIBED ELECTRICAL INSTALLATION WORK





13. FLOW CHART – NON-PRESCRIBED ELECTRICAL INSTALLATION WORK





14. PRESCRIBED ELECTRICAL INSTALLATION WORK

Application

Prescribed electrical installation work includes 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-

- (a) consumers mains, main earthing systems and those parts of main switchboards that are related to the control of installations and the protection against the spread of fire;
- (b) 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.

- Note*
- 1. Reference should be made to any declaration made under Section 4 of the Electricity Safety Act 1998 and Electricity Safety (Installations) Regulations 1999 whereby certain provisions of the Act or Regulations do not have effect.
 - 2. This is not a full list of Prescribed Electrical Installation Work - refer to Appendix E.

Prospective Fault Current

Consideration must be given to the prospective fault current available from an electricity supplier distribution system when determining the suitability of electrical equipment installed within the installation. The installation must be designed to withstand, without damage, the maximum currents, which may occur under fault conditions such as short circuit.

The magnitude of the prospective fault current that is available at the consumers terminals may be obtained from the electricity supplier.

In general, electricity suppliers have indicated that where supply is provided in a residential underground reticulated distributed mains area, the prospective fault current at the consumers terminals shall be deemed to be 3,000 amperes single phase and 6,000 amperes three phase symmetrical.

The Inspection and Testing must include:

- (a) Inspection/testing should where practicable include, but not be limited to, the following:
 - visual inspection
 - continuity of circuits
 - earth resistance
 - switching
 - short circuit
 - polarity
 - insulation resistance
- (c) Inspection of the main switchboard assemblies for compliance including (refer to Appendix A for ensuring switchboard suitability prior to site installation)
 - marking of switchboard equipment,
 - access to main switch/es,
 - location, accessibility, clearances of switchboard/s,
 - construction and type of switchboard/s,
 - current rating of control and protective device/s (if applicable),
 - earthing of any exposed conductive parts forming part of switchboard cases, surrounds & enclosures and/or wiring enclosures.



- (d) Inspection & test of the consumers mains including;
 - adequate current carrying capacity,
 - installation method,
 - mechanical protection
 - required clearance at the point of attachment,
 - voltage drop,
 - cable insulant,
 - insulation resistance test of all live conductors,
 - polarity test of the consumer's mains,
 - earthing of any exposed conductive parts associated with consumers mains and/or wiring enclosures.
- (e) Inspection & test of the earthing conductors & electrode;
 - size of main earth and any equipotential conductor/s determined to be part of the main earthing system,
 - installation of conductor/s and electrode,
 - electrode type,
 - mechanical protection.
 - resistance test of the installation earthing system including the main earthing conductor to the earth electrode.
- (f) Conductor switching operation of switches and circuit breakers.
- (g) Connection of the MEN point.

Note: Refer to Section 6 of AS/NZS 3000:2000 (Testing and Verification)

Inspection Guidelines

- (1) Ensure you are at the correct electrical installation.
- (2) If the occupier or owner is in attendance, state the purpose of your visit, and produce your Licence if requested.
- (3) Avoid any possible damage to the customer's property by your equipment or actions.
- (4) Ensure appropriate safety apparel is being worn and the work environment is suitable to perform the work safely.
- (5) Check testing equipment to ensure it is functioning correctly.
- (6) Test to ensure that any exposed conductive parts of meter box and switchboard enclosures are not live.
- (7) Ensure that all circuits, electrical equipment, switchboards, etc. are not live or that other adequate precautions are taken to prevent inadvertent contact with live parts.
- (8) Place "Danger - Installation Under Test" sign at the switchboard and/or meter position as appropriate.
- (9) Test and inspect consumer's mains for compliance.



- (10) Remove the main earthing conductor from the neutral bar or link as appropriate.
- (11) Remove the main neutral conductor from the neutral bar or link if appropriate.
- (12) Test the resistance of the main earth.
- (13) Test earthing resistance of any exposed conductive parts of the main switchboard and metering enclosure required to be earthed.
- (14) Test the resistance of the equipotential bond at exposed conductive parts required to be bonded.
- (15) Test insulation resistance between earth and the consumer's mains.
- (16) Test insulation resistance between conductors of any underground portion of consumer's mains.
- (17) Test earthing resistance of all exposed conductive parts required to be earthed.
- (18) Inspect, and if appropriate, test the main switchboard assembly for compliance with the Regulations including marking, access to main switches, construction, location, accessibility, clearances and provisions to prevent the spread of fire and risk from electric shock.
- (19) Inspect readily available (as defined in AS/NZS 3000) fixed wiring, accessories and fixed wired equipment. *e.g. ceiling and floor spaces.*
- (20) Inspect, and if appropriate, test any distribution board forming part of a multiple installation (where deemed to be prescribed work for the purposes of the Regulations) for compliance with the Regulations including protective and isolation devices, marking, access to main/isolation switches, construction, location, accessibility, clearances and provisions to prevent the spread of fire and risk from electric shock.
- (21) Inspect and test for compliance with the Regulations, sub-mains to any distribution board, forming part of a multiple installation (where deemed to be prescribed work for the purposes of the Regulations), including protective and isolation devices (where required) installed on the main switchboard.
- (22) Ensure correct operation of all main switches.
- (23) Connect the main earthing conductor and the main neutral conductor to the neutral bar or link.
- (24) Replace switchboard covers, escutcheons and doors.
- (25) At the completion of inspection & test, ensure that the installation is left in a safe condition.
- (26) Complete appropriate paperwork ie. the Certificate of Inspection, record defects (if any) and other relevant information pertaining to the installation.
- (27) Input the results of the inspection via the IVR to the OCEI's - COES database or use the lodging facility on the OCEI's Website.

Note: AS/NZS 3017 – Electrical Installation - Testing Guidelines; may be used as a method to carry out testing.

Refer to Appendix I for a pro-forma that may assist in notifying the RP of the defects relating to the work.



15. NON - PRESCRIBED ELECTRICAL INSTALLATION WORK

Application

To carry out an audit of electrical equipment, electrical installations and electrical installation work for compliance with the Act and Regulations.

An audit shall cover the tests and inspection required by the OCEI of all non-prescribed electrical installation work described on the certificate of electrical safety.

Any audit of non-prescribed electrical installation work may only be carried out by an electrical inspector who is licensed to inspect '**G**' class of electrical installation work. (*i.e. any low voltage electrical installation work other than classes; L, H, S, F, R & M*).

It is recognised that there may be instances due to the nature of the electrical installation which does not reasonably permit access to electrical equipment for the purposes of testing and inspection.

However, the LEI must ensure that, at the completion of the audit process, he/she is satisfied that the non-prescribed electrical installation work being audited complies with the Regulations and the electrical installation is safe.

Note: *A visual inspection of the main switchboard and the main earthing system may be necessary to verify that their integrity has not been affected by any additional electrical installation work or any alteration and/or modification to the metallic water piping system associated with the electrical installation.*

Selection

Audits may be based on a LEIW previous performance, and may be selected by using information provided by the OCEI's COES database system.

LEIW's shall be subject to an audit for a minimum of 10% of non-prescribed electrical installation work notified and recorded by the OCEI.

Audit Guidelines

- (1) Ensure you are at the correct installation.
- (2) If the occupier/owner is in attendance, state the purpose of your visit, and produce your Inspector's Licence if requested and seek permission to conduct an audit of the electrical installation work.
- (3) Seek the occupier/owner's agreement to disconnect supply where necessary for the purposes of testing and inspection.
- (4) Avoid any possible damage to the customer's property by your equipment or actions.
- (5) Ensure appropriate safety apparel is being worn and the work environment is suitable to perform the work safely.
- (6) Ensure that the electrical installation is de-energised or other safety measures are undertaken prior to carrying out inspection and/or testing.
- (7) Place "Danger - Installation Under Test" sign at the switchboard and/or meter position as appropriate.
- (8) Check testing equipment to ensure it is functioning correctly.
- (9) Test insulation resistance of fixed wiring and equipment.
- (10) Test socket outlets for correct polarity, polarisation, switching and earthing.
Note: *Where socket outlets are not accessible and equipment required to be earthed is*



connected by a plug, an earthing test should be effected to exposed conductive parts, to verify an effective earth, of the equipment.

- (11) Test earthing resistance of exposed conductive parts required to be earthed.
- (12) If appropriate, inspect and test any switchboard assembly for compliance with the Regulations including all protective and isolation devices marking, access to switches, construction, location, accessibility, clearances and provisions to prevent the spread of fire and risk from electric shock.
- (13) Visually check and/or test to ensure appropriate GPO's and socket outlets are RCD protected where required.
- (14) Ensure that final subcircuits are individually protected by an appropriately rated device.
- (15) Inspect circuits for correct conductor size, loading and correct functioning for the use intended to avoid danger and minimize inconvenience.
- (16) Ensure correct operation of all main switches.
- (17) Inspect the rear of selected switches and/or socket outlets to ascertain clearances from any conductive building materials, wiring methods and termination of conductors.
- (18) Inspect readily available (as defined in AS/NZS 3000) fixed wiring, accessories and fixed wired equipment. *e.g. ceiling and floor spaces.*
- (19) Replace switchboard covers, escutcheons and doors.
- (20) Ensure installation at completion of inspection & test is left in a safe condition.
- (21) Re-instate electrical supply where appropriate.
- (22) Complete appropriate paperwork ie; record of COES, defects recording and notification and other relevant information pertaining to the installation.
- (23) Input the results of the inspection via the IVR to the OCEI's - COES database or use the lodging facility on the OCEI's Website.

Note: AS/NZS 3017 – Electrical Installation – Testing Guidelines may be used as a method to carry out testing.

Refer to Appendix I for a pro-forma that may assist in notifying the RP of the defects relating to the work.

Refer to Section 6 of AS/NZS 3000:2000 (Testing and Verification)

16. NOTIFICATION OF DEFECTS

To OCEI

The LEI inspecting the prescribed electrical installation work must, if satisfied that the work is not installed in compliance with the Act or the Regulations, include the relevant defect codes on the certificate of inspection and notify the electrical contractor or electrical installation worker who was responsible for the carrying out of the work describing the defects, including the relevant clause or section of a Standard, Act or Regulation, relating to the work.

The OCEI has produced a listing of defects relating to electrical installation work. This list uses a unique 5-character code identifying the relevant clause or section of a Standard, Act or Regulation.

All defects identified at the completion of electrical inspection work must be electronically entered via the IVR or OCEI's Website to the OCEI COES database using the relevant defect code. Where identical defects occur, each must be entered separately.

The defect list will be continually monitored and updated to reflect changes in the Act, Regulations and associated Standards and from information received from Licensed Electrical Inspectors. Copies of the defect list are available directly from the OCEI or available on the OCEI's Website at < www.ocei.vic.gov.au >.



Example;

Defect No	AS/NZS Type	Reg/Clause	Text	Defect Category
10902	3000	3.2.1	Single insulated conductors are not enclosed throughout their entire length.	Technical
26520	3012	2.3.3.3(a)	Switchboard enclosure does not provide minimum protection of IP23 of AS1939.	Hazardous

Note: The same process is required for LEI's carrying out audits of non-prescribed electrical installation work on behalf of the OCEI

To Responsible Person (RP)

The registered electrical contractor or licensed electrical installation worker who was responsible for the carrying out of the work should be notified of the defects, including the relevant clause or section of an Australian Standard, Act or Regulation, using the Appendix I pro-forma included in this manual.

The details should include the defect number (code), clause or section of a Standard, Act or Regulation and relevant text.

Note: The same process is used for notifying the registered electrical contractor or licensed electrical installation worker of defects after an OCEI audit.

17. EXEMPTIONS

Exemptions from compliance with Regulation 416 of the Installation Safety (Installations) Regulations 1999 may be made on application, in writing to the OCEI, by any person *subject* to the following conditions;

(a) contain details of-

- (i) the applicant's name, telephone number, and business and postal address; and
- (ii) the exemption requested; and
- (iii) the reasons for the exemption; and

(b) be accompanied by-

- (i) any relevant technical information; and
- (ii) the written agreement to the proposed exemption by the owner, occupier or controlling body of the land on which the work is to be carried out; and
- (iii) the application fee set out in schedule 2 of the Regulations (\$70)

Note: An LEI may be requested by an RP or occupier/owner to provide a statement as to whether in his/her opinion the granting of the exemption would lead to a significant increase in electrical hazard and whether the application is reasonable



Appendix A

SWITCHBOARD INSPECTION GUIDELINE

To assist in determination of compliance with the appropriate Regulations, attention should be given to the following details. References to Electricity Supplier requirements for metering facilities are made on the assumption that current transformer operated metering is being installed into the switchboard.

Where possible, the relevant Australian or Australian/New Zealand Standard clause numbers are quoted.

It should be noted that the following items are typical of those requiring regular attention. Other clauses in AS/NZS 3000 may still need to be applied.

Approval of Switchboards Prior to Installation

The following procedures may be an additional useful service for ensuring switchboards comply with relevant Standards prior to site installation.

Note: these procedures are not a requirement under the Act or Regulations.

1. The drawing's are checked for compliance with the appropriate requirements:
 - Relevant Standards, including AS 3439.1, AS 1930, AS 2184, AS/NZS 3000;
 - Switchboard inspection Procedure detailed in this document.
2. Discussions may be held with the switchboard manufacturer as drawings may not necessarily include all relevant details - verbal discussions about such details generally highlight other problems that may occur.
3. Upon notification (phone call) from the switchboard manufacturer that the switchboard has been completed, an inspection may be carried out at the manufacturer's premises, if considered necessary. Manufacturers will need to give adequate notice prior to an inspection being required.

General - Inspection of Switchboard

1. All exposed conductive parts comprising frame, case and all associated electrical equipment of the switchboard is effectively earthed – Clause 5.4.1 of AS/NZS 3000.
2. Phase to phase, phase to neutral and phase to earth clearances comply with Clause 2.9.22 of AS/NZS 3000.
Note: Type tests in accordance AS 3439.1 may allow lesser creepage and clearance distances, between live parts and live parts and earth, than required by AS/NZS 3000.
3. Conductors do not rest against sharp edges – Clause 1.10.1 of AS/NZS 3000
4. Escutcheon plates and unhinged metallic covers have locating pins – Clause 2.9.2 of AS/NZS 3000
5. Escutcheon panels and unhinged metallic covers with an area exceeding 0.6m² are fitted with lift-off handles – Clause 2.9.2 of AS/NZS 3000
6. Dependent upon panel area, panels are fixed hinged or removable – Clause 2.9.2 of AS/NZS 3000
7. There are no exposed live parts – Clause 2.9.6 of AS/NZS 3000
8. Insulated conductors shall not rest against bare live parts at different potentials or sharp edges and shall be adequately supported – Clause 7.8.3.3 of AS 3439.1
9. Generally only one conductor is connected to a terminal – Clause 7.8.3.7 of AS 3439.1
10. Provisions are made to limit eddy currents where single core cables pass through plates of magnetic material – Clause 3.9.11 of AS/NZS 3000.



Incoming Cable Zone

1. Adequate space, allowance for bending of cables – Clause 3.9.7 of AS/NZS 3000.
2. Provisions for cable terminations, space for lugs, glands are not subject to undue stress – Clause 3.7.25 & Clause 3.9.7 of AS/NZS 3000.
3. Separate neutral and earth bars, with a MEN connection – Clause 5.6.4.1 of AS/NZS 3000.

Main Switches

1. Should be a withdrawable ACB, moulded case auto ACB or CFS unit as required.
2. Switch/es have been approved to AS 1930 or AS 2184.
3. Switchgear has correct fault current rating.
4. Main switches are grouped and identified as “Main Switches” - Clause 2.18.3.3.3 of AS/NZS 3000.
5. Operation of all main switch/es is clear and unambiguous.

Busbars

1. All busbars (and cables) are of adequate cross sectional area, in accordance with AS 3439.1.
2. Busbars are supported and spaced where necessary.
3. Current carrying busbars are transposed with neutral bars to prevent eddy currents, or other appropriate measures taken – Clause 3.9.11 of AS/NZS 3000
4. Busbars joints are effected in accordance with AS 3439.1.

Essential Equipment

1. Connected to line side of main switch – Clause 7.10.4.1 of AS/NZS 3000
2. All associated wiring and switchgear is suitably segregated from remainder of the switchboard
Clause 7.10.8 of AS/NZS 3000

Alternate Supply

1. Must be mechanically interlocked from the main supply.
2. Switchgear is suitably fault rated.
3. Suggest “Normal Supply Available” indication.

Note:- Refer to AS 3010.1 - Electrical Installations – Supply by Generating Set.

Metering Facilities - Refer to the electricity supplier’s requirements.



Appendix B

HIGH VOLTAGE INSPECTION GUIDELINES

Strict observance of all Electrical Safety Instructions is to be applied at all times; these are detailed in the following Code;

- *Electrical Safety for Work On or Near High Voltage Electrical Apparatus (The Blue Book)*

High Voltage Inspection details to be considered is as follows:

1. The installation complies with Section 7.8 of AS/NZS 3000
2. Site conditions conform with the approved drawings.
3. Insulation and high voltage tests have been carried out and the certified results are satisfactory, Clause 7.8.13.
4. Earth resistance and earth electrode tests have been carried out and the results checked, Clause 7.8.13.

Note:- *Circuit protection settings of main protective devices should be in accordance and comply with the supply authority's power protection setting order. Refer to the electricity supply agreement between the supply authority and the customer.*

Refer to next page for checklist for High Voltage installations



Checklist for High Voltage Installations

	<u>Yes</u>	<u>No</u>
1. Control of incoming supply, Clause 7.8.6 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
2. Control and protection of outgoing circuits, Clause 7.8.5.3 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
3. High voltage switchgear, Clause 7.8.7 of AS/NZS 3000 and AS 2067	<input type="checkbox"/>	<input type="checkbox"/>
4. Cable installations, Clause 7.8.11 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
5. Substation and main switchroom layouts	<input type="checkbox"/>	<input type="checkbox"/>
(a) 0.6m around transformers and switchgear, Clause 7.8.8.4 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(b) Two outward opening exists, Clause 7.8.8.3 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(c) Danger Notices provided,, Clause 7.8.9 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(d) Fire Protection and Ratings , Clause 7.8.8.5 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(e) Outdoor substation and switchroom enclosures of approved type, Clause 7.8 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(f) Containment of liquid dielectrics, Clause 7.8.8.5.3 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(g) Clearances for safety purposes, Clause 7.8.8.4 of AS/NZS 3000 and AS 2067	<input type="checkbox"/>	<input type="checkbox"/>

Earthing

(a) Two connections to earth bar, Clause 7.8.10.3 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(b) Conductors adequately sized, Clause 7.8.10.7 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(c) For outdoor installations (grading wire, etc.), AS 2067 and AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(d) Common or separate system, Clause 7.8.10.2 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>

Common
 Separate

Inspection Stage

	<u>Yes</u>	<u>No</u>
(a) Installation complies with AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(b) Site conditions conform to approved drawings.	<input type="checkbox"/>	<input type="checkbox"/>
(c) Insulation tests and high voltage tests completed and the certified results Clause 7.8.13 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(d) Earth resistance and electrode tests completed and the certified results are satisfactory, checked, 7.8.10.4.2 of AS/NZS 3000	<input type="checkbox"/>	<input type="checkbox"/>
(e) Circuit protection settings of main protective devices are in accordance with Supply Authority protection setting order.	<input type="checkbox"/>	<input type="checkbox"/>



Appendix C

HAZARDOUS AREAS INSPECTION GUIDELINES

(Note- Some of these systems operate at Extra Low Voltage (ELV) and are therefore not deemed to be Electrical Installation Work.)

CLASSIFICATION

Yes **No**

1. Is the hazardous area's classification listed in AS/NZS 2430.3 series of Standards.
2. If **Yes** list the hazard's identity and its assigned Zonal classification, together with the extent of the classification

List hazard & classification

3. If the hazard is not specifically listed, obtain written confirmation from the occupier (or his agent) which testifies to the hazardous area's classification.

To be separately attached

EQUIPMENT & WIRING – GENERAL

Yes **No**

4. Determine whether equipment & wiring, including flexible connections is suitable for the classification according to AS/NZS 2381.1, AS 2381.7 or AS/NZS 61241.1.2
5. Does equipment have Australian or Australian accepted certification.
6. Is equipment clearly labeled.
7. If the equipment is NOT Australian certified does it have certification from a recognised testing station and does it provide an equivalent level of protection to that sought for the explosion-proofing technique listed in the applicable Australian Standard.
8. Are you prepared to vouch for the equipment's suitability for the application.
9. Will it be necessary to obtain acceptance from a 3rd party.
Has an acceptance report been provided.
10. Are prohibited equipment types excluded from the hazardous area.
11. Is designated equipment, which is located less than 3.5 m above hazard suitably guarded or screened.
12. Is wiring correctly connected to equipment according to the employed protection technique.
13. Are circuits capable of having all live conductors isolated, including where employed the neutral
14. Is labeling provided upon or immediately adjacent to each isolator to indicate that the circuit enters an hazardous area, and is the isolator capable of being locked in the 'OFF' position
15. Are sealing fittings provided on conduits or water pipes at hazard boundaries
16. Are the sealing fittings filled with the required sealing material
17. Are conduits adequately jointed (minimum thread engagement)
18. Are conduits drained where this is necessary



- | | | |
|---|--------------------------|--------------------------|
| 19. Are intrinsically safe circuit conductors correctly marked/identified | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. Are earthing conductors enclosed except in the case of MIMS or HV installations and terminated in an enclosure which maintains the appropriate type of protection | <input type="checkbox"/> | <input type="checkbox"/> |
| 21. Is equipotential bonding provided where required | <input type="checkbox"/> | <input type="checkbox"/> |

PRE-COMMISSIONING TESTS & CIRCUIT PROTECTION - to have been conducted and provided by a competent person include :-

22. **Testing**

- Earth impedance (by test or calculation)
- Earth & earth continuity resistance
- Insulation resistance
- Setting & operation of protective devices

23. **Electrical Protection**

- Any circuits and equipment installed in a Zone 0, Zone 1, Zone 2, Zone 20, Zone 21 or Zone 22 areas shall be provided with means to ensure disconnection quickly in the event of overcurrent, internal short-circuit or earth fault conditions.

INSPECTION & TESTING ACCORDING TO CLASSIFICATION AND PROTECTION TECHNIQUE

Intrinsically Safe (IS)	<u>Yes</u>	<u>No</u>
24. Is the system or its components intended for use in a Zone 0, Zone 1, Zone 2, Zone 21, or Zone 22 environment <i>List classification</i> _____		
25. Are the system elements suitable for the applicable Equipment Grouping & Temperature Class	<input type="checkbox"/>	<input type="checkbox"/>
26. Are the system elements clearly & correctly marked	<input type="checkbox"/>	<input type="checkbox"/>
27. Are all circuit components correctly identified	<input type="checkbox"/>	<input type="checkbox"/>
28. Are barrier assemblies, relays and other energy limiting devices installed in accordance with restrictions & limitations and suitably earthed (if required)	<input type="checkbox"/>	<input type="checkbox"/>
29. Is the required level of segregation provided between IS and non-IS circuits in cubicles, panels or marshalling boxes	<input type="checkbox"/>	<input type="checkbox"/>
30. Are the IS connecting cables' limitations concerning inductance/capacitance complied with	<input type="checkbox"/>	<input type="checkbox"/>
31. Are the cables marked/identified in accordance with requirements	<input type="checkbox"/>	<input type="checkbox"/>
32. Are cable screens earthed at one point only	<input type="checkbox"/>	<input type="checkbox"/>
33. Is the IS circuit itself earthed in accordance with documentation	<input type="checkbox"/>	<input type="checkbox"/>



34. If earthing is required to permit the systems' correct operation, is the resistance from the high integrity IS earth to the transformer neutral's star point less than one (1) ohm

35. Are all unused cable entries sealed

Special Protection

36. Is the system or its components intended for use in the Zone 0, Zone 1 or Zone 2 environment

List classification _____

37. Is the item suitable for the applicable Equipment Grouping & Temperature Class and clearly & correctly marked

38. Is circuit identification conspicuous and does it carry the circuit number and switchboard from which the circuit originates

Flameproof Enclosure

39. Is the systems individual components intended for use in a Zone 1, or Zone 2 environment

List classification _____

40. Are all installed items suitable for the applicable Equipment Grouping & Temperature Class and clearly & correctly marked

41. Is the equipment operated within its approved ratings for power, voltage, current, frequency, duty and temperature

42. Is circuit identification conspicuous and does it carry the circuit number and switchboard from which the circuit originates

43. Is the required clearance between the flameproof enclosure and adjacent solid objects provided

44. Are manufacturer's directions followed where taping is employed across joint surfaces

45. Are prohibited running threads or barrel unions used in the connecting conduit system

46. Where used have sealing fittings been correctly employed

47. Are the sealing fittings filled with the required sealing material

48. Where used have the limitations applicable to compound filled flameproof cable glands been observed

49. Are all terminal box cable entries sealed

Encapsulation

50. Is the system or its components intended for use in a Zone 1, Zone 2, Zone 20, Zone 21 or Zone 22 environment

List classification _____



- | | | | |
|-----|--|--------------------------|--------------------------|
| 51. | Are the system elements suitable for the applicable Equipment Grouping & Temperature Class | <input type="checkbox"/> | <input type="checkbox"/> |
| 52. | Are the system elements clearly & correctly marked | <input type="checkbox"/> | <input type="checkbox"/> |
| 53. | Are all circuit components correctly identified | <input type="checkbox"/> | <input type="checkbox"/> |
| 54. | Is circuit identification conspicuous and does it carry the circuit number and switchboard from which the circuit originates | <input type="checkbox"/> | <input type="checkbox"/> |

Pressurized Rooms & Enclosures

- | | | | |
|-----|---|--------------------------|--------------------------|
| 55. | Is the system or its components intended for use in a Zone 1, Zone 2, Zone 20, Zone 21 or Zone 22 environment | <input type="checkbox"/> | <input type="checkbox"/> |
|-----|---|--------------------------|--------------------------|

List classification _____

- | | | | |
|-----|---|--------------------------|--------------------------|
| 56. | Are the system elements suitable for the applicable Equipment Grouping & Temperature Class | <input type="checkbox"/> | <input type="checkbox"/> |
| 57. | Are the system elements clearly & correctly marked | <input type="checkbox"/> | <input type="checkbox"/> |
| 58. | Are all circuit components correctly identified | <input type="checkbox"/> | <input type="checkbox"/> |
| 59. | Is circuit identification conspicuous and does it carry the circuit number and switchboard from which the circuit originates | <input type="checkbox"/> | <input type="checkbox"/> |
| 60. | Are the required pressure or flow monitoring devices, warning labels (including that specified for Zone 20, Zone 21 or Zone 22 environment) and alarms provided | <input type="checkbox"/> | <input type="checkbox"/> |

List departures _____

- | | | | |
|-----|---|--------------------------|--------------------------|
| 61. | Is the required isolation of power (all live conductors) provided where required | <input type="checkbox"/> | <input type="checkbox"/> |
| 62. | Is the specified mechanical protection of fresh air intakes provided | <input type="checkbox"/> | <input type="checkbox"/> |
| 63. | Is the supply (read fresh) air derived from a Non-hazardous location | <input type="checkbox"/> | <input type="checkbox"/> |
| 64. | Is the required level of overpressure and, in the case of rooms having access openings, is the required gas outflow velocity provided | <input type="checkbox"/> | <input type="checkbox"/> |

Provide details _____

Increased Safety

- | | | | |
|-----|---|--------------------------|--------------------------|
| 65. | Is the system or its components intended for use in a Zone 1, Zone 2, Zone 20, Zone 21 or Zone 22 environment | <input type="checkbox"/> | <input type="checkbox"/> |
|-----|---|--------------------------|--------------------------|

List classification _____

- | | | | |
|-----|--|--------------------------|--------------------------|
| 66. | Are the system elements suitable for the applicable Equipment Grouping & Temperature Class | <input type="checkbox"/> | <input type="checkbox"/> |
| 67. | Are the system elements clearly & correctly marked | <input type="checkbox"/> | <input type="checkbox"/> |
| 68. | Are all circuit components correctly identified | <input type="checkbox"/> | <input type="checkbox"/> |
| 69. | Is circuit identification conspicuous and does it carry the circuit number and switchboard from which the circuit originates | <input type="checkbox"/> | <input type="checkbox"/> |



- | | | | |
|-----|--|--------------------------|--------------------------|
| 70. | Is the equipment operated within its approved ratings for power, voltage, current, frequency, duty and temperature | <input type="checkbox"/> | <input type="checkbox"/> |
| 71. | For motor installations is the manufacturer's recommended form of protection (time/temperature) provided | <input type="checkbox"/> | <input type="checkbox"/> |
| 72. | If not has the provided protection system the ability to trip the motor at 80% of the t_e time | <input type="checkbox"/> | <input type="checkbox"/> |
| 73. | Are junction boxes and other forms of enclosure operated within their permissible maximum dissipating power range | <input type="checkbox"/> | <input type="checkbox"/> |
| 74. | Are all terminal box cable entries sealed | <input type="checkbox"/> | <input type="checkbox"/> |

Ventilation - Of Buildings & Rooms

- | | | | |
|-----|---|--------------------------|--------------------------|
| 75. | Are the required pressure or flow monitoring or combustible gas detector devices arranged to isolate supply to all non-explosion-proof equipment in the ventilated area upon either failure of the supply air or the concentration of vapour attaining 50% of the lower-explosive-limit (LEL) | <input type="checkbox"/> | <input type="checkbox"/> |
| 76. | Is the area pre-ventilated until its atmosphere is maintained at 50% LEL or better | <input type="checkbox"/> | <input type="checkbox"/> |
| 77. | Are fan motors located in exhaust air streams explosion-proof | <input type="checkbox"/> | <input type="checkbox"/> |
| 78. | Is the specified mechanical protection of fresh air intakes provided | <input type="checkbox"/> | <input type="checkbox"/> |
| 79. | Is the make-up air derived from a Non-hazardous location | <input type="checkbox"/> | <input type="checkbox"/> |

Ventilation - For the Heat Dissipation of Power Equipment

- | | | | |
|-----|--|--------------------------|--------------------------|
| 80. | Is the ventilation air supply capable of maintaining the equipment's interior at 5 mm water gauge pressure above ambient | <input type="checkbox"/> | <input type="checkbox"/> |
| 81. | Is the enclosure pre-ventilated by at least 10 air changes before contained equipment can be energised | <input type="checkbox"/> | <input type="checkbox"/> |
| 82. | Is the ventilation air flow sufficient to limit the temperature of any part of the equipment to 80% of the ignition temperature of the flammable which is expected to be present | <input type="checkbox"/> | <input type="checkbox"/> |
| 83. | Is the specified mechanical protection of fresh air intakes provided | <input type="checkbox"/> | <input type="checkbox"/> |
| 84. | Is the make-up air derived from a Non-hazardous location | <input type="checkbox"/> | <input type="checkbox"/> |
| 85. | Are the required marking labels provided | <input type="checkbox"/> | <input type="checkbox"/> |

Non-Sparking - Zone 2 application only

- | | | | |
|-----|--|--------------------------|--------------------------|
| 86. | Are the system elements suitable for the applicable Equipment Grouping & Temperature Class | <input type="checkbox"/> | <input type="checkbox"/> |
| 87. | Are the system elements clearly & correctly marked | <input type="checkbox"/> | <input type="checkbox"/> |
| 88. | Are all circuit components correctly identified | <input type="checkbox"/> | <input type="checkbox"/> |
| 89. | Is circuit identification conspicuous and does it carry the circuit number and switchboard from which the circuit originates | <input type="checkbox"/> | <input type="checkbox"/> |
| 90. | Is the equipment operated within its approved ratings for power, voltage, current, frequency, duty and temperature | <input type="checkbox"/> | <input type="checkbox"/> |
| 91. | For motor installations is the manufacturer's recommended form of protection (time/temperature) provided | <input type="checkbox"/> | <input type="checkbox"/> |



92. Are junction boxes and other forms of enclosure operated within their permissible maximum dissipating power range
93. Are warning labels provided on plug & socket outlets
94. Are all unused cable entries sealed

DIP- Zone 20, Zone 21 or Zone 22 environment application only

95. Is the maximum operating temperature of installed electrical equipment 50^oC lower than the cloud ignition temperature of the dust present in the operating environment
96. Are conduits adequately jointed (minimum thread engagement) and drained where this is necessary
97. Are acceptable wiring systems used
98. Are motors internally over-temperature protected
99. Are all unused cable entries sealed
-



Appendix D

INSPECTION AND TESTING GUIDELINES

Electrical Wiring & Equipment Installed in Body-Protected and Cardiac-Protected Patient Treatment Areas of Hospitals and Patient Care Facilities

INTRODUCTION

The applicable standard, AS/NZS 3003 “Electrical Installations — Patient treatment areas of hospitals and medical and dental practices,” sets out requirements for body-protected and cardiac-protected patient treatment areas. As these requirements are additional to those of AS/NZS 3000, inspection and testing to AS/NZS 3003 assumes compliance with AS/NZS 3000 and the latter is not covered in these guidelines.

Inspection and testing (“commissioning”) of body-protected and cardiac-protected areas is a normative requirement of AS/NZS 3003.

The only patient treatment areas of hospitals and medical and dental practices covered by AS/NZS 3003 are those marked as body-protected or cardiac-protected areas. Other patient treatment areas not so marked only require compliance with AS/NZS 3000 and inspection and testing requirements for these areas are not covered in AS/NZS 3003.

Note: *Decisions about which patient treatment areas need to be wired as body-protected or cardiac-protected areas should be based on the safe practice code set out in AS/NZS 2500, “Guide to the safe use of electricity in patient care”. This standard clearly identifies these decisions as the responsibility of the medical institution. However, those involved in designing, inspecting and testing these areas must understand, and be in a position to explain, the rules set out in AS/NZS 2500 relating to the need for body-protected or cardiac-protected areas with the specific medical procedures to be carried out and the level of electric shock protection provided in the particular medical equipment available for these procedures.*

BODY-PROTECTED AREAS

Body-protected electrical areas provide appropriate additional “macro-shock” protection to that afforded by AS/NZS 3000 for patients who are connected to medical electrical equipment with “unprotected” applied parts, providing these do not directly contact the heart.

Note: *Under the safe practice code set out in AS/NZS 2500, medical electrical equipment with “protected” applied parts can be used for such procedures in any patient treatment area.*
“Unprotected” (Type B) applied parts and “protected” (Type BF and Type CF) applied parts are marked according to the applicable product safety standard, AS/NZS 3200.1.

All LV and ELV socket-outlets and some medical electrical equipment in body-protected areas are protected by leakage protective devices (LPDs). These are appropriately rated residual current devices (RCDs) or transformer-isolated supply systems with line isolation monitors (LIMs) and overload monitors. Protective earthing follows the requirements of AS/NZS 3000.

CARDIAC-PROTECTED AREAS

Cardiac-protected areas provide further “micro-shock” protection for patients undergoing procedures in which an insulated conductor is introduced into direct contact with the heart while being exposed to contact outside the body. Under such conditions, currents as low as 100 μ A may result in electrocution. Cardiac-protected areas require similar macro-shock protection to body-protected areas. However, to



address “micro-shock” hazards they are also provided with equipotential earthing systems to ensure that less than 100 mV appears between different items of electrical equipment which may contact the patient, and between such equipment and other exposed metal objects in the patient vicinity.

Requirements for equipotential earthing systems assume that substantial a.c. currents may flow into the protective earthing system from LPD-protected circuits and non-LPD-protected circuits and, further, from any contact with structural metal or reticulated water, waste or medical gas systems, etc. A number of options for wiring the equipotential earthing system are provided in the standard.

INSPECTION AND TESTING OF PATIENT TREATMENT AREAS

Appendix D of AS/NZS 3003, “Commissioning tests for body-protected areas and cardiac-protected areas”, identifies items to be investigated and tests to be performed prior to occupancy of patient treatment areas. This appendix also provides examples of suitable test reports aligning with the requirements of the standard, including visual inspections and test requirements for earthing systems, RCDs, transformer-isolated supplies, LIMs and overload monitors.

It is important for the electrical mechanic in charge of the wiring installation to be present during inspection and testing, for guidance with regard to the equipment installed including any equipotential earthing systems, and to ensure that defects are rectified prior to commissioning.

It is desirable to carry out testing of equipotential earthing systems as soon as they are installed in cardiac-protected areas, as it is relatively easy to rectify defects before wall linings are finished off.

Test Equipment

Specialized test equipment is required to carry out the specified tests prior to commissioning. Calibration of all test equipment should be traceable to national standards.

Specialized test sets may also assist in checking requirements such as those relating to whether switches on socket-outlet and isolating switches on permanently wired equipment open all live supply conductors.

Testing of earthing systems

A four-wire resistance measuring set capable of accurately resolving resistance measurements down to 0.01 Ω is required for certifying equipotential earthing systems in cardiac-protected areas.

Supply voltage measurements

Appropriate test equipment is required to establish whether ELV and LV supplies are earth references or not, and in the latter case, the degree of isolation from earth.

Testing Of Residual Current Devices (RCD's)

Appropriate test equipment is required to measure the following characteristics of RCDs operating in single-phase ELV circuits and in single-phase and multi-phase LV circuits:

Tripping current

RCDs in cardiac-protected and body-protected areas must have a rated tripping current of 10 mA for LV circuits and 100 mA for ELV circuits. The test set must use a gradually increasing fault current and accurately measure actual tripping current down to half the rated tripping current.

Tripping time

The tripping time of these RCDs must not exceed 40 mS for faults applied at the rated tripping current. The test set must have provision for setting the required fault current,



taking into account the actual active-to-earth voltage of the particular supply; applying the fault at random times during the a.c. cycle; and accurately measuring the tripping time under these conditions.

Note: Many simple RCD test sets do not meet the above requirements.

Testing of transformer-isolated supplies

Appropriate test equipment is required to measure the following characteristics of transformer-isolated supplies:

Prospective hazard current

The test set must accurately resolve prospective hazard current measurements down to 5 mA.

Line isolation monitor (LIM) tests

The test set must be capable of applying a range of single-sided and balanced, resistive and capacitive faults at 0°, 45° and 90°, accurately specified between 3 mA and 15 mA, in order to check the accuracy of the prospective hazard current display and alarm.

Overload alarm monitor tests

Adequately rated, variable loads with accurate current measuring facilities are required to check the accuracy of overload monitors associated with transformer-isolated supplies, which must operate between 3 s and 5 s of the load current exceeding the isolating transformer rating.

Measurement of potential differences in cardiac-protected areas

A test set complying with the requirements of Appendix G of AS/NZS 3003 is required to check the maximum allowed voltage of 100 mV between protectively earthed points, and between these points and permanently installed, accessible metal objects in the equipotential area of cardiac-protected areas.

This test set measures the potential difference across a 1 k Ω load using a true RMS (a.c. and d.c.) voltmeter with a frequency compensating, single-section R/C filter rolling off above 1 kHz.



Appendix E

Types of Prescribed Electrical Installation Work

1.	
1.	For the purposes of section 45 of the Act “prescribed electrical installation work” means 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;
(a)	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.
(b)	Sub-mains, earthing systems and any distribution boards related to the control of individual occupiers’ portion of multiple installations unless the occupier has immediate and unimpeded access to the main switch or switches controlling the whole of the multiple installation.
(c)	Electrical equipment installed in a hazardous area described in Section 7.9.2.2 of the Australian/New Zealand Wiring Rules and electrical equipment associated with the protection of such a hazardous areas but not installed within the hazardous area.
(d)	High voltage installations except high voltage electrical equipment that is - (i) associated with an electric discharge lighting systems; or (ii) associated with X-ray equipment; or (iii) associated with high frequency equipment; or (iv) within self contained equipment supplied at low voltage.
(e)	Wiring systems, switchgear, controlgear and accessories installed to provide control and protection of standby generation or co-generation electricity supply systems.
(f)	Electric fences used for security purposes but not including electric fences intended primarily for the control or containment of animals.
(g)	Wiring systems, switchgear, controlgear and accessories installed to provide control and protection of stand alone power systems.
(h)	Fixed electrical equipment installed in body-protected or cardiac-protected electrical areas of hospitals and medical and dental practices.
2.	
2.	For the purposes of section 45 of the Act “prescribed electrical installation work” does not include the following:
(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.

**Appendix F****Rules and relationship between type of PEIW and LEIW type of Licence**

LEIW	TYPE	TYPE OF PRESCRIBED ELECTRICAL WORK (Reg 406)							
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Unrestricted	Electrician (E)	✓	✓	✓	✓	✓	✓	✓	✓
Restricted S & N	Disconnect/Reconnect Worker (D) *	✗	✗	✓	✗	✓	✗	✓	✓
Restricted B	Electrician Supervised (ES)	✓	✓	✓	✓	✓	✓	✓	✓
Restricted R	Occupier (O)	✓	✓	✗	✗	✓	✗	✓	✗
	Supervised Worker (L)	✓	✓	✓	✓	✓	✓	✓	✓

* of the appropriate class

✓ = Permitted to carry out the work.

✗ = Not permitted to carry out the work.

Appendix G**Prescribed Classes of Electrical Inspection Work**

Class	Description
L	Electrical equipment installed in installations comprising a low voltage single phase, 2 wire supply comprising consumers mains, a main earthing system, consumer terminals connection devices or those parts of a main switchboards that are related to the control of the installation and the protection against the spread of fire.
G	Any low voltage installations other than classes, H, S, F, R & M.
H	Electrical equipment installed in a hazardous area described in section 7.9.2.2 of the Australian/New Zealand Wiring Rules and electrical equipment associated with the protection of the hazardous area but not installed within the hazardous area.
V	high voltage installations except high voltage wiring and equipment that is: (i) associated with electric discharge lighting systems; or (ii) associated with X-ray equipment; or (iii) associated with high frequency equipment; or (iv) within self contained equipment supplied at low voltage.
S	Wiring systems, switchgear, controlgear and accessories installed to provide control and protection of standby generation or co-generation electricity supply systems.
F	Electric fences used for security purposes but not including electric fences intended primarily for the control or containment of animals.
R	Wiring systems, switchgear, controlgear and accessories installed to provide control and protection of stand alone power systems.
M	Fixed electrical equipment installed in body-protected or cardiac-protected electrical areas of hospitals and medical and dental practices.



Appendix H

Types of Inspection Licence and the Associated Work Types

LEI Class of Inspector	TYPE OF PRESCRIBED ELECTRICAL WORK (Reg 406)							
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
L	✓	✗	✗	✗	✗	✗	✗	✗
G	✓	✓	✗	✗	✗	✗	✗	✗
H	✗	✗	✓	✗	✗	✗	✗	✗
V	✗	✗	✗	✓	✗	✗	✗	✗
S	✗	✗	✗	✗	✓	✗	✗	✗
F	✗	✗	✗	✗	✗	✓	✗	✗
R	✗	✗	✗	✗	✗	✗	✓	✗
M	✗	✗	✗	✗	✗	✗	✗	✓

✓ = Permitted to inspect this type of PEIW

✗ = Not permitted to inspect this type of PEIW



Appendix I

INSTALLATION INSPECTION DEFECT REPORT FORM

Certificate of Electrical Safety No:	□□□□□□□□
Installation Location Address:	
Town/City:	
Postcode:	□□□□
Date Inspected:	□□ / □□ / □□□□
Inspector's Licence Number:	□□□□□□□□
Inspector's Name:	
Inspection Type (Tick ✓) :	<input type="checkbox"/> Audit <input type="checkbox"/> Inspection

Defect Number

Defect Text

□□□□□ Standard:..... Clause No:
□□□□□ Standard:..... Clause No:
□□□□□ Standard:..... Clause No:

Attach additional sheet/s as necessary.

Inspector's Signature



Continued from previous.

Certificate of Electrical Safety No:	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
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<u>Defect Number</u>	<u>Defect Text</u>
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Standard:..... Clause No:
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Standard:..... Clause No:
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Standard:..... Clause No:
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Standard:..... Clause No:
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Standard:..... Clause No:

Inspector's Signature



Appendix J
Typical Advice of Installation Defects Letter to Occupier/Owner

Gadget Electrical Inspection Services

PO Box 356 Kieta – 3965 Tel 5347 7750

September 13, 2002

Ms Maya Savior
352 Princes Street
KYNETON 3352

Dear Sir/Madam,

ELECTRICAL INSTALLATION WIRING/EQUIPMENT DEFECTS

On Tuesday April 25, 1999, I carried out an electrical inspection of electrical installation work at 352 Princes Street, KYNETON notified in a Certificate of Electrical Safety (No 123456) supplied by ABC Electrics (REC No 992345).

During the course of the inspection it was revealed that unsafe and potentially dangerous wiring and equipment not associated with the work advised on the certificate was identified.

The following defects were identified,

1. **Exposed live conductors associated with a socket outlet situated in the laundry,**
2. **Cables located in the roof space have exposed live terminations subject to personal contact.**

This does not preclude the possible existence of other electrical defects within this installation.

I recommend that, without delay, you arrange for correction of the above defects by a Registered Electrical Contractor to prevent injury to yourself or others. A copy of these defects has been forwarded to the Office of the Chief Electrical Inspector for the purposes of alerting the appropriate person/s regarding the existence of unsafe electrical installations.

You are advised that penalties of up to \$4,000 may apply for failing to comply with Section 43 (2) & (3) of the Electricity Safety Act 1998, which states that,

- (2) *The occupier of any premises in which there is unsafe electrical equipment must-*
 - (a) *cause the electrical equipment to be removed from the premises or to be made safe; or*
 - (b) *in the case of electrical equipment forming part of an electrical installation, notify the owner of the premises of the unsafe electrical installation.*
- (3) *an owner of premises who is notified under sub-section (2) must cause the electrical installation to be removed from the premises or to be made safe.*

Further information and advice can be obtained by telephoning Ian Gadget 1234 5678 or contacting the Office of the Chief Electrical Inspector, telephone 9203 9700.

Yours faithfully

Ms Katrina Mitchelton
LICENCED ELECTRICAL INSPECTOR (No 990001)