

# LORD HOWE ISLAND SERVICE RULES



Lord Howe

I S L A N D B O A R D

## FOREWORD

These Service and Installation Rules have been compiled and issued for the guidance of Electrical Contractors, Consulting Engineers, Architects, and those persons directly concerned with the installation of electrical systems within the area of the Lord Howe Island Board Electricity Supply. They embrace the Board's requirements regarding metering and control equipment, underground consumers mains and point of supply, and the consumer's installation. Except where otherwise provided, the Wiring Rules published by Standards Australia, which are known as the AS/NZS 3000-2000 Wiring Rules shall apply.

Where the words "Supply Authority" or "Board" are used in these rules they shall be deemed to be the Lord Howe Island Board. "Officer" shall be the Lord Howe Island Board's Electrical Supply Consultants, their Authorised Contractors and/or the Senior Electrical Officer.

Words defined in the AS/NZS 3000-2000 Wiring Rules are used in these rules in accordance with these definitions.

The Board reserves the right to add to, alter or amend these rules as it at any time thinks fit and any such amendment, deletion or addition to these Rules shall, when duly advertised, become an integral part of the Rules.

CEO  
LORD HOWE ISLAND BOARD

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## GENERAL ADVICE TO PROSPECTIVE CONSUMERS AND CONTRACTORS

### AREA OF SUPPLY

The Board distributes supply within the confines of Lord Howe Island.

Lord Howe Island Board Administration Office	Telephone	02 6563 2066
	Fax	02 6563 2127
Powerhouse	Telephone	02 6563 2080
	Fax	02 6563 2128

### APPLICATIONS

Immediately it is known that a new supply or an addition and/or alteration is required the appropriate application form or forms should be obtained, filled in with all the required information, signed by the consumer responsible for the payment of the accounts, and lodged with the Board.

The '*Application for Supply*' form must indicate the full extent of the whole of the proposed installation where such information is known by the applicant at the time of making the application.

### ADDITIONAL INFORMATION

Any additional information on the matters covered by these rules, or on the supply of Electricity generally, may be obtained by addressing an enquiry to the CEO, Lord Howe Island Board, or by applying personally to the Senior Electrical Officer who is available to provide advice or guidance on electrical matters and problems.

### WARNING AGAINST PREMATURE EXPENDITURE

No expense should be incurred by the prospective customer until an application form has been lodged with the Supply Authority, and advice has been received that supply will be given and on the condition under which it will be given including the provisions to be made by the consumer for the installation of the Board's equipment on the premises.

The Supply Authority will not provide supply to sub-standard premises unless such premises have been approved by a building inspector. When contemplating the connection of appliances (such as electrical welding apparatus, x-ray equipment, motors with rapidly fluctuating loads and the like), particular care should be taken to ascertain the conditions which must be observed to prevent their interference with the supply to other consumers. Where interference cannot be prevented, the Supply Authority reserves the right to refuse to connect such equipment.

Matters affecting the design of a building project, such as determining the position of service equipment, the point of entry of the underground service cable and position of any substation or distribution pillar on the site, should be settled by consultation at an early stage.

#### COMPLIANCE WITH AS/NZS 3000-2007 WIRING RULES

An electrical installation will not be approved for connection to the Supply Authority's mains if it is found not to comply with the Wiring Rules published by Standards Australia, which are known as the AS/NZ 3000-2007 Wiring Rules, but as a Supply Authority inspection can be made after the installation has been completed, and is, therefore limited by the fact that much of the installation is included within the structure and is inaccessible to the Supply Authority's Officers, neither the Inspection nor the subsequent connection of the installation can be relied upon as in any way giving an assurance of quality in the installation, or of its compliance with any specification or with the AS/NZ 3000-2007 Wiring Rules.

#### NECESSITY FOR EMPLOYING A LICENCED PERSON

The Electricity Act, 1945, as amended, requires that all electrical installation work be carried out by, or under the constant personal supervision of a suitably licenced person.

#### WORKERS SAFETY

The Electricity (Workers' Safety) Regulation 1992, authorized under the Electricity Act 1945, as amended, applies to work practices and procedures for all electrical work under the control of the Board.

#### NOTIFICATION OF ELECTRICAL WORK AND INSPECTION REQUIREMENTS

No installation and no addition to an existing installation may be connected without specific permission until it has been inspected, tested, and approved for connection. However permission may be granted for the connection of an addition to an existing final sub-circuit, which itself is already connected and in use, pending the inspection, provided the additional work is complete and complies with the AS/NZ 3000-2007 Wiring Rules and these Service Rules.

In the same way permission will be granted for the connection of additional circuits to the switchboard of existing installation, provided the new circuits are complete and comply with the AS/NZ 3000-2007 Wiring Rules and these Service Rules, and are isolated from the supply in the following manner.

- (i) If the additional circuits are to be protected by fuses, the fuse carriers shall be removed from the circuit fuses.
- (ii) If the additional circuits are to be protected by overload circuit breakers, the circuit breakers shall be left in the 'off' (open) position.

The *Electricity (Installation Safety) Regulation* under the *Electricity Act*, as amended, requires that the customer and the supply authority be given copies of the *Certificate of Compliance - Electrical Work* form by the installing electrical contractor, within 14 days of such work being completed. The *Compliance* form details the particulars of work carried out on the customer's installation.

A *Compliance* form is also required following:

- The remedying of any notified defect in a customer's installation.
- The reconnection of supply by an Electrical Contractor whom the Board has authorised to carry out such work.

The Supply Authority and the contractor are to retain the *Compliance* form for two years.

An installation will not be inspected until a *Compliance* form has been lodged with the Supply Authority.

#### RE-INSPECTION FEE

If the initial inspection or test shows that the Installation is incomplete or does not comply with AS/NZ 3000-2000 Wiring Rules, or these Service Rules, a fee in accordance with the Schedule of Fees and Charges may be charged by the Board for every subsequent inspection necessary. A fee may also be charged for other inspections.

#### DAMAGE TO SUPPLY AUTHORITIES EQUIPMENT

Certain penalties are prescribed for damaging or interfering with the Supply Authority's equipment. As a consumer may be held liable for damage to the equipment installed on his Premises, such equipment should be covered by insurance.

#### INTERFERENCE TO SUPPLY OF OTHER CONSUMERS

If the consumer should rise or deal with the electricity supplied to him in such a manner as to cause, in the opinion of the Supply Authority, undue interference with the supply to other consumers, the Supply Authority may call on him to make such necessary adjustments or alterations and to operate the offending equipment in such a manner as to ensure that the supply to other consumers will not be interfered with. In the event of his failing to do so, the Supply Authority may disconnect the supply of electricity to the premises. The fact that the Supply Authority shall have connected and have approved that apparatus or equipment shall not be taken to exempt the consumer from the operation of this rule.

Where it is established that, in the opinion of the Supply Authority, undue damage to equipment and or, interference with the supply has occurred due to the actions of the consumer, the Board reserves the right to recover costs involved in restoring supply.



## INTERFERENCE WITH EQUIPMENT

No person, other than an Officer of the Supply Authority or person duly authorised, may interfere with, operate, remove, replace, connect or disconnect any conductor, service fuse, meter, seal, link, time switch or other device the property of or under control of the Supply Authority.

## SEPARATE OR ADDITIONAL SERVICES

In general, the Supply Authority will connect only one service for any building or for any group of buildings occupied by one consumer.

Additional points of supply may be given for the following reasons:

- Dual occupancy where it is more convenient to give supply from another source.
- Technical considerations.

All costs involved in providing additional points of supply will be paid by the customer.

Where more than one point of supply is provided, each installation which is separately supplied must be clearly defined. Any facilities for interconnection with any other installation or source of supply (either directly or by change-over switching) must not be provided unless otherwise agreed to by the Supply Authority.

The extent of each installation must be defined either in terms of plant or equipment connected to it, or of specified areas which it serves.

## SOURCES OF ALTERNATE SUPPLY

Where the customer installs an alternative source of electrical supply, such as a stand-by generator, facilities for connection to the electrical installation *normally* supplied by the Supply Authority's system must not be installed unless the proposed arrangements have been agreed to by the Supply Authority.

If approved the facilities must be arranged either directly, or by suitable interlocking procedures, so that the Supply Authority's system and Service Equipment cannot be energised from the alternative source, except in the case of connections via inverters as described in Appendix B.

A notice must be fixed on the main switchboard to show that such facilities exist, which sections of the installation they can supply, their point of control, and the conditions under which they may be operated.

## POINT OF SUPPLY

Before any work on an installation is commenced, the point of entry for the underground service cable and the position of the service equipment should be ascertained from the Supply Authority. This particularly applies to existing installations in which new consumers' mains and/or switchboard is being provided.

## THE SUPPLY AUTHORITY'S RIGHTS AND POWERS

Nothing contained in these Service Rules shall prejudice the rights and powers of the Supply Authority under any Act or Regulation or amendments thereto.

The Supply Authority reserves the right to add to, alter or amend, any of the foregoing service rules at any time it may think fit, and any such addition, alteration or amendments shall be deemed to apply as if it has been included in these conditions.

## SYSTEM OF SUPPLY

### PARTICULARS OF SUPPLY

The system of supply is alternating current at a frequency of 50 hertz originating from one of the following sources:

- (i) Single phase, 2 wire 240 volts
- (ii) Three phase, 4 wire 240/415 volts

All supply is provided through underground cables from substations or distribution pillars. All voltages are measured at the customers distribution pillar/substation supply point.

Note: Voice frequency control signals may be superimposed on the supply voltage.

### EARTHING OF SUPPLY

The neutral conductor of the system is earthed at the source of supply under the Multiple Earthed Neutral (MEN) system of earthing, and such system will apply to all installations connected to the Supply Authority's low and medium voltage mains.

## LIMITATIONS OF THE LOADING OF APPARATUS AND BALANCING OF LOAD

In general appliances shall be limited to 10 Amps or 10 Amps per phase unless special approval is granted by the Board. Upon receipt of an application for appliances requiring more than 10 Amps per phase the Board may approach an independent consultant for determination on ability to supply such loads.

### BALANCING OF INSTALLATION

An installation, or separately metered portion of an installation, supplied through a service having more than one active conductor, shall have the total load balanced as nearly as practicable, over the active conductors.

### BALANCING OF APPARATUS

An individual lighting installation or individual appliance, other than one of those dealt with specifically in this Rule, shall if its rated loading exceeds 10 amperes at 240 volts be balanced over two actives of the system; and if its rated loading exceeds 20 amperes at 240 volts it shall be balanced over three actives of the system. However, two actives and neutral of the supply will not be provided merely for the connection of apparatus which, in accordance with these Rules, may be connected to one active and neutral; nor will three actives and neutral be provided merely for the connection of apparatus which, in accordance with these Rules, may be connected to one active and neutral or to two actives and neutral of the supply.

### LARGE TWO WIRE APPARATUS (EXCEPTING WELDING APPARATUS)

The Supply Authority reserves the right to refuse to connect apparatus, of two-wire connection, having rapidly fluctuating loads.

### WELDING APPARATUS

The Supply Authority reserves the right to refuse to supply electricity from general supply mains to any electrical welder, and **no** expense should be incurred by any consumer or prospective consumer until advice has been received that the supply will be given and upon what terms and conditions it will be given.

### COOKING RANGES, HOTPLATE UNITS, WASH BOILERS (240 VOLT PERMANENTLY CONNECTED TYPE)

The Supply Authority will not permit the connection of appliances of this type.

### DISHWASHERS AND CLOTHES DRYERS

The Supply Authority reserves the right to control the use of dishwashers and clothes dryers.

### WATER HEATERS

#### INSTANTANEOUS HEATING TYPE

The Supply Authority reserves the right to refuse to connect water heaters of the instantaneous heating type.

#### ELECTRIC BOOSTED SOLAR TYPE

The Supply Authority reserves the right to control the supply to electric boosters for solar hot water heaters. The booster elements are to be limited to 2.4 kw or 2.4 kw per phase per unit.

Note: It will be necessary to specify this rating with the supplier or his agent when placing an order to purchase either a new complete Electric Boosted Solar Hot Water unit or any replacement element.

The control of supply will be by time switch or frequency injection equipment (Emetcom).

### AIR CONDITIONERS

The Supply Authority reserves the right to refuse to connect air conditioners. However approval may be given on the grounds of medical reasons, with the Supply Authority reserving the right to control the supply by time switch or frequency injection.

Approval may be given for air conditioners being used to protect technical equipment ie; equipment rooms or other communications enclosures. The Supply Authority reserves the right to control the supply by time switch or frequency injection equipment.

### MOTORS AND STARTERS

- (i) The Supply Authority reserves the right to refuse to connect any motor when it is considered that the supply of electricity to other consumers may be adversely affected.
- (ii) Motors having nameplate HP ratings not exceeding 1 HP at 240 volts may be connected to single phase supply.

Subject to location and usage written permission may be granted for the installation of single phase 240 volt motors in excess of 1 HP.

- (iii) Motors, the maximum nameplate HP ratings of which do not exceed those indicated in the following table may be controlled by one of the types or starters listed:

*Type of Starter*

1. Direct-on-line	0-1 HP Single Phase 0-3 HP 3 Phase
2. Star-delta	0-7.5 HP 3 Phase
3. AUTO-Transformer	0-15 HP

The Supply Authority reserves the right to nominate the tappings with respect to auto transformer type starters.

- (iv) Motors having nameplate HP ratings exceeding 15 HP will not be connected without special permission and certain conditions.
- (v) The foregoing table indicating the types of starters for the various motor horsepower ratings must be adhered to except that relaxation maybe permitted only in special cases and only after investigation by the Supply Authority Technical staff upon receipt of request from Contractors.

#### MOTOR STARTING CURRENT

Notwithstanding the above requirements, the Supply Authority may require that the starting current of any motor installation be limited.

## SERVICE CABLES

### GENERAL

The Supply Authority will generally connect only one service to supply one building, or any group of buildings occupied by one consumer.

The supply of materials and the installation of these materials for any service is the responsibility of the relevant customer. The connection of any service shall attract a fee to cover the cost of metering, service equipment and connection to the supply system.

### POINT OF ENTRY

- (i) The Supply Authority shall determine the route of the underground service cable and the position of the point of entry.

Electrical Contractors should consult the Supply Authority officers for directions before commencing work on installations.

- (ii) The point of entry and main switchboard position will be indicated by the Supply Authority. Consultation with the Supply Authority in the planning stage prior to development applications being submitted may be advantageous.

- (iii) If the consumer wishes the meter box to be recessed into the wall the supply conduit may have to pass through the structural footing of the building and rise within the cavity of an external wall. If it is preferred that the conduit rise on the outside of the wall then the standard meter box should be surface mounted on the wall.

Note: It has been the practice of the SEO to pre drill, fit and wire the Supply Authority supplied equipment on the meter panel provided by the customer.

### UNDERGROUND SERVICES

- (i) The consumers' mains shall be installed in heavy duty rigid PVC conduit to Australian Standard Specification 2053 – "Non-Metallic Conduits and Fittings". The nominal size shall be 32mm minimum with a minimum bend radius of 300mm. (Refer drawing Appendix A.)

Note: the above ground section may consist of appropriate light duty conduit which is provided with adequate mechanical protection for approximately 450mm above ground level. AS/NZ 3000-2000 Wiring Rules requires conduits exposed to direct sunlight are to be treated or painted.

- (ii) The conduit shall be laid in a generally straight line from the service connection position to the meter box position. Generally the conduit shall extend into the meter box however an alternative arrangement may apply. The conduit shall be laid at a depth which provides 600mm of cover to finished ground level.



## EARTHING

### MEN SYSTEM

The multiple earthed neutral (MEN) system of earthing will apply to all installations connected to the Supply Authority's low or medium voltage mains.

### MAIN EARTHING CONDUCTOR

The main earthing conductor shall be taken from the neutral busbar on the main switchboard directly, and without a break, to electrodes installed according to the requirements of the AS/NZ 3000-2007 Wiring Rules.

### EXISTING INSTALLATIONS

Where alterations to plumbing in **existing** installations leads to a substantial portion of the plumbing being non metallic, the power circuits will be protected by a Residual Current Device (Safety Switch) as described in AS/NZ 3000-2007 Wiring Rules.

## METERING EQUIPMENT

### GENERAL

Suitable space must be made available for the Supply Authority's metering equipment in a position readily accessible to its Officers for fixing, reading, testing and adjustment and removing it without difficulty. In general, the metering point must be such that the Officers can gain access to it without having to obtain a key, but no objection will be raised to the enclosure of the meters within business premises which will be open during business hours.

The space to be made available on the main switchboard for the Supply Authority's metering equipment must be adequate to permit the fixing of such equipment; the space being dependent upon the type of supply tariff rates, and number of meters, fuses etc.

The Supply Authority may install its metering equipment at locations remote from the consumers installation, but Electrical Contractors must not assume that such will be the case in all or any instance. They are advised to contact the Supply Authority for direction in this regard. Where it is necessary for metering boxes to be mounted on poles, they shall be fitted at such a height that the top of the meter panel is 2000mm above ground level.

The consumer shall ensure that access to the meters is not **subsequently** restricted. If access is so restricted, the consumer shall be required to pay all costs involved in moving the meters to an accessible position. The consumer shall provide adequate protection for the meters where, in the opinion of the Officer, they would otherwise be exposed to mechanical injury, weather, corrosion etc.

Note: It has been the practice of the SEO to pre drill, fit and wire the Supply Authority supplied equipment on the meter panel provided by the customer.

### DOMESTIC PREMISES

The consumers Electrical Contractor shall supply and wire an approved Office of Energy weatherproof meter box.

### NON-DOMESTIC PREMISES

An approved Office of Energy weatherproof meter box will be required where the maximum demand of the consumers installation does not exceed 100 amperes per phase. Where the maximum demand exceeds 100 amperes per phase the size and type of the metering equipment will be indicated by the Supply Authority upon receiving a "*Certificate of Compliance – Electrical Work*" form.

## METERING EQUIPMENT

Includes meters and instruments, metering links and terminal blocks; instrument transformers and any other equipment installed solely for metering purposes.

## ADDITIONAL METERING EQUIPMENT

- (i) Sub-metering installations will not be provided by the Supply Authority, nor will sub-meters (if installed by the consumer) be read by officers of the Supply Authority.
- (ii) Should additional meters be required above those necessary for the Supply Authority's purposes, the Supply Authority, upon application, may supply, install and connect such additional meters at a charge to the consumer. The Supply Authority will not be responsible for the reading nor the maintenance of such additional meters.

## RESTRICTED HOURS METERING AND EQUIPMENT

### ALLIED EQUIPMENT

Includes such items as time switches, relays, contactors and the like for the control of supply for restricted hours operation. All allied equipment is to be of a type and make approved by the Supply Authority and all items of equipment must be capable of being effectively sealed by the Supply Authority.

### METERS - GENERAL

- (i) Direct reading meters (energy) will generally be used. A single phase meter will not be installed on a three phase installation, such as a three phase motor.
- (ii) The following meters will generally be used:
  - Single phase two wire 240 volts 10/60amp
  - Three phase 4 wire 3 x 240 volts 10/40 amp

## CONNECTIONS OF METERING EQUIPMENT

Metering cables for direct connected meters shall not be smaller than 4mm<sup>2</sup> (7/0.85) nor greater than 35mm<sup>2</sup> (19/1.53) but should be of suitable ratings.

Note: It has been the practice of the SEO to pre drill, fit and wire the Supply Authority supplied equipment on the meter panel provided by the customer.

- (i) The connection of the metering equipment will be carried out by the Supply Authority.

- (ii) Where it is necessary to connect more than one portion of an installation to a meter, the contractor shall arrange, by the use of links or by paralleling the different parts of the installation that not more than two 4mm<sup>2</sup> (7/0.85) cables need be connected to any one terminal of a meter.
- (iii) Cables of the same colour as those of the Consumer's mains, shall be used for wiring of directly connected metering equipment.

#### GROUPING OF METERING EQUIPMENT

Generally all metering equipment connected to an installation will be grouped at the one location approved by the Supply Authority.

## CONSUMER INSTALLATION POWER FACTOR

### GENERAL

The power factor at maximum demand shall not be less than 0.9 lagging. Notwithstanding this provision the power factor of certain classes of apparatus must comply with the following:

### LUMINOUS DISCHARGE TUBES (FLUORESCENT LAMPS AND THE LIKE)

In any installation (other than a single domestic installation) where the total installed capacity of electrical discharge lighting systems which exceeds 300 watts, the power factor of such lighting shall be not less than .85 lagging.

No condition of operation with a capacitor or variation of an inductive load, which will result in a "leading" power factor shall be introduced on any installation except by arrangement with the Supply Authority.

## TEMPORARY SUPPLY

### BUILDING IN COURSE OF ERECTION

Temporary service will not, in general, be given to buildings in course of erection. However, the Supply Authority may make supply available before the completion of a building, provided that the progress is such as to permit the permanent installation of the service and metering equipment, and further, that the installation is installed in accordance with the AS/NZ 3000-2007 Wiring Rules and these Service Rules.

### BUILDERS SERVICE

Once service cables have been installed builders may apply for a "builders service", which may be either single, two or three phase as required, and provided the type of supply is available. This service shall be connected to an independent structure erected adjacent to the building by the builder.

The temporary switchboard and the Supply Authority's metering equipment shall be erected on the structure and protected by a weather proof box of approved design, and the installation shall be installed in accordance with the AS/NZ 3000-2007 Wiring Rules and these Service Rules. However, in this instance flexible conduit will be acceptable as the protection of the consumers' mains.

It would be prudent to locate the Builders Service adjacent to the planned point of entry and leave enough length of underground service cable to redirect it to the point of supply when the building is ready for connection to supply and the Builders Service is no longer required.

### HOUSEHOLDERS

Temporary services will be provided to temporary dwellings, such as garage or part house, where it is not expected that it will become necessary to alter the position of the service and metering equipment when the permanent dwelling is completed. The cost of any subsequent alterations will be charged to the consumer.

## TARIFFS

### GENERAL

Electricity is supplied by the Board at various tariffs. Presently the tariff structure is broken into four types:

1. Domestic
2. Commercial
3. Pensioner
4. Electric Vehicles (re-charging point)

These types are defined according to Office of Energy guidelines and included in the Schedule of Fees and Charges.

### SCHEDULE OF FEES AND CHARGES

The schedule is not considered in these rules due to the frequency of review and alteration. The effective charges are available at the Board's Administration Office.

All electricity supplied by the Board to the customer's premises shall be paid for by the consumer in accordance with the rates adopted by the Board from time to time as set out in the "*Schedule of Fees and Charges*". (Generally guided by State Government decree.)

The Board shall have the right at any time and from time to time to increase or decrease rates of charges and to alter the form of tariff as it may deem fit or as directed by other Government Authorities or departments. All such alterations shall be notified to the customers affected, either personally, or by letter and shall apply to the consumption of electricity recorded by all meters read on and after the date fixed in such notification.

### DETERMINATION OF TARIFFS

The Board reserves the right to decide which tariff type any customer should be charged. The tariff cannot be altered unless approved by the CEO. Where a dispute exists the Board may approach an independent arbitrator for determination of the appropriate tariff. The actual tariff may be set, varied and any increase limited, by Government edict.

### MINIMUM CHARGE

A minimum charge shall apply to all metered points of a supply.

## ISSUE AND PAYMENT OF ACCOUNTS

All accounts shall be rendered quarterly or otherwise as the Board may, from time to time, determine. Payments thereof shall be made at the Board's Administration Office.

Should any employee of the Board, misread a meter or make an error when rendering the account, the Board reserves the right to cancel such account and submit an amended statement in lieu thereof.

An account shall not be deemed to be paid until it has been received in the Board's office, or in the case of payment by cheque, until the cheque has been cleared by the bank.

No receipt will be recognised unless it is made on the official receipt form of the Board.

## RE-CONNECTION FEE

Failing payment of any electricity accounts within the stated period, the Board may discontinue the supply of electricity until such accounts have been paid. In such case, a fee shall be charged and payable for effecting the re-connection of supply.

Where supply of electricity has been disconnected by request to allow work of any nature to be carried out, lodgement of a *Notice of Electrical Work* form requesting re-connection shall attract a charge for effecting the re-connection.

## FEED-IN TARIFF

The Lord Howe Island Board does not have a feed-in tariff.



# APPENDIX A

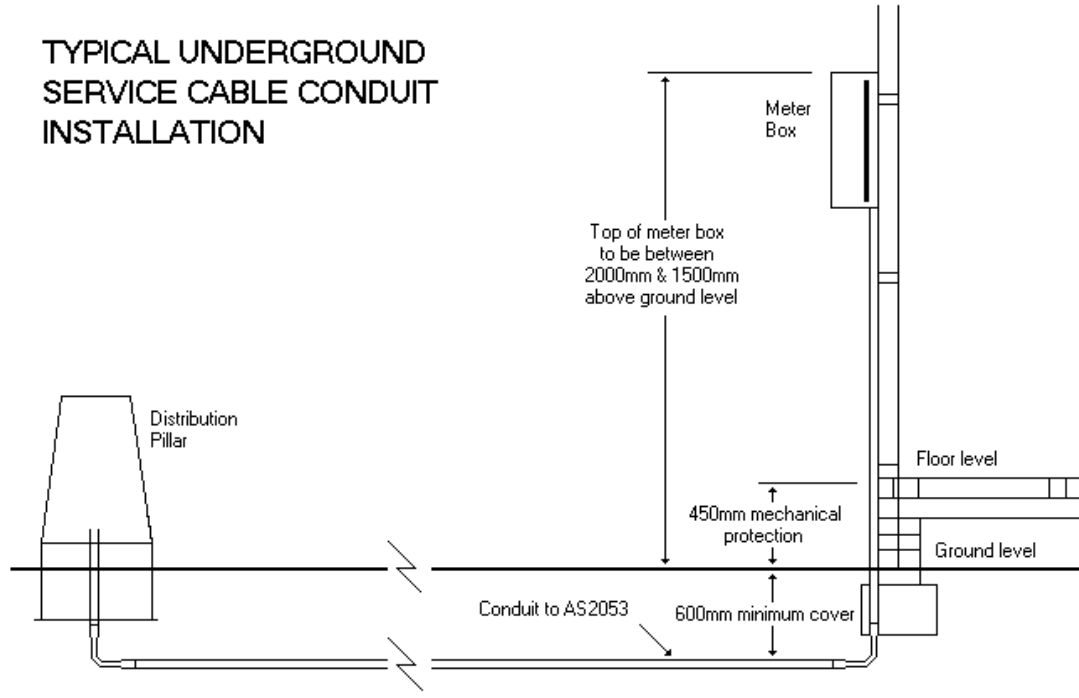


FIGURE 1

Figure 1  
Typical Underground Service Conduit Installation

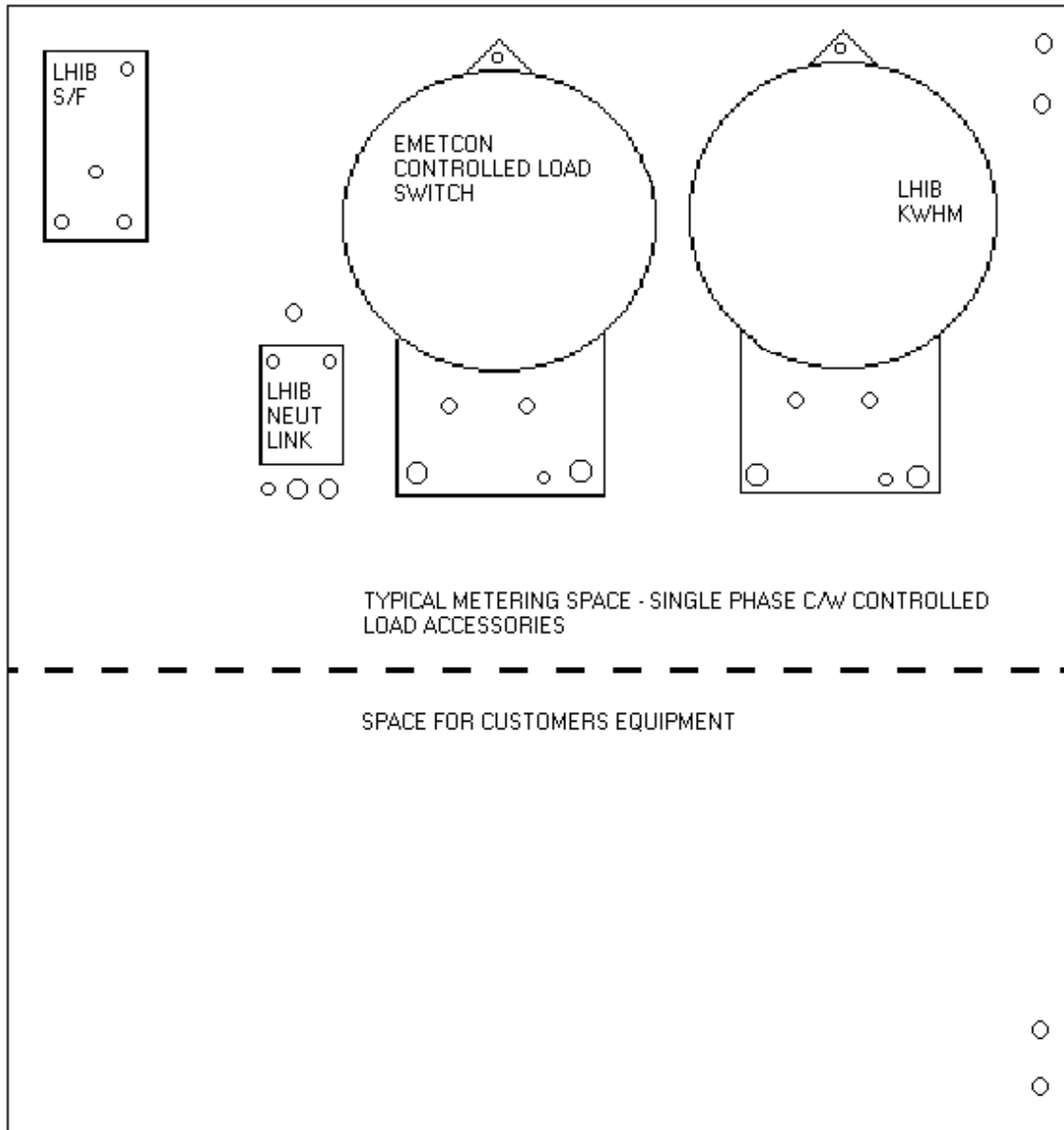


Figure 2  
Typical Single Phase Meter Panel Layout

Note: Drawings and drilling templates for this and other variations of metering arrangements such as multiple services on the one meter panel, are held by the Senior Electrical Officer.

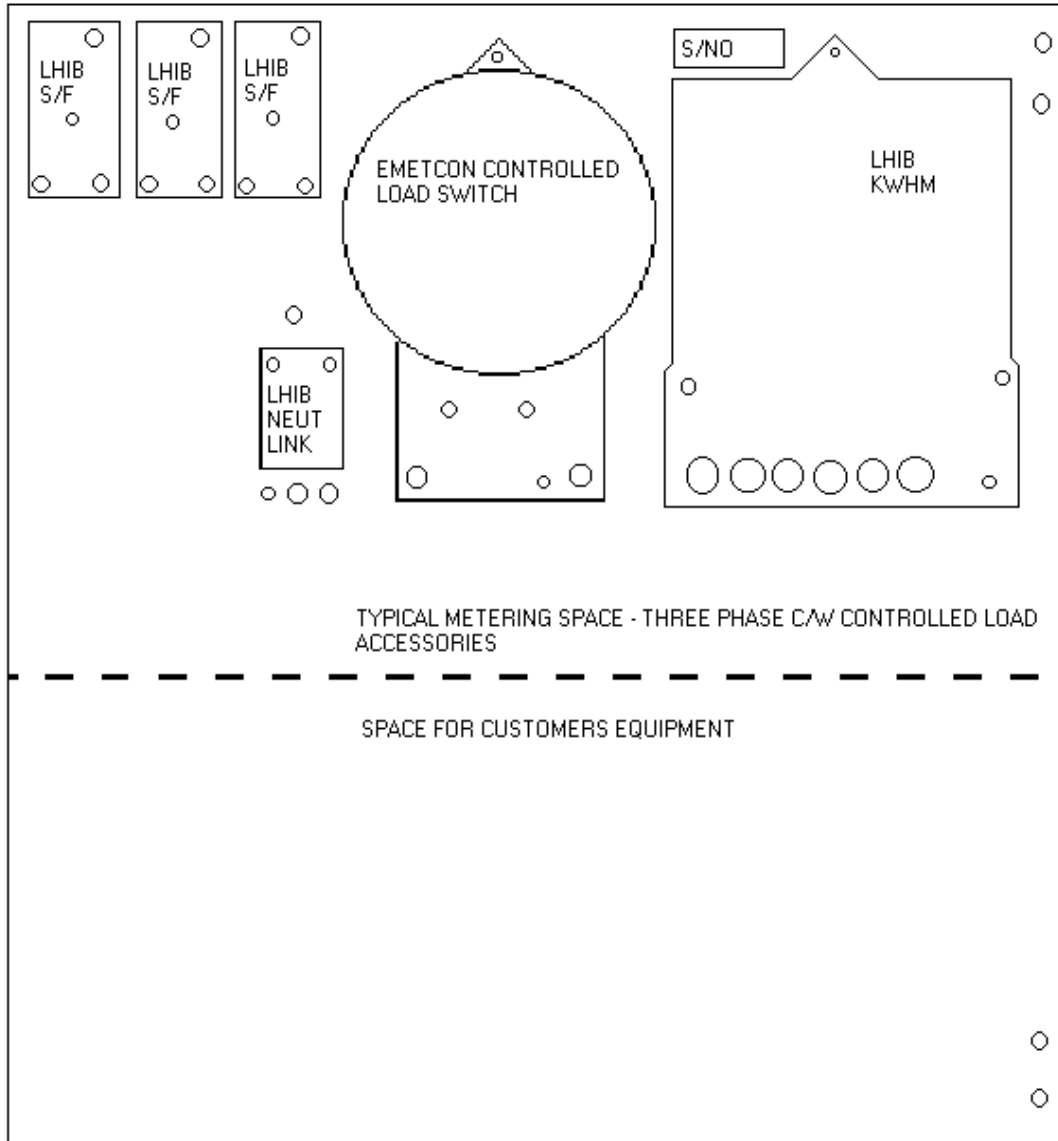


Figure 3  
Typical Three Phase Meter Panel Layout

Note: Drawings and drilling templates for this and other variations of metering arrangements such as multiple services on the one meter panel, are held by the Senior Electrical Officer.

## APPENDIX B

### AUSTRALIAN GUIDELINES FOR GRID CONNECTION OF ENERGY SYSTEMS VIA INVERTERS

#### 1. SCOPE

These guidelines apply to any **inverter energy system** as described in Energy Sources, connected to the Lord Howe Island Board low voltage distribution network. These inverter energy systems must satisfy the requirements of these guidelines and incorporate an accepted inverter. These guidelines address technical matters only. Commercial matters are outside the scope of these guidelines.

#### 2. DEFINITIONS

(i) ***Energy Sources***

Grid connected inverter energy systems (excluding motor drive inverters). Single phase systems from 0 to 10kVA, three phase systems from 0 to 30kVA, connected at the nominal interconnection voltage and frequency. Herein referred to as **inverter energy system(s)**.

(ii) ***Nominal Interconnection voltage***

Low voltage ie 240 volts single phase / 415 volts three phase.

(iii) ***Nominal Interconnection frequency***

50Hz

(iv) ***Accepted inverter***

An accepted inverter is one approved by the relevant electricity distributor for grid connection.

(v) ***Lockable switch***

Lockable switch means that the switch or circuit breaker must as a minimum have provision for insertion of a wire seal to prevent the switch being closed.

(vi) ***Electricity Distributor***

The Lord Howe Island Board.

(vii) **Islanding**

Islanding of inverter systems in the context of these guidelines means any situation where the grid fails or is tripped and one or more inverters maintains a supply of any description (be it stable or not) to any section of the distribution network outside the consumers installation (ie on the distribution network side of the point of the connection).

3. CONNECTION REQUIREMENTS

(I) GENERAL

Inverter energy systems must satisfy the requirements listed in the subsections below to satisfy these guidelines. The inverter must also be an accepted inverter.

(ii) POWER FLOW DIRECTION

Both directions of power flow allowed ie from inverter to grid and from grid to inverter.

(iii) POWER FACTOR

Allowable range is from:

0.8 lagging to 0.95 leading for outputs from 20% to 100% of rated VA  
 0.6 lagging to 0.9 leading from outputs from 5% to 20% of rated VA

Unless the device is approved by the relevant electricity distributor to control power factor beyond the above range for the purpose of providing voltage support at the point of connection. (Lagging power factor is to be interpreted with the inverter as a generator ie the inverter is supplying to the grid as if the grid was a load with lagging power factor, similarly for leading power factor.) Alternatively under special circumstances the relevant electricity distributor may require a specific power factor.

(iv) HARMONICS

(a) GENERAL

In order to maintain fairness to manufacturers of both current and voltage source inverters two test methods have been specified below. The method appropriate to the inverter type should be used.

(b) TEST SUPPLY SPECIFICATION

In order to carry out inverter tests a minimum requirement on the supply that the inverters are required to work into is as below:

V3rd 0.9%

V5th	0.4%
V7th	0.3%
V9th	0.2%
Vevens order 2-10	0.2%
V11-40	0.1%

Individual supply harmonics should not be greater than these figures.

(c) TEST METHOD FOR VOLTAGE SOURCE INVERTERS

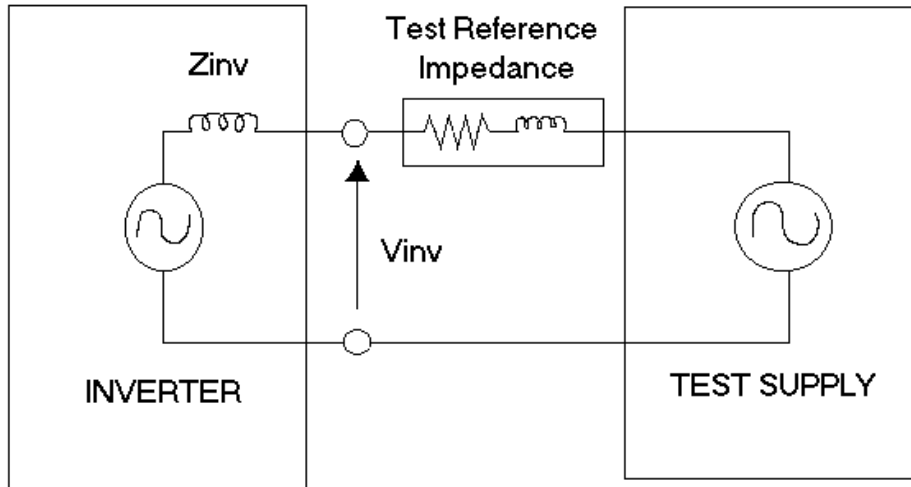


Figure 1 Harmonic Voltage Measurement Circuit

Test reference impedance should be  $0.4 + j0.025$  per unit using the inverter continuous rating as the per unit base.

Voltage Total Harmonic Distortion (THD) measured at the inverter terminals should not exceed 3%.

Individual voltage harmonics should not exceed values in table 1 at full load. The values in the table are shown as a percentage of the fundamental.

V3rd	2.7%
V5th	1.2%
V7th	0.9%
V9th	0.6%
Vevens order 2 – 10	0.6%
V11 – 40	0.3%

Table 1 Voltage harmonic ratio limits for voltage source inverters.

(d) TEST METHOD FOR CURRENT SOURCE INVERTERS

Current source inverters should be directly connected to the test supply and current harmonic ratios measured.

Current Total Harmonic Distortion (THD) measured at the inverter terminals should not exceed 4%.

Individual current harmonics should not exceed values in table 2 at full load. The values in the table are shown as a percentage of the fundamental.

13rd	3.6%
15th	1.6%
17th	1.2%
19th	0.8%
evens order 2 – 10	0.8%
11 – 40	0.4%

*Table 2 Current harmonic ratio limits for current source inverters.*

(v) HIGH FREQUENCY NOISE

Equipment must conform to AS1044 “Electromagnetic interference – Household electrical appliances, portable tools and similar electrical equipment – Limits and Methods of measurement”.

(vi) VOLTAGE FLICKER

Equipment must conform to limits as per AS2279 part 4 section 6.

(vii) PROTECTION

A minimum requirement to facilitate the prevention of islanding is that the **inverter energy system** protection operates and isolates the **inverter energy system** from the grid if:

- operating voltage is greater than 250V phase to neutral
- operating voltage is less than 210V phase to neutral
- operating frequency is greater than FreqMAX
- operating frequency is less than FreqMIN

FreqMAX will be in the range 50 to 52 Hz.

FreqMIN will be in the range 48 to 50 Hz.

Both these limits may be either factory set or site programmable. The values of these limits will be stipulated by the relevant electricity distributor. The protection voltage operating points may be set in a narrower band eg 220V to 250V if required.

(If the inverter energy system does not have the above frequency features the manufacturer must demonstrate an alternate anti-islanding protection feature that is acceptable to the relevant electricity distributor.)

The maximum time allowed for operation of the protection is 2 seconds.

If the protection function above is to be incorporated in the inverter it must be type tested for compliance with these requirements and accepted by the relevant electricity distributor. Otherwise other forms of external protection relaying are required which have been tested for compliance with these requirements and approved by the relevant electricity distributor.

In addition to the passive protection detailed above, and to prevent the situation where islanding may occur because multiple inverters provide a frequency reference for one another, inverters must have an accepted method of islanding prevention eg frequency drift. This protection must operate and isolate the **inverter energy system** from the grid a maximum of 2 seconds after grid failure under all local conditions. (See compliance test requirements.) The inverter energy system must remain disconnected from the grid until the reconnection conditions are met (see section (xii)).

(viii) DC INJECTION PREVENTION

A transformer shall be installed to prevent DC from entering the grid. The transformer can be omitted when a DC detection device is installed at the point of connection on the AC side. This detection device may be incorporated in the inverter provided that its performance has been type tested and approved for compliance with these guidelines. The limit on DC current injection will be such that the injected DC current will not exceed 5 milli-Amps. Guidance can be obtained from AS3300 on DC current limitations for continuously operated devices.

(ix) CONNECTION POINT

It is preferable that the **inverter energy system(s)** be connected directly to the main switchboard. In installations where this is not possible/desirable the nearest distribution board shall be used and all switchboards between the inverter energy system and the main switchboard shall be labelled. See section on labelling.

The **inverter energy system** must be connected to a dedicated circuit. The rating of the inverter circuit cables and all the cables between any distribution boards and the main switchboard, which carry inverter output must be rated for at least the full output of the inverter. See AS3000.



## (x) EXTERNAL DISCONNECT SWITCH

The main issue here is one of personnel safety when working on electrical systems both within a customer's installation which contains an **inverter energy system(s)** and on the grid adjacent to a customer that has an **inverter energy system**. To address these issues it is required that there be a visible and accessible method of ensuring that the **inverter energy system** is disconnected from the grid and disconnected from the customer's installation.

Where the **inverter energy system** is connected directly to the main switchboard these requirements may be met by a single lockable switch appropriately labelled.

In installations where the **inverter energy system** is connected at a distribution board other than the main switchboard then two lockable switches must be provided.

- 1) The switch located on the main switchboard which controls the sub-circuit of the distribution board to which the **inverter energy system** connects must be lockable to be used as isolation for utility staff working on the grid.
- 2) The other lockable switch must be located at the distribution board from where the **inverter energy system** sub-circuit emanates to provide isolation for electrical contractors working on the customer's installation.

Irrespective of where the **inverter energy system** circuit emanates from, the controlling device will be installed to the requirements governing main switches in AS3000.

## (xi) LABELLING / SIGNAGE

The **inverter energy system** installation must include warning signage. Signage should as a minimum be placed:

- On the switchboard or distribution board that has the **inverter energy system** connected to it.
- On all switchboards including main switchboard and distribution board(s) between the main switchboard and the board that has the **inverter energy system** connected to it.

Signage should describe the actual **type** of generation source installed because particular generation sources, such as photovoltaic or wind, have varied electrical characteristics.

The owner of the **inverter energy system** shall make arrangements to supply and install appropriate signage on the installation, in accordance with requirements outlined in appendix AA.

The materials for the labelling / signage must comply with AS3100.

(xii) RECONNECTION PROCEDURE

Automatic reconnection of **inverter energy system(s)** onto the grid will only occur if the voltage is within the range of 200V to 270V phase to neutral and the frequency is within the range FreqMIN o FreqMAX, (as per section (vii)) and these conditions have been maintained for a minimum of 1 minute.

(xiii) CABLES AND WIRES

The installation must comply with all appropriate local and Australian Standards.

(xiv) METERING

Metering is the responsibility of the relevant electricity distributor.

#### 4. SAMPLE SIGNAGE

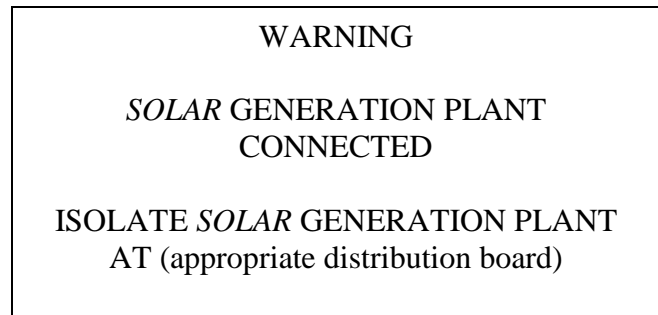
This is only a sample of appropriate signage. It is indicative of the type of appropriate signage required at the various locations specified.

Note: Word in *italic* would change to describe the type of generation (eg. Photovoltaic, induction generator, synchronous generator, alternative, renewable, etc.)

Size specifications are a minimum size.

Main switchboard and distribution board(s) upstream of distribution board where the inverter energy system is connected:

Qty: 1  
Lettering: 4mm, 8mm "WARNING"  
Colour: Red, white letters  
Size: **120\*60mm**



Main switchboard or distribution board where the inverter energy system is connected:

Qty: 1  
Lettering: 4mm, 8mm "WARNING"  
Colour: Red, white letters  
Size: **120\*60mm**

WARNING  
  
DUAL SUPPLY  
  
ISOLATE BOTH NORMAL AND *SOLAR*  
SUPPLIES BEFORE WORKING ON THIS  
SWITCHBOARD

Main switchboard or distribution board where inverter energy system is connected:

NORMAL SUPPLY MAIN SWITCH

Qty: 1  
Lettering: 5mm  
Colour: White, black letters  
Size: **75\*30mm**

NORMAL SUPPLY MAIN SWITCH

SOLAR GENERATOR MAIN SWITCH

Qty: 1  
Lettering: Title 5mm, words 4mm  
Colour: White, black letters  
Size: **75\*30mm**

*SOLAR* SUPPLY MAIN SWITCH  
  
*SOLAR* GENERATOR LOCATED IN  
(location of *solar* generator)