Section 4

Service and Metering Equipment

(Including Current Transformer Metering and Installations with Main Switchboards rated above 100 Amps per Phase)

Service and Installation Rules of New South Wales
October 2006
Amendment 3: January 2010

CONTENTS

4 Service and Metering Equipment

(Including Current Transformer metering and installations with Main Switchboards rated above 100 Amps per phase)

4.1 INTRODUCTION

The customer must arrange to provide and install at the customer's cost:

(a) Service Protective Device.

(b) Service fuses / service circuit breakers.

(c) Service neutral/active links.

(d) Metering and load control devices.

(e) The meter/switchgear enclosure.

(f) Associated wiring and connections in accordance with AS/NZS 3000.

(g) Any other service equipment required.

The enclosure must be in a location and in conditions the electricity distributor accepts.

A customer may be required to supply metering or load control devices which may be purchased from the electricity distributor or from a meter supplier approved by the electricity distributor. Electricity distributors will have technical and administrative requirements which must be observed.

Ownership of meters, demand indicators, and load control devices used for revenue purposes, will upon connection be transferred to the electricity distributor or the accredited meter provider.

The electricity distributor or the nominated metering provider will maintain the metering and load control equipment.

The electricity distributor will assess the maximum demand for service and metering equipment. Where it exceeds 100A per phase for separately metered parts of an installation Current Transformer (CT) metering must be installed. In all other cases whole current metering will be installed.

All installations are to be arranged to be metered through the minimum number of standard meters. Refer to clause 4.11.1.

4.1.1 Existing Installations

In general where metering installations are changed or relocated, standard metering arrangements as required by this Section will apply.

You may install additional service and metering equipment on an existing board if the additions can be accommodated without relocating existing metering equipment.

If it is necessary to install additional panels, these panels may be either:

(a) In the standard arrangements which are outlined in this document, or

(b) Matched to the existing style.

Where new tenancies are created in an existing non domestic multiple installation and insufficient room exists at a common metering point the metering may be:

(c) Located on the exterior wall of its associated tenancy.

(d) In all cases where no practical alternative exists contact your local Electricity Distributor.

Where additional whole current service and metering equipment is required you must also comply with the provisions for the isolation requirements of clause 4.13.

4.2 LOCATION AND ACCESSIBILITY OF SERVICE AND METERING EQUIPMENT

Service and metering equipment must be located in an accessible area on common property.

For installations on non urban properties exceeding 0.4 Hectare (Ha) in area, apply to the electricity distributor regarding a suitable meter location.

The customer must make sure that access to any enclosure for meters or service and metering equipment is never restricted or made unsafe. The location must always be kept clear.

If access is obstructed the customer must remove the obstruction or relocate the service and metering equipment.

Keep rooms dedicated to housing service and metering equipment well lit, clean and unobstructed. Do not use them for storage of materials or equipment. The door(s) of rooms and enclosures housing metering equipment must be labelled “Electricity Meters”.

Make sure the metering and load control equipment is easily accessible to electricity

distributor officers within normal electricity distributor working hours.

As an alternative and subject to availability and agreement between the customer and the electricity distributor, an alternative metering system such as remote metering may be installed at the customer's expense.

Provide access to an elevated position as specified in AS 1657 'Fixed platforms, walkways, stairways and ladders - Design, construction and installation'.

Any gas meter, fittings, enclosures or other obstructions installed below the service metering panel must not project further than 300mm from the face of the wall on or in which the service metering panel is mounted.

Provide and maintain adequate space in front of the service and metering equipment panel or cabinet, to enable the equipment to be operated or adjusted.

The space must:

(a) Be flat and level

(b) Enable the door or panel to be opened or removed; and

(c) Provide a vertical clearance of not less than 2 metres from the ground, floor or platform and a minimum horizontal clearance of not less than 0.6 metre from the:

  i) Equipment mounted on the hinged panel or

  ii) External front edge of the switchboard enclosure

  whichever point protrudes the most.

When a hinged meter panel is extended on its hinge to the 90^0 open position, make sure a clearance of 200mm is maintained between the front face of the panel and any fixed object.

Provide a clearance of 175 mm from the front of the panel to the door.

Note: The local government Act requires compliance to the Building Code of Australia for **exits for fire escape** purposes, or any corridor, hallway, lobby or the like leading to such an exit. This does not apply in single dwellings. In the case of buildings being altered or the use being changed, the local council may require an existing building to be brought up to this standard.

CAUTION

Whenever a property or building is of a type which may be subdivided, care should be taken to ensure that the meters and wiring are located within the area which would be set aside as common property or within the individual lot supplied thereby. Wiring installed within an individual lot must be associated only with that lot.

4.2.1 Single Domestic Premises

The service and metering equipment must be located where ready pedestrian access is maintained, in one of the following locations:

(a) On the face of the residence facing the front boundary.

(b) On the adjacent side wall within 1.5m of that face or associated corner window or verandah.

(c) On a private pole.

(d) Within the front boundary fence so that distributor meter reading and maintenance of service and metering equipment may be carried out without introducing a safety hazard.

Where the main entrance is on the side of a residence the service and metering equipment may be installed on that side not further than 1.5 metres beyond the main entrance subject to access being available.

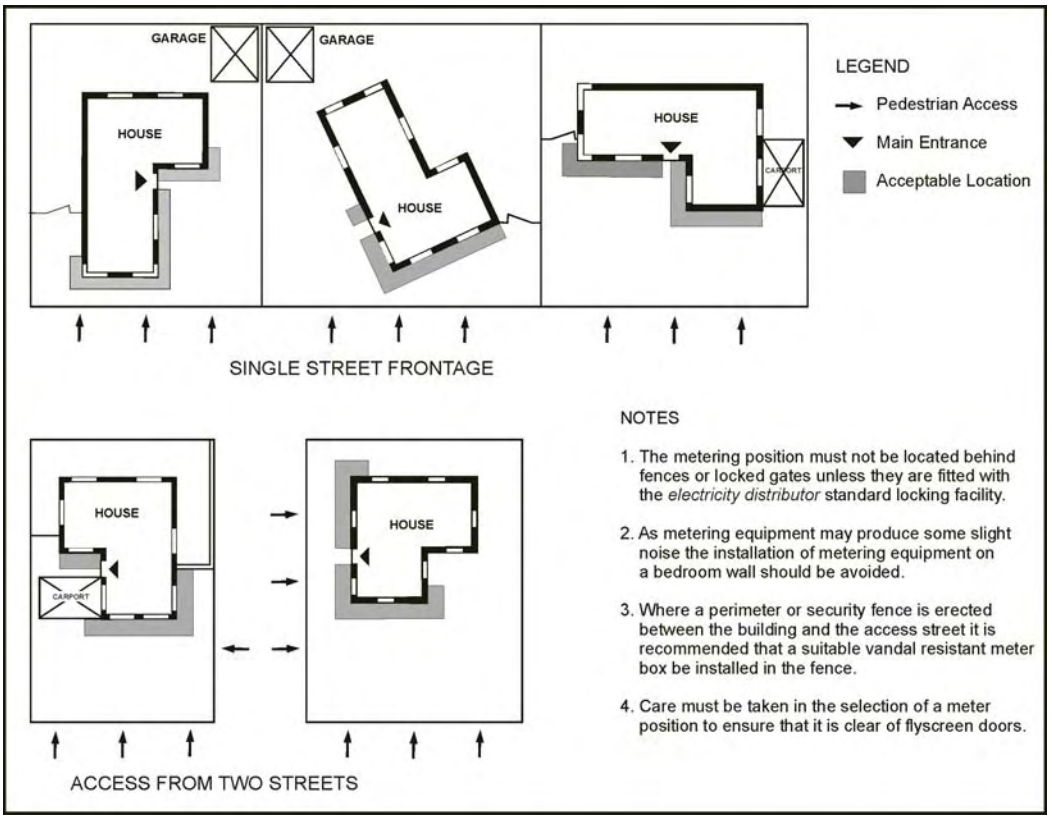
Suitable locations are shown in Figure 4.1.

The service and meter position must not be located behind fences or locked gates unless they are fitted with the electricity distributor standard locking facility. Refer to clause 4.6.

Where a perimeter or security fence is erected between the building and the access street it is recommended that a suitable vandal resistant meter box be installed in the fence.

As metering equipment may produce slight noise the installation of metering equipment on a bedroom wall should be avoided.

Figure 4.1: Suitable Metering Locations for Single Domestic Installations



4.2.2 Single Business Premises

Unless otherwise approved by the electricity distributor, the service and metering equipment must be located as close as practicable to the entrance of the premises and must be readily accessible (in an area normally open to the public).

In addition, metering equipment must not be located in areas intended for product display such as shop windows or where access is restricted during normal operations for security, health or other reasons.

The service and metering equipment for single business premises within a multiple occupancy must be grouped at the associated common distribution board, external to the tenancies.

Access must be available during the electricity distributor's normal business hours.

4.2.3 Multiple Occupancy Premises

The metering for new multiple occupancy premises will be grouped at the one metering position. Provision should be made to cater for any future metering requirements.

The grouped metering must be in a location accessible to all associated tenants. It must not be located within any one occupancy.

If located in a secured common area access must be available by means of a standard locking system obtained from the electricity distributor.

For practical reasons it may be necessary to provide more than one metering position. The following clauses shall apply.

4.2.3.1 Multi-Storey Developments

In multi-storey developments, group the meters together on each floor, unless otherwise agreed to by the electricity distributor.

4.2.3.2 High Density Residential Installations

In high density residential installations, locate the meters on or adjacent to the main switchboard. The metering may be on an individual floor basis, where agreed to by the electricity distributor.

4.2.3.3 Medium Density Residential

Do not locate the metering within any individual occupancy's right of way in medium density residential developments (eg town houses, villa units, cluster homes, duplex units), and domestic installations which include a separate flat or unit.

4.2.3.4 Factory Unit Developments, Shopping Centres and Malls

For factory unit developments, shopping centres and malls, locate the service and metering equipment external to the tenancies.

4.2.3.5 Remotely Read Meters

Remotely read metering may be located within the tenancy at customers expense, refer to electricity distributor.

4.3 UNSUITABLE LOCATIONS

Service and metering equipment must not be installed behind locked gates or doors unless they are fitted with the electricity distributor's locking systems.

In addition the following locations are considered unsuitable for mounting service and metering equipment:

(a) Over stairways or ramps, in narrow passageways, or in confined spaces.

(b) In vehicle docks, driveways, factory passageways where the equipment or a person working on it would not be effectively protected.

(c) In close proximity to, or over, machinery or open type switchgear.

(d) Locations which are liable to be affected by fumes, vibration, dampness, or dust, which may cause deterioration of equipment or unsatisfactory working conditions.

(e) In hazardous or prohibited switchboard locations as defined in the AS/NZS 3000.

(f) Where the normal ambient temperature exceeds 50^{o}C.

(g) Where there is insufficient light.

(h) Where exposed to direct sunlight.

(i) Where the use of a ladder would be necessary.

(j) Where projections at head height are a hazard.

(k) In pool or spa areas.

(l) In carports, unless with the prior permission of the electricity distributor.

(m) On enclosed verandahs.

(n) In areas enclosing dogs.

(o) In areas to which access is normally restricted - for security, health or other reasons. (This would include areas in which animals are kept for security reasons).

(p) Behind a fence without a gate.

(q) Within gas emitting devices exclusion zone, refer to AS 5601.

(r) Within LPG cylinder minimum clearance to ignition sources refer to AS 5601.

(s) In fire isolated stairways, passageways or corridors.

(t) Where access is restricted by vegetation.

(u) On the electricity distributor's asset.

See AS/NZS 2430.3.4 'Classification of hazardous areas Part 3.4 - Examples of area classification - Flammable gases'.

4.4 HAZARDS OF EXISTING METER AND SWITCHBOARD PANELS THAT MAY CONTAIN ASBESTOS

Accredited Service Providers and electrical contractors should not carry out work that disturbs the integrity (eg drilling) of existing meter or switchboard panels that may contain asbestos, within electrical installations, without taking suitable precautions. Information in this regard is available from the WorkCover website (www.workcover.nsw.gov.au) which lists relevant industry safety guidelines and model procedures.

WARNING - ASBESTOS

Historically, asbestos has been used in switchboard panels used in electrical installations. All electrical personnel who work on switchboard panels need to identify if this hazard may be present, and if necessary adopt approved industry procedures, when working with switchboard panels.

4.5 FACILITIES FOR THE INSTALLATION OF METER AND SERVICE EQUIPMENT

4.5.1 Service and Metering Equipment Panel

For all new installations the meter/switchgear panel must:

(a) Not use materials containing asbestos.

(b) Provide sufficient space for the installation of service and metering equipment, refer to the electricity distributor or your accredited service provider for metering equipment sizes.

(c) Separate the service and metering equipment from the customer's equipment. Separation may be shown by marking.

4.5.2 Service and Metering Equipment Enclosure

Provide and install enclosures complying with AS/NZS 3000 and AS/NZS 6002 Domestic Electricity Enclosures.

4.5.3 Free length of consumers mains/underground service

The free length of consumers mains/underground service mains to be installed, measured from where it passes through the hole in the panel, must be as follows: above fuse (line side) 75mm; below fuse (load side) 150mm. A similar length is required for the neutral conductor. All cables must be connected to the Service Protective Device and neutral link by the accredited service provider.

4.5.4 Physical Protection of Service and Metering Equipment

Service and metering equipment must be protected from:

(a) The weather.

(b) Mechanical damage.

(c) Salt or dust laden air or corrosive atmospheres.

(d) Vandalism.

An enclosure must be fitted with a door and catch.

4.5.5 Isolated and Unattended Locations

Where service or metering equipment is installed in an enclosure externally on a building or a pole in an isolated and unattended location, the enclosure must be constructed using galvanised steel or equivalent material of sufficient strength to achieve protection against vandalism, weather or other external factors. Such enclosures must be kept locked at all times using the electricity distributor's standard locking system.

This requirement does not apply for service and metering equipment enclosures on construction sites.

4.5.6 Top Hinged Switchboard Doors

If the door is hinged at the top, provide a stay fastened to the enclosure to hold the door open greater than 90°.

4.5.7 Glazed Switchboard Doors

Do not glaze the door if the enclosure is exposed to sunlight or the risk of breakage is high.

4.5.8 Fixing of Service Equipment Enclosure

Ensure the facilities for mounting the electricity distributor's service and metering equipment and associated surrounds and enclosures, are securely fixed to a wall or rigid supporting structure.

4.5.9 Service Protective Device and Service Fuse Rating Selection

The service protective device and service fuse rating must be suitable for the design of the installation. Multiple service fuses are allowed in accordance with Table 4.1.

Table 4.1: Examples of Suitable Service Protective Device Combinations

Service Rating	Service Protective Device Rating	Comments
100A	1 X 100A	Maximum of 4 customers per service fuse.
200A	2 x 100A	Multiple service protective devices may be installed for this service rating only. Maximum of 8 customers per phase.
	1 x 200A	See Note 4
300A	1 x 300A/315A	This may cause some grading problems with substation distributor fuses, which if blown are not able to be replaced by the customer. See Note 4
	250A	If there are restrictions these fuses may be used as this size would grade. See Note 4
400A	1 x 400A	This may cause some grading problems with substation distributor fuses, which if blown are not able to be replaced by the customer. Fuses must be to Class Q1 to BSS 88, 1975. You may be requested to install bars or have a combination of fuse ratings. See Note 4
Refer also to multiple customer arrangements shown in clause 4.14.		

Notes:

1. These examples are dependant on the loading of the various metered sections of an installation.
2. When using service protective devices of the larger sizes you must ensure that grading is achieved below those fuses. The grading prevents nuisance loss of supply as the service fuse then protects a smaller portion of the installation by ensuring that the fault is seen by the fuse which is closest to the fault (between the fault and the supply).
3. With supplies direct from a substation, grading must be achieved.
4. Multiple 100 Amp service fuses per phase are allowed, when there is a single service protective device protecting the whole installation.
5. Number of customers per 100 Amp service fuses is determined by the requirements of Clause 4.14.1.

4.6 LOCKING OF SERVICE AND METERING ENCLOSURES

Locking and restricting access to a meter enclosure or other enclosure for service equipment is acceptable if the lock or access is by means of a standard locking system obtained through the electricity distributor.

The following access arrangements are acceptable provided the electricity distributor's officer is not required to reset security alarms:

(a) Where electrically operated security locking is used, a key switch is to be provided and fitted with the electricity distributor's standard cylinder.

(b) Where access is given by means of a security card, either a key switch as above or a card left in a locked box provided by the customer and mounted adjacent to the entrance door which can be opened by the electricity distributor's standard key is to be provided. The lock box must be mounted no lower than 0.6 m or no more than 2.0m above the ground, floor or platform.

Note: The electricity distributor's locking system is a restricted key system not a high security system. The electricity distributor's locking system must not be installed on doors which give access to any rooms or areas in which portable articles and equipment of any value, personal goods and the like are located.

4.7 SERVICE PROTECTION DEVICE

The customer must provide, install and maintain an approved service protection device located in accordance with the following sub clauses.

For installations with a maximum demand of up to 100A per phase, determined in accordance with the AS/NZS 3000 for consumers mains, unless otherwise approved by the electricity distributor the service protective device must be located at the meter position.

For installations with a maximum demand exceeding 100A per phase, determined in accordance with the AS/NZS 3000 for consumers mains, the service protective device must be located adjacent to or incorporated in the main switchboard. The service protective device must be installed on the line side of the current transformers.

The requirements of this clause apply to alterations and additions to existing installations except where the relocation of the service protective device would require upgrading of the service mains, consumers mains or main switchboard, then the existing service protective device location may be maintained.

Locate the service protective device no higher than 2.0m to the top of the device and no lower than 0.5m to the line side terminals of the device above the ground floor or platform.

For special situations check with the distributor.

4.7.1 Working Live Information for Electrical Contractors

Occupational Health and Safety Amendment (Electrical Work) Regulation 2004 expands the existing requirements of the Occupational Health and Safety Regulation 2001. The regulation requires:

(a) That electrical work is not carried out while the circuits and apparatus of the part of the electrical installation that is being worked on are energised.

(b) That any electrical work on an electrical installation is carried out using a safe system of work, which must include checks to ensure that the circuits and apparatus of the part of the installation that is being worked on are not energised before work commences and remain that way until the work is completed, and measures to eliminate or control the risk of the person carrying out the work inadvertently contacting any part of the installation that remains energised.

(c) Generally, live electrical work cannot be justified. The only variation to this requirement is where the electrical work is necessary in the interests of safety and the risk of harm would be greater if the circuits and electrical apparatus were de-energised before the work commenced. Only in this situation can live electrical work proceed. The work must be performed in the presence of a safety observer who is competent to perform the particular task that is to be carried out and competent in electrical rescue and CPR. The safe system of work also encompasses a list of other mandatory safety measures.

(d) Testing and fault finding on live circuits must be carried out using a safe system of work including a risk assessment in respect of the tests and a list of other mandatory safety measures.

Note: The risk assessment may identify the need for the presence of a safety observer who is competent to assist the persons who are conducting the tests and competent in electrical rescue and CPR.

WorkCover has produced the Code of Practice: Low Voltage Electrical Work. The Code provides employers with practical guidance on measures to eliminate or control the risks to employees and other workers who perform electrical work on low voltage electrical installations.

For further information contact your local WorkCover NSW offices listed in the telephone directory or ring the WorkCover Assistance Service on 13 10 50 or visit WorkCover's website www.workcover.nsw.gov.au

4.7.2 100A Service Protective Devices and Service Fuses

New installations with maximum demands of up to 100A per phase, determined in accordance with the AS/NZS 3000 for consumers mains, must have 100A service protective device. The fuse assembly must have a sealable escutcheon, known as an anti intrusion assembly, which prevents access to the terminal. The fuse carrier does not have to be sealed to the fuse base.

The 100A service protective device and service fuses must comply with the following requirements:

(a) The fuse assembly must accept a Type llb 100A current limiting (HRC) fusible link. The fusible link must be manufactured in accordance with AS 60269.3.0 and AS 60269.3.1.

(b) The equipment must be supplied complete with the fusible link, fuse carrier, base and sealed escutcheon.

(c) The fuse base may be either front or back connected.

(d) The fuse base must have two load terminals, or you must provide a sealable active link for connection of more than one tariff or customer.

(e) Connect one conductor only to each separate terminal. Protect unused terminals from accidental contact.

(f) Where the service protective device and service fuses consist of a base, insulating cover (turret) and fuse carrier, you must install and secure the insulating cover (turret) before the fuse carrier is inserted.

(g) Where insulating barriers are provided on one terminal only, you must use that side of the fuse base for the line side connection. (Do not remove barriers).

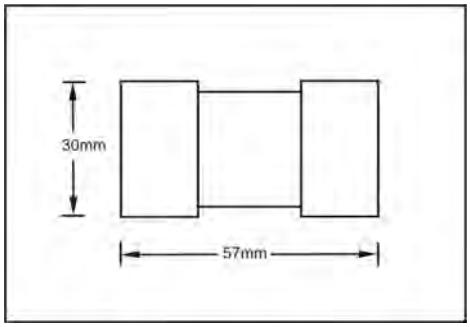
(h) If you have to use specialised insulated tools to make connections into the fuse base, you must follow the fuse manufacturer's instructions.

(i) The fuse-link dimensions are shown in Figure 4.2.

(j) Bolt-in style motor start fuses are an acceptable alternative to the fuse shown in Figure 4.2. Note: Bolt-in style motor fuses are not standard. Where used a spare set of fuse links are to be provided by the customer.

Note: For electrical installations on railway land in the 1500V dc electrified track area RailCorp normally requires circuit breakers as service protective devices.

Figure 4.2: 100A fuse link dimensions Type IIb



4.7.3 Enclosures for Service Protective Device greater than 100A

Service protective devices exceeding 100 Amp rating must be designed and installed in accordance with the requirements *Appendix ZC* of AS 3439.1 – Type Tested and Partially Type Tested Switchboard Assemblies for arc fault minimisation.

4.7.4 Service Protective Devices greater than 100A

Service protective devices exceeding 100A must comply with:

(a) AS 60269.21.

(b) IEC 269 Part 2-1 'Low Voltage Fuses'.

(c) BS 88 Part 2, 1975 'Low Voltage Fuses'.

(d) AS 60529-2004 'Degrees of protection provided by enclosures (IP Code)'.

The service protective device must also comply with the following requirements:

(a) The assembly must be suitable for the installation of current limiting (HRC) fuses with a current rating from 200A to 400A.

(b) Links must be current limiting (HRC), Type G, T or NHG (DIN) and must comply with Class Q1, to BS 88 part 2, 1975.

(c) They must have a rated voltage not less than 500V.

(d) Have a rated breaking capacity of not less than 80kA.

(e) The equipment must be supplied complete with the requested current rated fusible links. Where requested by the distributor, solid links must be fitted in lieu of fuses.

(f) The fuse-link dimensions must be B4 or C1 for bolted connected fuse links and Size 2, for blade connected fuse links.

(g) Have phase segregation dividers fitted to prevent phase to phase faults or separately enclosed phase fittings used. Where practical the fixed contacts should be shrouded to reduce the risk of contact with live parts.

(h) The fuse assembly must be contained by an insulated enclosure. If within a metal switchboard the sides of the enclosure must be insulated.

(i) The fuse assembly cover must be capable of being adequately sealed, with or without the fuse link fitted. No live parts must be exposed during the sealing operation.

(j) The fuse assembly may be either front or back connected.

(k) A combined fuse-switch unit with segregation is satisfactory.

(l) Grade (discriminate) with the electricity distributor's protection.

Where the service protective device consists of a base, insulating cover (turret) and fuse carrier, the insulating cover (turret) must be installed and secured before inserting the fuse carrier.

Where specialised insulated tools are necessary to make connections into the fuse base then the fuse manufacturer's instructions must be followed.

Service protective devices greater than 100A utilising fuses must be installed in a vertical orientation with fuse withdrawal towards the operator and must comply with clause 4.7.3 of this document.

Figure 4.3: Figure Deleted

4.7.5 Circuit Breakers in Lieu of 100A Service Protective Devices and Service Fuses

In special circumstances and on application to the electricity distributor approval may be given to allow circuit breakers in lieu of a 100A service protective device and service fuses.

Where approved the circuit breaker must comply with the requirements of clause 4.7.6.

For electrical installations on railway land in the railway 1500V dc electrified track area RailCorp normally requires circuit breakers instead of fuses.

4.7.6 Circuit Breakers in Lieu of Service Protective Devices greater than 100A

Circuit breakers may be used as an alternative to service protective devices in accordance with the following requirements.

Circuit breakers to be installed must:

(a) Be of the fault current limiting type, without considering the effects of cascading (if used).

(b) Have a rated short circuit current capacity equal to or greater than the prospective short circuit current at the point of its installation. Refer to clause 1.10.4.

(c) Grade (discriminate) with the electricity distributor's protection.

(d) Have the facility for locking and sealing in the 'off' position.

(e) Comply with AS 3947.2 Low voltage switchgear and control gear - Circuit breakers and the emergency systems provisions of AS/NZS 3000.

(f) Have any adjustable settings sealable such that only authorised persons have access. Where such settings are located behind a sealed escutcheon, this provision does not apply.

(g) Have unmetered active/live connections enclosed and have facilities for sealing to prevent unauthorised access.

(h) Be maintained by the customer in accordance with the manufacturer's specifications.

4.7.7 Connection to Service Protection Devices

The line side connection of service protection devices must:

(a) Be at the top where mounted vertically, or

(b) Have the line side labelled.

4.7.8 Identification

The Service Protection Device, Service Fuse and Service Circuit Breaker are to be clearly identified.

Labelling to be in a legible and durable manner, in accordance with the AS/NZS 3000.

4.8 REWIRABLE FUSES

When altering service mains or consumers mains terminated at existing rewirable service fuses or carrying out any work on existing rewirable service fuses, replace the rewirable service fuse assembly with a service protection device complying with clause 4.7 of these Rules.

4.9 SERVICE ACTIVE LINK

The link must:

(a) Be the all insulated type.

(b) Be fitted with a cover suitable for sealing.

(c) Have a separate terminal for each conductor.

(d) Have a current rating not less than the current carrying capacity of the incoming conductor.

(e) Be located so that it is easily accessible and safe to work on.

(f) Be identified to indicate they are “service active links” in a legible and durable manner in accordance with AS/NZS 3000.

Hinged panel construction may enable the link to be located on the rear of the panel, see AS/NZS 3000.

4.10 SERVICE AND METERING NEUTRAL LINKS

The links must:

(a) Be the all insulated type.

(b) Be fitted with a cover suitable for sealing.

(c) Have a separate tunnel terminal for each conductor which is clamped by not less than two screws.

(d) Have a current rating not less than the current carrying capacity of the associated incoming conductor.

(e) Be located so that they are not higher than 2.0m and not lower than 0.5m above the ground floor or platform. For special situations check with the distributor.

(f) Be identified to indicate that they are either a ‘Service Neutral Link’ or ‘Meter Neutral Link’. Labelling must be legible and durable in accordance with AS/NZS 3000.

(g) Hinged panel construction enables the service or meter neutral link to be located on the rear of the panel.

4.10.1 Service Neutral Link

The service neutral link must accommodate:

i) The incoming main neutral conductor.

ii) The neutral connection to the customer's neutral link.

iii) A separate neutral conductor for each meter or load control device being installed.

iv) The operating coil of the controlled load contactor if provided.

An auxiliary sealable metering link must be provided if the service neutral link cannot terminate all of the meter neutral conductors. The connection to the meter neutral link must be made using a minimum 4mm^2 sized copper conductor.

4.10.2 Meter Neutral Link

The meter neutral link must accommodate the following:

i) The incoming main neutral conductor.

ii) A separate neutral conductor for each meter or load control device being installed.

4.11 LOW VOLTAGE INSTALLATIONS UP TO 100A PER ACTIVE CONDUCTOR - WHOLE CURRENT METERING

4.11.1 Whole Current Metering

Whole current meters must be protected by a 100A current limiting (HRC) service fuse. The electricity distributor may approve a circuit breaker in some circumstances. Refer to clause 4.7.5 and 4.14.1. The protective device must be located at the meter position.

The electricity distributor will specify the type of meters to be used.

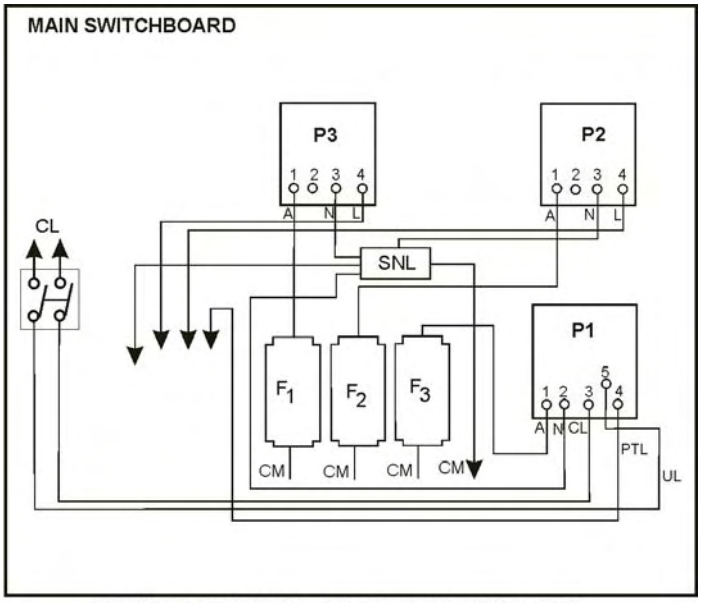
Ensure that:

(a) The top edge of the meter is no more than 2.0 metres above the ground, floor or platform beneath the meter.

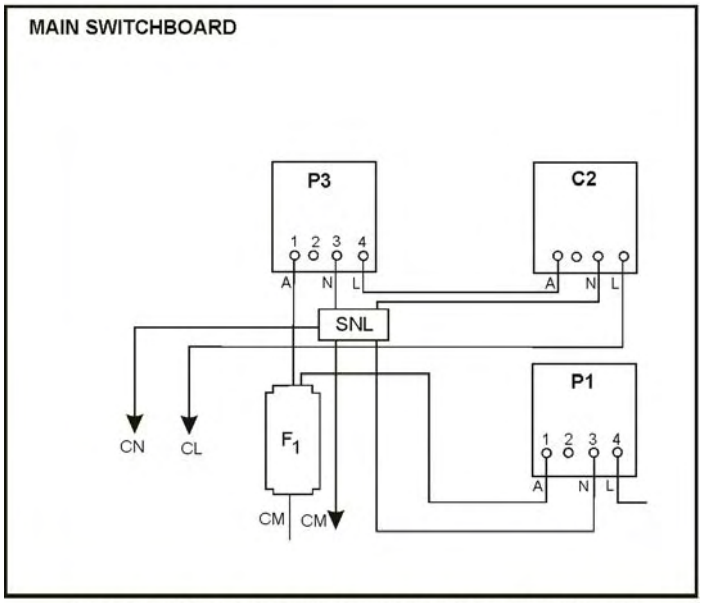
(b) The bottom of the lowest meter is at least 0.6 metres above the ground, floor or platform beneath the meter.

(c) Each metering and load control device is to be secured using all available fixing points by metallic bolts.

Figure 4.4: Examples of Wiring Diagrams for Bottom Connected Metering



EXAMPLE THREE PHASE AND OFF-PEAK INSTALLATION
(P1 IS AN ELECTRONIC METER)



EXAMPLE SINGLE PHASE AND OFF-PEAK INSTALLATION BOTTOM CONNECTED DEVICES

LEGEND

A	Active terminal
C	Load-control device
F	Service Protective Device
L	Load terminal
M	Meter
MC	Controlled load meter
N	Neutral terminal
SNL	Service neutral link on back of panel
P	Positions
PTL	Principal Tariff Load
P1	First position used in each layout
CL	Connection to controlled-load main switch or contactor
CM	consumers mains/underground service mains
UL	Uncontrolled Load

Note:

1. Panels hinged on the right hand side
2. The diagram indicates the line side as the bottom of the service protective device, therefore they must be labelled 'LINE SIDE' refer clause 4.7.6

4.11.2 Bottom Connected Meters

For bottom connected meters, the contractor must:

(a) Pre drill the meter panel, as per the electricity distributor's drilling templates.

(b) Provide the necessary cables in position.

(c) Leave a free length of 75mm through the pre-drilled holes.

(d) Remove 20mm of insulation from the end of the cable so it is ready for connection.

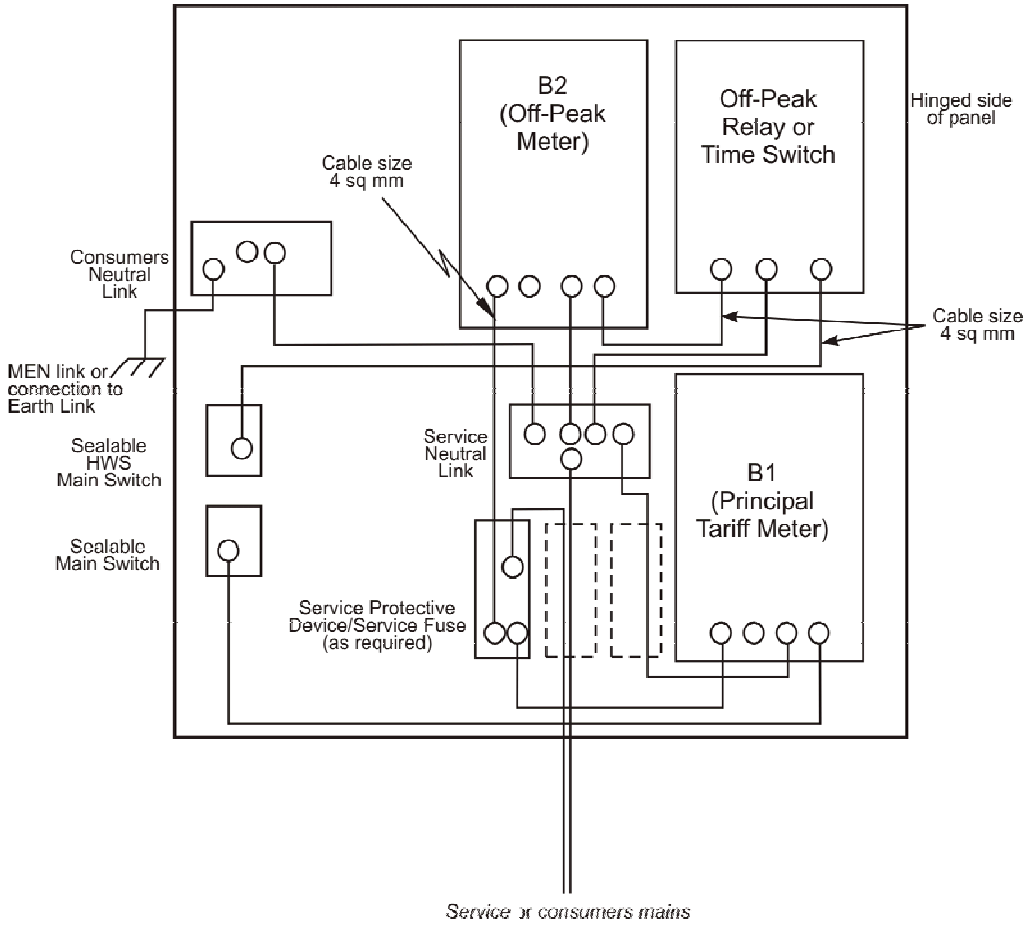
Where bottom connected metering exists, any additional meter/control equipment will also be bottom connected.

Note: Care should be taken when stripping the cable to ensure the conductor strands are not damaged.

An example layout of bottom connected metering equipment and associated service equipment is shown in Figure 4.5.

Figure 4.5: Example Layout for Bottom Connected Metering

Example shown is for a single phase customer with Off Peak



Note: 1. The Service Neutral link may be mounted in any suitable location either on the front as shown or on the rear of a hinged panel.

2. All equipment must be mounted no closer than 32mm from the hinged edge of the panel.

4.11.3 Load Control Equipment

Where electricity is to be supplied only during certain hours in accordance with the provisions of a published tariff, the electricity distributor may require the customer to provide and install a single pole load control device to directly control the load supplied under that tariff.

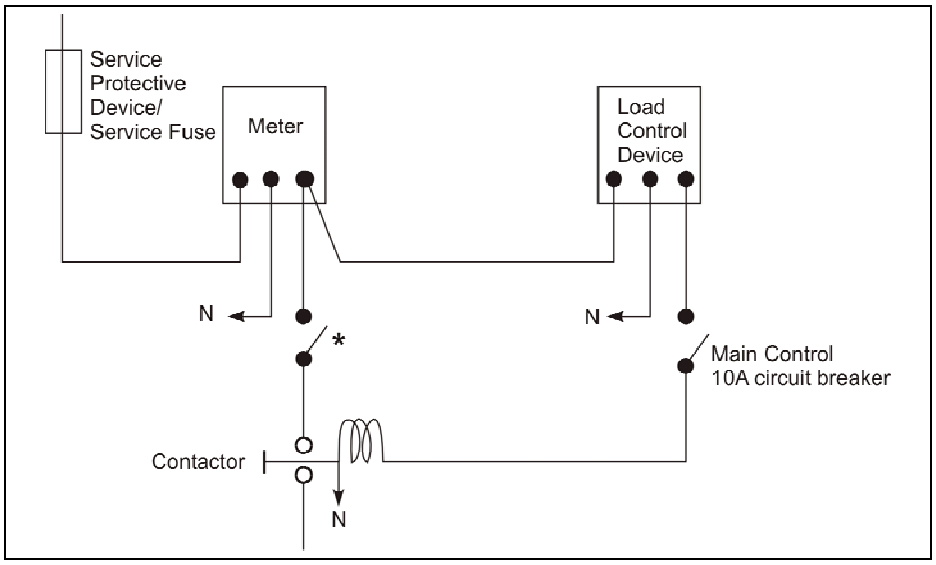
The electricity distributor will either provide or specify the type of load control device to be used.

Unless approved by the electricity distributor, controlled load must not exceed 25A single phase. Where the load exceeds 25A single phase or is inductive, the customer must provide, install and wire a contactor so that it is operated by the load control device. The contactor must be a non-latching type with provision for sealing and be installed at the metering position.

The contactor control circuit must be controlled and protected by a 10A circuit breaker which must be sealable. Refer to Figure 4.6. The neutral conductor for the contactor coil must be terminated in the service neutral link.

Other methods may be acceptable, apply to the electricity distributor.

Figure 4.6: Controlled Load - Contactor Wiring



Note:

1. The customer is required to install a contactor and associated wiring where the controlled load exceeds 25A or involves the switching of more than one phase of supply.
2. The contactor must be located at the meter position with a switch controlling the contactor coil.
3. The circuit breaker and contactor covers are to be sealable.
4. Single phase shown for clarity.

* An alternate location for the main switch may be on the load side of the contactor.

4.12 CONNECTIONS AT SERVICE AND METERING EQUIPMENT

The *customer* must arrange with an accredited service provider for the installation and connection of service equipment. If you use cables other than thermoplastic or elastomer-insulated stranded copper-conductor cable, you must joint the cables, or connect them in an approved manner, to a cable of the required type and size for connection to this equipment.

Only connect a single cable to any one terminal of the service and metering equipment.

For installations containing twin element off-peak water heaters, or a contactor as per clause 4.11.3 two cables may be connected into the meter load terminal.

The two cables must be twisted together.

Where there is the need to connect more than one meter to one phase of an unmetered supply or sub main, use links to arrange the circuits connected to the meters.

Install meter wiring of not less than 4mm^2 on the load side of the service fuses and service neutral link. The wiring must be suitable for the maximum demand that it will carry.

If two load terminals are provided in the service fuse, you may connect an additional cable to supply a separately metered portion of the installation. Where more than two portions of the installation have to be supplied from one service fuse, you must provide and install a suitable, sealable service active link.

4.12.1 Cable Preparation

If the conductor size is small, compared to the tunnel terminal of the service and meter equipment, the conductor strands must be twisted and doubled over before they are clamped. Soldering is not acceptable.

4.12.2 Maximum Conductor Sizes for Services of up to 100A Rating

The maximum total conductor cross-sectional area which is permitted to be terminated directly at meters and 100 A service fuses is 35 mm^2.

4.12.3 Flexible Switchboard and Panel Wiring

Flexible switchboard and panel wiring may be used to connect service and metering equipment, provided it is installed in accordance with the manufacturer's specifications.

4.13 PROVISION OF ISOLATION OF CUSTOMER INSTALLATIONS

4.13.1 Whole Current Metering

In installations where whole current metering is used, a control device must be provided on the load side of the meter and load control equipment at the meter/switchgear enclosure to enable each individual tariff to be isolated and sealed.

The means of isolation:

(a) Must be on the load side of the meters to prevent unwanted removal of supply to the meters, in particular electronic meters.

(b) The switch toggle must be sealable in the open position, with nylon/plastic sealing wire, not less than 1.4 mm in diameter, refer to Figure 4.7.

(c) May be comprised of a customer's main switches or protective devices (one switch per tariff) refer to Figure 4.9.

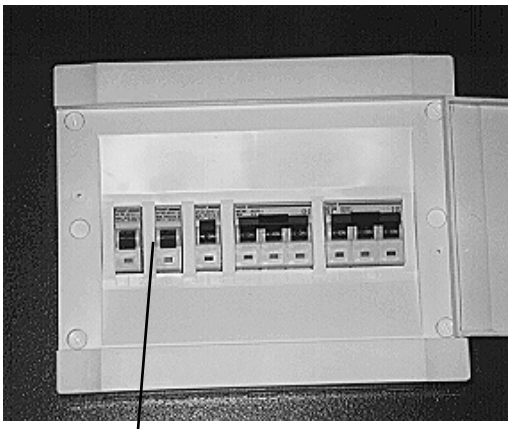
(d) Must be an independent device, or group of devices, for each customer, in particular for customers in multiple installations.

(e) Emergency services (eg lift and fire services) may require an additional main switch, and be a 3 phase switch where 3 phase equipment is installed. Refer to AS/NZS 3000.

Figure 4.7: Sealable Circuit Breaker

Where the switch or circuit breaker to be sealed is mounted in a DIN rail enclosure provide a space of minimum 6mm between the sealing apertures to enable sealing of the switch or circuit breaker refer to Figure 4.8. This 6mm space may not be required where multiple tariffs apply to a single customer and the isolation of each independent and adjacent tariff switch may be sealed as one.

Figure 4.8: Din Rail Enclosure

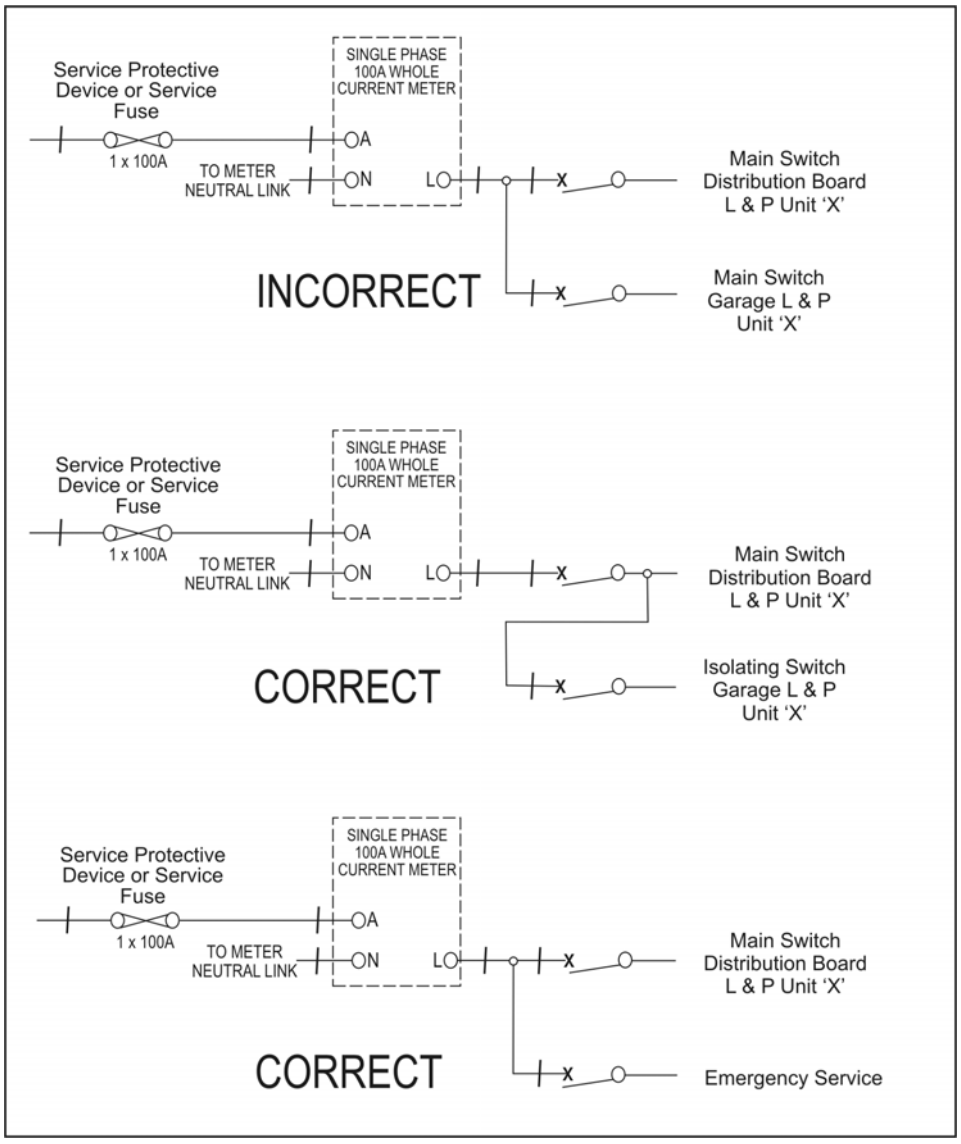


Minimum 6mm space between sealing apertures

4.13.2 Current Transformer Metering

A sealable isolation device must be provided for CT metered installations. This isolation device is located on the line side of the CTs, which allows each individual tariff or customer to be isolated and sealed. A circuit breaker is a suitable device for this purpose.

Figure 4.9: Example of isolation provision for whole current metering



Note: Emergency services may require additional main switch.

4.14 MULTIPLE INSTALLATIONS

Examples of multiple installations are:

(a) Multiple residential installations which include: a number of single domestic installations. Single domestic installations include a flat, unit or duplex unit

(b) Groups of small shops and/or offices

(c) Shopping malls

(d) Factory units

(e) Combinations of the above.

For large multiple installation developments, contact the electricity distributor as early as possible to prevent delays for connection of electricity. Refer to clause 1.9.1.

The customer must provide for supply to each separately metered portion of an installation that is supplied from a single connection point.

If you have to install the main switches on the line side of the service protective device (before or after the upstream active links) the main switches must be rated to withstand the nominal short circuit currents. Refer to clause 1.10.4.

4.14.1 Service Fuses 100Amp

The number of customers per 100A service fuse is determined by the total maximum demand of those customers in accordance with the AS/NZS 3000. However, no more than four customers per 100A service fuse is allowed.

4.14.2 Arrangement of Metering Neutrals

Each metering device must be supplied by a separate neutral conductor. The neutral conductor must be connected to a separate terminal of the service neutral link, or an additional neutral link which will serve as a meter neutral link.

4.14.3 Paralleling Links

A customer may install paralleling links to facilitate changes to metering arrangements.

The links must be readily available as defined by AS/NZS 3000 and provided with sealing facilities. Customer's equipment must not be located behind CT compartment access door or cover.

Each paralleling link and connecting cable must be labelled to identify the particular portion of the installation connected to it. All paralleling links must be arranged in a single group, on a panel in close proximity to the associated meter group.

4.14.4 Mounting Provisions for Meters

Switchboard panels must be non-metallic, comply with AS/NZS 3000 and may be:

hinged - there must be no permanent deformation of hinged panel supports with the fully loaded panel swinging on its hinges.

fixed - the size of the fixed panel and the fillet must comply with the requirements of AS AS6002:1999 Domestic Electricity Meter Enclosures.

removable - the size of the removable panel must comply with the AS/NZS 3000.

4.14.5 Unmetered Submains

The customer is to provide facilities for sealing or locking of all covers etc, providing access to unmetered equipment. The customer must be able to replace any unmetered fuse link or operate circuit breakers without the removal of the seal or lock.

The customer is responsible to pay the cost of such locks which will remain the property of the electricity distributor.

Refer to clause 4.16 for sealing details.

4.14.6 Labelling

For multiple installations, meter panels must be clearly and permanently labelled to indicate occupancy identification in accordance with clause 1.10.9, for all equipment to be mounted on the panel.

4.14.7 Metering Equipment Requirements

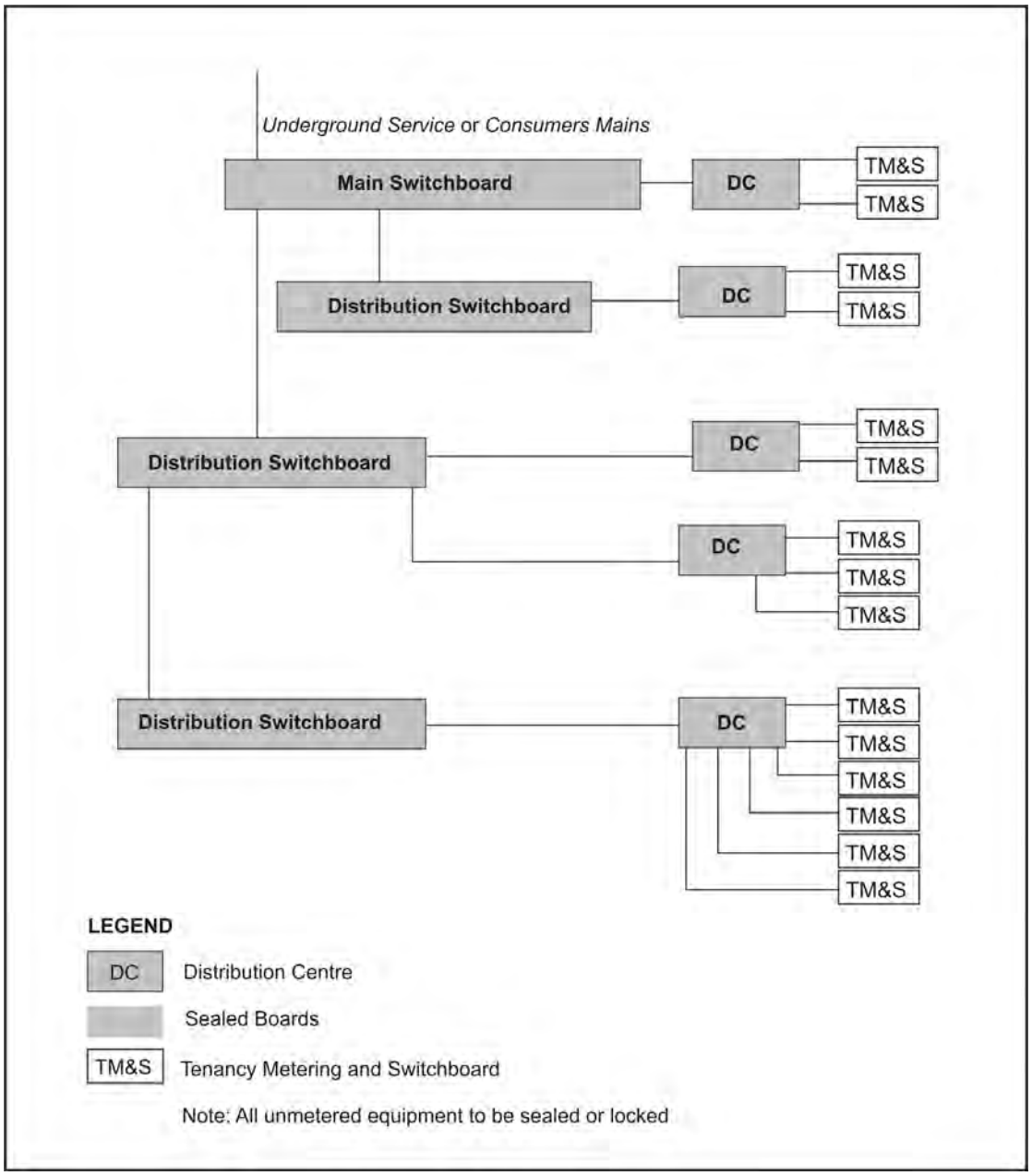
Refer to the accredited service provider or electricity distributor for space and metering equipment requirements.

Figure 4.10: Figure Deleted

Figure 4.11: Figure Deleted

Figure 4.12: Figure Deleted

Figure 4.13: Typical Arrangement of Multiple Installations using Unmetered Mains, Submains and Switchboards



4.15 SPACING BETWEEN METERS AND HIGH CURRENT CONDUCTORS

External magnetic fields damage meters. The following minimum spacings between meters and current carrying conductors must be provided and maintained.

4.15.1 Multicore Cables and Bunched Single Core Cables

No special requirement for spacing is needed where the separation between all conductors of a circuit is due solely to the solid insulation and sheathing on the conductors, (eg, multicore cables or a group of single core cables in flat or bunched formation).

4.15.2 Spaced Single Core Cables, Busway or Busbars

Where the separation between conductors of the same circuit exceeds that in clause 4.15.1 but does not exceed 160mm, refer to Table 4.2.

Table 4.2

*Maximum Current in Conductor Nearest to Meter (A)	Minimum Spacing between Conductor and Meter (mm)
150	Nil
200	100
400	500
600	700
1000	900
1500	1200
2000	1400
3000	1700
4000	2000

*The maximum current in the conductor is that determined by the maximum demand in accordance with AS/NZS 3000 for consumers mains and submains.

Table 4.2 gives the minimum spacing between any point on the meter and any point on the nearest conductor of the circuit. Calculate the intermediate measurement proportionally.

4.15.3 Shielding

Spacings determined under clause 4.15.2 may be reduced if the meters or conductors are mounted within a suitable shielding enclosure. Determine the spacing by multiplying the value from clause 4.15.2 by a factor. Table 4.3 indicates the multiplying factors for various thickness of mild steel. If other thicknesses or materials are proposed, the electricity distributor will determine the factor.

Table 4.3

Thickness of Mild Steel Plate (mm)	Multiplying Factor
5.0	0.25
2.5	0.5
1.2	0.75

Eg using a 1.2mm thick shield reduces the minimum spacing between a meter and a 4000A conductor from 2m to 1.5m (spacing) 2000 x 0.75 (multiplying factor) = 1.5m.

4.15.4 Special Cases

Avoid spacings in excess of 160mm between the centres of conductors of a circuit near meters. If you can't do this, submit the details in writing to the electricity distributor, who will determine the spacing requirements from the metering equipment for you.

4.16 SEALING OF SERVICE AND METERING EQUIPMENT

Security seals must not be removed without authorisation/permission from the electricity distributor on each occasion.

Make sure all service and metering equipment, unmetered links and paralleling links can be sealed. A nylon/plastic sealing wire will be used to seal them.

Where seals on a service protection device are required to be broken the Level 2 authorised person/electricity distributor must re-seal them. A charge for resealing may apply.

The customer must suitably enclose and provide for the sealing of all equipment installed on the line side of the meters, and all metering connections.

Note: Some electricity distributors may require sealing by locking, check with the electricity distributor.

4.16.1 Multiple, Single and Large Installations

The customer must be able to replace ruptured unmetered fuses, without electricity distributor staff attending to remove seals and reseal equipment. Sealable escutcheon panels may be used with either front or back connected fuses or circuit breakers to allow this.

Individual items of equipment such as unmetered links must be sealed. In some cases it may be better to provide a sealable cover or panel over equipment which the customer does not need to access for maintenance.

4.17 LV INSTALLATION IN EXCESS OF 100A PER PHASE - LV CURRENT TRANSFORMER METERING

Where the assessed load of an installation or portion of an installation to be separately metered exceeds 100A per phase the electricity distributor will require that the meter be a current transformer (CT) type

The customer must provide the facilities for the mounting and connection of the current transformers, meters and associated equipment in accordance with these Rules.

The customer is responsible for the provision and installation of:

(a) All equipment mounting facilities.

(b) Meter panels pre-drilled and installed.

(c) Voltage circuit fuses (10A current limiting (HRC)) suitable for sealing.

(d) Meter links - used for metering purposes where the service neutral link cannot accommodate all the neutral cables associated with metering.

(e) All cabling to the specified identification code fully connected to the equipment.

(f) The CTs.

(g) The meter test block - used to allow in circuit testing of CT metering systems.

(h) The meters and their connection.

The electricity distributor will specify:

(a) The type of CTs.

(b) The meter test block.

(c) The meter equipment to be provided.

4.17.1 Submission of Design

The customer must submit full details of the proposed installation for examination before the relevant work proceeds to prevent possible delays in the connection of electricity.

The submission must include:

(a) The proposed load details.

(b) The design of the CT enclosure.

(c) A single line schematic diagram.

(d) Power Factor correction **where applicable**.

The electricity distributor will not normally comment on the design of an electrical installation unless a fee is paid by the customer. Check with the electricity distributor.

The design will be assessed for tariff and metering requirements.

Note: Not all of the requirements of this section apply to low voltage switchboards installed in installations supplied and metered at high voltage. However, it is recommended that the principles of this document be applied to these switchboards.

4.17.2 Prospective Short Circuit Current

Clause 1.10.4 of these Rules states that the electrical installation must be capable of withstanding, without damage, the nominated prospective short circuit current.

Switchboards and equipment rated greater than 400A must be rated for the nominal prospective short circuit current for 1 second. The electricity distributor will provide values not specified in these Rules upon application.

4.17.3 Protection Grading

Select and arrange your main circuit breakers or fuses so that they will interrupt the fault current in the event of a fault on the portion of the installation they protect. They must interrupt the fault current rapidly enough to ensure that the electricity distributor's protection devices do not operate.

The electricity distributor will provide information on the characteristics of the electricity distributor's protection equipment.

WARNING

Where a single customer is supplied direct from a substation the electricity distributor generally protects its equipment by the installation of a circuit breaker or fuse in each out going LV circuit.

Unless the customer's protective devices are correctly selected to discriminate with the electricity distributor's device, a fault within the electrical installation may cause the device to operate.

The implications of this are as follows:

Supply to smoke and fire control and emergency evacuation equipment and lifts may be interrupted. It is common for such faults to occur during fires when the need for emergency supply is paramount.

Resetting of 'tripped' equipment can only be carried out by the electricity distributor's specialised staff and this may cause considerable delay to the reconnection of supply. It may also incur a charge.

4.17.4 Whole Current Metering

Where it is necessary to meter other sections of the premises using whole current meters, the take-off connection point to the service fuses must be on the line side of the CT metering. It is not permitted to have the connection point on the load side of a CT and pass cables through the CT in the reverse direction.

Where the primary conductor is an insulated cable, sealable links must be used. The wiring to the service fuses must be connected at these links.

The service fuses must:

(a) Be located in that section of the enclosure allocated for the electricity distributor's use.

(b) Be mounted either on the busbar or on an adjacent insulating panel.

(c) Be capable of being withdrawn towards the operator.

(d) Not impede access to the metering current transformers or other equipment.

(e) Be sealable in accordance with clause 4.16.

4.17.5 Current Transformer Facilities

Metering CTs must be:

(a) Mounted in a suitable enclosure segregated from the meters and switchboard equipment.

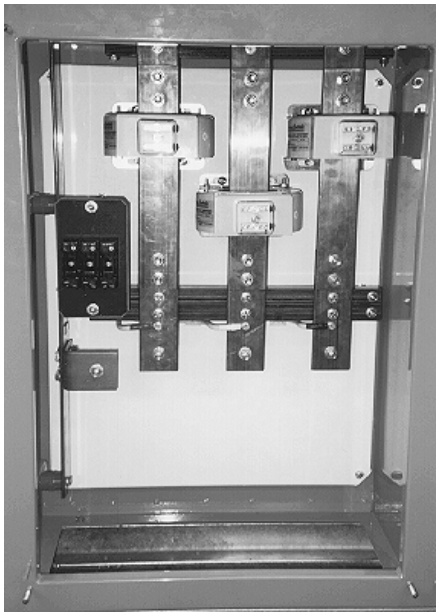
(b) Installed on the **load** side of the service protective device.

For installations and separately metered portions of installations with maximum demands greater than 400A per phase the metering CTs must be installed within a cubicle type switchboard. Refer to Figure 4.15.

Attention must be paid to additional space requirements to terminate large conductors.

Figure 4.14: Figure Deleted

Figure 4.15: Typical CT Installation in a cubicle type switchboard



Note: Shown without safety screen. Refer to clause 4.17.6.

4.17.6 CT Enclosure - Construction

The CT enclosure when forming part of a cubicle switchboard must be constructed so that a tool or article accidentally dropped by a person working on the connections cannot fall from the CT compartment into other areas of the switchboard.

CTs should be segregated from other equipment. No part of the electrical installation, including any measuring instruments and control devices, is permitted within the CT enclosure, except the customer's measurement current transformers.

Do not mount the customer measurement transformers on the removable section of the busbar provided for the metering transformers or impede access thereto.

For other situations apply to the electricity distributor.

These requirements also apply to the unmetered sections of a cubicle type switchboard.

All live conductors within 300mm of the secondary terminals, voltage circuit fuses and metering neutral link must be insulated or screened to prevent inadvertent contact. Convenient access is required for removal of CTs. These requirements may be met by the provision of a removable screen of light insulating material with openings shaped to fit over the CT secondary terminals and associated wiring. The secondary terminals, voltage-circuit fuses and metering neutral link must be accessible without removal of the screen. Where a screen is used it must be fitted with two insulated handles and be secured to the switchboard.

4.17.7 Vermin Proofing

All entries to the CT compartments/enclosures should be fitted with suitable gland plates, barriers etc, to prevent pests from entering.

4.17.8 Doors and Access Cover

Provide doors and access covers that are easy and safe to open or remove. If they are hinged, they must be capable of opening to 90° minimum.

Access covers must not be greater than 1 square metre in area. The length must not exceed 1500 mm. Fit a handle to each side of the cover, slightly higher than its horizontal centre line.

Provide fixings so that the cover remains in position when the fasteners are released or removed.

4.17.9 Identification of Enclosures

The customer must provide identification for the CT metering enclosure.

The cover, whether hinged or removable, must:

(a) Be marked "Electricity Distributor Metering CTs Enclosed".

(b) Clearly identify the customer.

(c) Identify the relevant tariffs, if more than one tariff is involved.

Fix a similar label adjacent to the CTs.

4.17.10 CT Security Locking or Sealing

The CT compartment and unmetered sections of a switchboard/installation must be sealed or locked as follows:

(a) The CT access cover/s and unmetered sections must be locked where located outdoors or remote from the meter position. All locks must be the electricity distributor's security type and provided at the customer's cost. Locking facilities must accept a 10mm shank.

(b) The CT access covers and unmetered sections may be sealed where located within a building.

The sealing facilities must be designed so that they can be sealed with short lengths of sealing line.

Provide sealing for:

(a) **A door** - at the side of the door opposite to its hinged edge.

(b) **A removable cover** - at two approximately diagonally opposite points on the cover.

4.17.11 CT Location and Access

Locate CTs, removable busbars, voltage-circuit fuses, and neutral links so that they are:

(a) More than 500mm.

(b) Less than 2500mm

from the ground floor or platform of access.

4.17.12 Voltage Circuit Protection

The customer must provide and install all the links and the voltage circuit protection fuses.

All fuses must be:

(a) a 10A current limiting (HRC) fuse type NS to AS 60269.3.0 and AS 60269.3.1, in an enclosure with class IP2X to AS 1939 'Degrees of protection provided by enclosures for electrical equipment (IP Code)', or

(b) Class G current limiting (HRC) fuse links in a modular fuse holder complying with IEC 269 - Part 2.

10A current limiting (HRC) fuse link must be installed in either option.

Fuses must be suitable for sealing the fuse-link holder to the base. You can provide a sealable cover over all the fuse assemblies. The fuses should be installed so that they are extracted away from the face of the panel and towards the operator.

WARNING
Remove the fuse links from the fuse link holders and tie them nearby. Insert the holders into the fuse bases. The authorised person will install the fuse links when commissioning the metering installation.

Mount the voltage circuit fuses on a panel of insulating material. They must be located in an accessible position to enable their safe withdrawal whilst the supply is energised and be as close as practicable to the current transformers that they are associated with.

Provide a clearance of between 100mm (minimum) to 300mm (maximum) between the panel and the enclosure door.

Alternative forms of voltage circuit fuse mounting include:

(a) "DIN" rail.

(b) Securely fixed on a steel bracket provided the mounting screw hole is covered with a suitable insulating material.

4.17.13 Current Transformers

The CTs must comply with Chapter 7 of the National Electricity Rules. Figure 4.16 details the dimensions of the various CTs available.

Where the electricity distributor does not provide the CTs, the customer must provide the electricity distributor with test results in accordance with Chapter 7 of the National Electricity Rules.

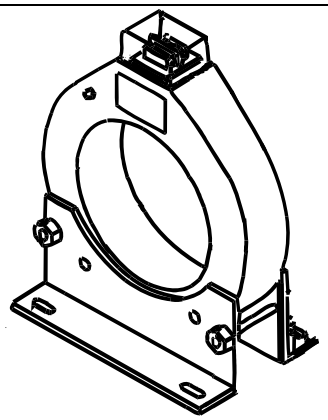
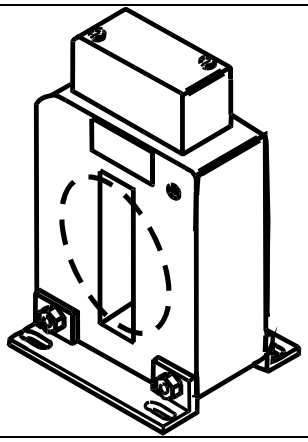
WARNING
Never open-circuit the secondary terminals of a CT while the primary winding is energised because a high voltage will be induced. This voltage will give the person working on it a severe electric shock and may cause damage to the CT insulation.

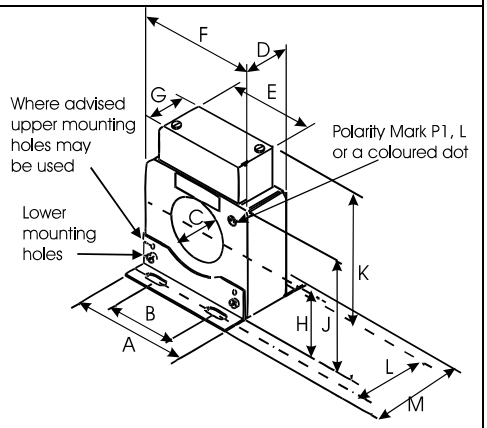
The secondary terminals of the CTs are to be short-circuited to prevent inadvertent damage and shock. The bridges are to be removed when commissioning the metering installation.

Retain the short-circuit when connecting the secondary current conductors, if supply is connected.

The CTs must be mounted with the polarity marks P1, L or a distinctively coloured dot adjacent to the terminals facing the incoming supply. The operating range of extended range current transformers must not be exceeded.

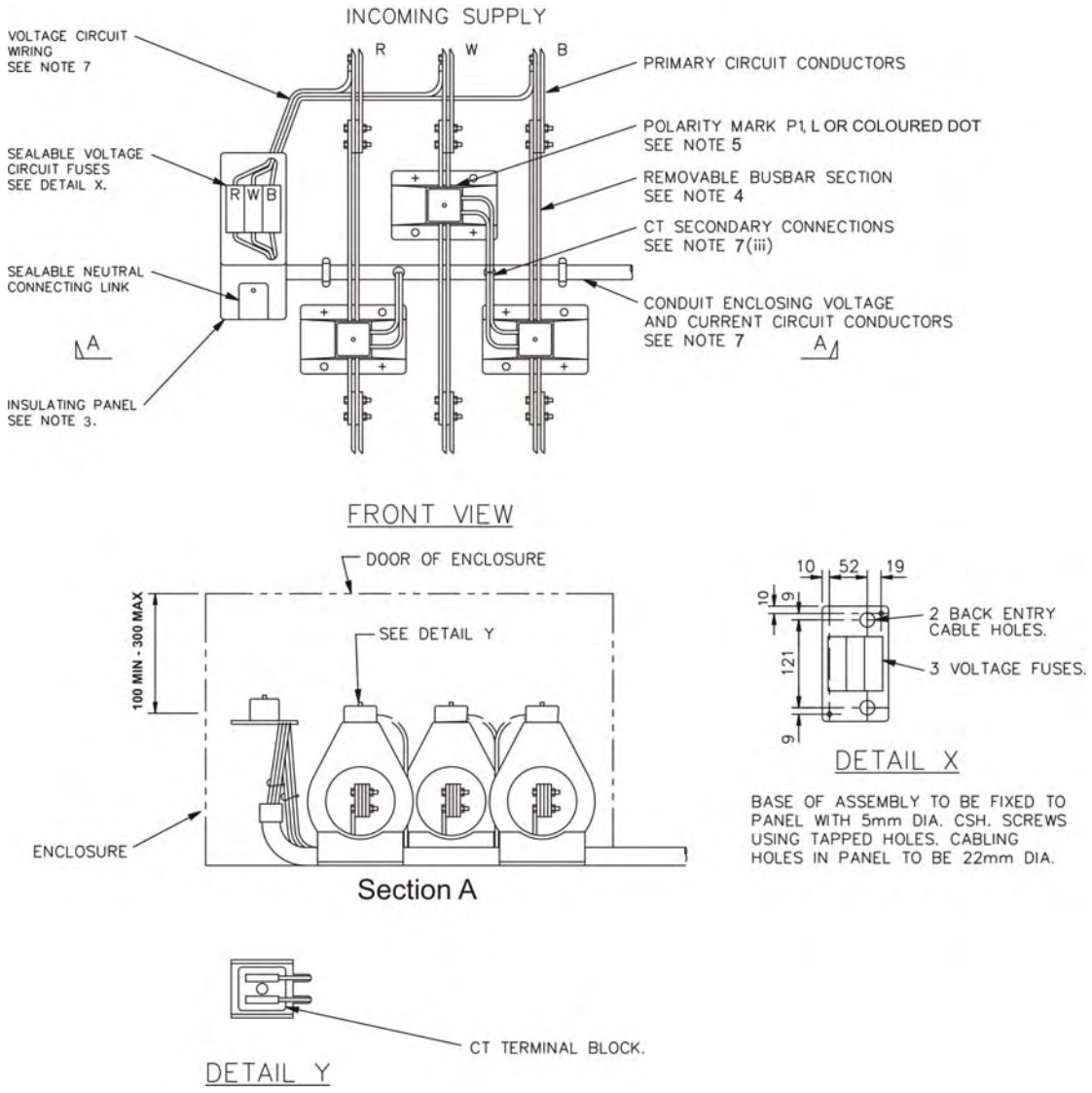
Figure 4.16: Current Transformer Details

	
TYPE “S” 200/5 TO TYPE “S” 200-400/5 TYPE “T” 800/5 TO TYPE “T” 800-1600/5 TYPE “U” 2000/5 EXTENDED RANGE TO TYPE “U” 2000-4000/5 TYPE “V” 4000/5 EXTENDED RANGE TYPE “W” 1500/5 EXTENDED RANGE	TYPE “C” 1000/2000/3000/5 MULTI-RATIO Alternate circular window shown in dashes.

Notes	Current Transformer dimensions. See table below.
1. Chapter 7 of the National Electricity Code specifies the type of CTs to be used.	
2. Before proceeding with the manufacture or design of any switchboard assembly, requiring the use of metering current transformers, reference should be made to the electricity distributor.	
3. Alternate mounting height of type “S”, “T” and “U” current transformers may be available from the electricity distributor. When allowed the feet may be assembled to provide alternative heights “H1” and “H2” between the mounting surface and the centre line of the CT. Opening (dimension “C”) maximum height “H2” must be used if busbars pass through opening unless stated by electricity distributor.	
4. Polarity. Unless stated by the electricity distributor, each current transformer is to be provided with polarity marks. The transformer must be installed with the polarity marks P1 L or coloured dot facing the direction of the incoming supply. Refer to clause 4.17.13.	

CTs Commonly Used				CTs which may be available, consult Electricity Distributor							
DIMENSIONS	TYPE ‘S-45’	TYPE “T”	TYPE ‘W’	TYPE ‘S-SE’	TYPE ‘S’	TYPE ‘T-SE’	TYPE “U-SE”	TYPE “U”	TYPE “V”	TYPE ‘C - SE’	TYPE ‘C’
A	115	155	165	125	115	160	240	240	275	156	156
B-MOUNTING HOLE CENTRES	75	75	75	75	75	75	190	190	225	114	114
C	DIA 45	DIA 85	DIA 112	DIA 35	DIA 32	DIA 95	DIA 170	DIA 170	DIA 178	Width 35 Height 137	DIA 112
D	54	60	60	48	48	48	48	48	48	49	49
E	53	53	53	53	53	53	53	53	53	112	112
F	114	165	165	110	110	165	254	250	308	162	162
G	55	59	59	50	55	55	55	55	62	70	70
H SEE NOTE 3	65 85	85	87 115	H1-50 H2-80	80 65	80	130	130	154	105	105 115
J SEE NOTE 3	130 150	175	175 200	J1-110 J2-145	150	185	270	270	325	212	212
K SEE NOTE 3	163 183	210	210 236	K1-145 K2-180	180	210	310	310	370	264	264
L-MOUNTING HOLE CENTRES	80	80	80	80	80	80	125	125	132	95	95
M	102	107	107	105	105	105	160	160	162	122	122
WIDTH OF MOUNTING SLOT	10	10	10	10	10	10	10	10	10	10	10

Figure 4.17: Mounting of Current Transformer Switchboards - General Requirements



Notes to Figure 4.17

1. This is a typical arrangement of equipment showing how the requirements may be met.
2. Location and access requirements are covered in these Rules.
3. The customer is to supply and mount the voltage circuit fuses and a sealable metering neutral link (if required) to be fixed on a supporting panel.
4. The requirements for the installation of primary circuit conductors passing through the CTs are covered in clause 4.17.15.
5. Each current transformer is provided with polarity marks. The transformers must be installed with the polarity mark P1, L or a coloured dot facing the direction of the incoming supply.
6. The CTs may be staggered as required. The incoming supply may be from any direction.
7. Wiring.
   (i) All wiring for metering purposes must be installed and connected by the customer's contractor. Under normal circumstances, the switchboard will not be energised until approved by the electricity distributor.
   (ii) The insulated and sheathed cables between voltage circuit fuses, meter neutral link and primary circuit conductors must be adequately supported. The requirement for sheathing may be met by using PVC insulated cable enclosed in 6mm diameter clear PVC tubing with a wall thickness of 1.5mm. Apart from the connections a clearance of 25mm (min) must be maintained from the busbars apart from the connection.
   (iii) The current circuit cables must be supported between the conduit and terminal blocks by tying them together. The CT meter circuit cables are to be colour identified or numbered.
8. Safety screen when used is not shown in Figure 4.17.

4.17.14 Mounting of Current Transformers

The customer must provide the mountings for the CTs.

The mountings may use fixed studs or threaded holes tapped in a suitable mounting plate. Dimensions for the mounting centres are shown in Figure 4.16.

Where the primary conductor is a busbar the CT mounting plate may be adjustable to allow for the different mounting heights of the CT suitable for the maximum current rating of the switchboard.

The mountings must consist of 6mm (min) to 9mm (max) diameter studs, secured by brazing, or equivalent means, to a mounting plate or bar, together with nuts.

Alternatively, threaded holes at two diagonally opposite corners of a mounting plate, and slotted or hexagon-headed set screws with a diameter of between 6mm (min) to 9mm (max.) are acceptable. In this case, provide dowels at the other corners to support the CTs while the set screws are removed.

Two methods of mounting current transformers are acceptable, these are:

(a) In-line where the bodies of each CT are in one line.

(b) Staggered where the centre phase CT is offset from the other two.

Refer to Figure 4.17 for details.

4.17.15 Primary Conductors

Provide a removable section of busbar through each CT.

Do not connect any wiring to the removable section of the busbar or the bolts or fixings which secure it.

Select the size and shape of the busbar to suit the openings in the type of CTs specified by the electricity distributor or meter provider.

The length of the removable section of busbar must be:

- 300mm (min) to 450mm (max) in length for CT types A, B, C, S, T and W.

Alternatively you can use an insulated cable as the primary conductor passing through each CT. Arrange the cable so that the CT can be removed. Do not use more than 1000mm of cable from the CTs to the location of the line side cable connection.

The surfaces to which these conductors will be connected must be either copper or suitably plated copper or copper alloy. They must be free of any painting, coating or covering.

You must be able to connect and disconnect the CTs without using any tools except an adjustable or socket type spanner.

4.17.16 Cubicle Switchboard enclosed Current Transformers

The following additional requirements apply when CTs are installed in a cubicle type switchboard.

The switchboard manufacturer must submit to the electricity distributor drawings including the location of metering CTs. The equipment must be readily accessible from the outside of the cubicle.

Connections to the:

(a) CT secondary terminals.

(b) Voltage circuit fuses.

(c) Meter neutral link

must not be more than 300mm from the plane of the access panel or doorway.

The cubicle or section of the switchboard allocated for the electricity distributor's use must be separated from the customer's portion of the switchboard by means of a suitable barrier(s).

No part of the electrical installation is permitted within or on the electricity distributor's section of the switchboard except as permitted in clause 4.17.6.

The electricity distributor may require arrangements for an inspection of the switchboard at the switchboard manufacturer's premises.

This is a preliminary inspection and a final inspection will be made when installed on site.

Access arrangements must also comply with clause 4.2.

4.17.17 Connection of Neutral Links

Conditions for the location of the MEN connection are:

(a) It must be located, so that it can be readily and safely removed whilst the supply is connected.

(b) It must be located within the customer's section of the switchboard.

(c) An appropriate notice must be fixed to the switchboard indicating the location of the MEN connection.

Where a switchboard consists of one assembly and is provided with multiple supplies the neutral bar and earth bar must be electrically continuous throughout the assembly.

Where a switchboard consists of more than one assembly, which are located in the one switchroom, and is provided with multiple supplies:

(d) You must provide an MEN connection in each separate assembly.

(e) You must make the earthing system of the installation common to all assemblies.

(f) If you install a bus-section coupler:

i) The MEN connection must be made on only one assembly;

ii) The common neutral must join each switchboard neutral bar;

iii) The neutral bars must have a current carrying capacity not less than the underground service/consumers mains neutral conductor;

in case there is feed-back through the earth-neutral system.

4.17.17.1 RailCorp

For electrical installations on railway land in the railway 1500V dc electrified track area the RailCorp uses a modified direct earthing system which incorporates a reticulated insulated earthing conductor. This system requires the neutral and earth to be insulated from each other, hence no multiple earth neutral (MEN) connection is permitted, except for the one and only connection for each supply made by RailCorp as the electricity distributor.

Note: In certain circumstances this connection may be located on the consumers main switchboard. Refer to clauses 1.5.9 and 1.10.7.1.

4.17.18 Earthing

The electrical installation main earth is not normally directly connected to the electricity distributor's earthing system.

Written acceptance from the electricity distributor is necessary before such an arrangement may be carried out.

4.17.18.1 RailCorp

Refer to clauses 1.5.9 and 1.10.7.1 for earthing of electrical installation on railway land in the 1500V dc electrified track area.

4.17.19 Stand-by Supply Equipment

Main switches and changeover devices to connect a stand-by generating plant must comply with all requirements of Section 8 - Alternate Source of Low Voltage Supply.

Where stand-by supplies exist that are controlled by automatic changeover equipment, the following conditions apply:

(a) The main isolator of each stand-by supply must be able to be locked in the open position.

(b) The control circuitry must be designed to prevent operation of the main isolator, due to the loss of the other supply, when it is locked open.

(c) The changeover equipment must be preceded by a manually operated load break isolator.

4.18 METER PANEL LOCATION AND ACCESS FOR CT METERING

The customer must provide and install a hinged meter panel where CT metering is required. The meters and their associated equipment for each separately metered part of the installation must be kept together.

Locate the meter panel so that:

(a) The height of the top edge of the meter above the ground, floor or platform level is not more than 2 metres.

(b) The bottom of the lowest part of the metering equipment is at least 0.6 metres above the ground, floor or platform except where otherwise approved by the electricity distributor.

Provide a minimum clearance of 175mm from the face of the hinged panel to the inside face of any enclosure.

Provide a minimum distance of 200mm from the face of the panel to any fixed object when the panel is open 90 degrees on its hinges.

The metering panel must not be installed in a location subject to high intensity magnetic fields. You must provide and maintain the minimum spacing between meters and current carrying conductors which are set out in clause 4.15.

The requirements set out in this Section for service and metering equipment will also apply to the installation, grouping, accessibility, location, and protection of CT meter equipment and meter panel.

4.18.1 CT Meter Panel

The customer must provide a meter panel (550mm X 550mm) or greater for a single metering installation (which includes check metering when required).

The panel must:

(a) Be of suitable insulating material.

(b) Be hinged on the left or right hand side.

(c) Be mounted on a surround made of 1mm (min) zinc coated steel to provide a clear depth of 75mm (min) behind the panel.

(d) Be pre-drilled to suit the installation of the proposed metering instruments.

(e) Only CT metering and associated equipment is permitted on this panel.

The panel may form part of the main switchboard.

Any door fitted to a metering enclosure must be labelled “Electricity Meters”.

4.19 FACILITIES REQUIRED FOR THE CONNECTION OF CT METERING EQUIPMENT

Figure 4.18 shows a typical wiring diagram for CT metering.

The customer must provide and install all wiring necessary between the CT position and the CT meter for each separately metered part of the installation. Provide sufficient length to make the connections to the meters.

Insert 75mm of cable through the appropriate holes in the meter panel and bare 20mm of insulation from the ends.

The wiring must be 0.6/1 kV, PVC insulated, stranded copper conductor of cross sectional area as shown in Table 4.4. Each of the insulated conductors must be visually distinguishable by size, colour and/or number marked on the insulation at regular intervals throughout its length. Refer to Table 4.4.

Sheathing of the voltage and CT secondary cables are required by AS/NZS 3000 and AS/NZS 3808 Insulating and Sheathing Materials for Electric Cables. It may be sheathed with clear PVC tubing with a wall thickness of 1.5mm to make the identification visible.

The conductors must be:

(a) Single insulated conductors enclosed in conduit, or

(b) Multi-core cables.

Do not include any wiring for purposes other than the current and voltage circuit wiring in the conduit or sheath protecting this wiring, with the exception of the earth conductor for earthing the meter enclosure.

The conduit or cable(s) must be open to view, unless the electricity distributor approves otherwise.

4.19.1 Protective Enclosure

Wherever possible, the protective enclosure for the voltage and current circuit wiring should be:

(a) A surface-run PVC conduit, or

(b) The plastic sheath of multicore cable.

The conduit or sheath must be installed in accordance with AS/NZS 3000.

Where surface-run wiring is not practicable or additional protection is required the cable must be installed in heavy duty UPVC conduit.

Where installed underground the conduit must be laid at a depth of 500mm except where encased in concrete.

Figure 4.18: Typical Wiring for Current Transformer Metering

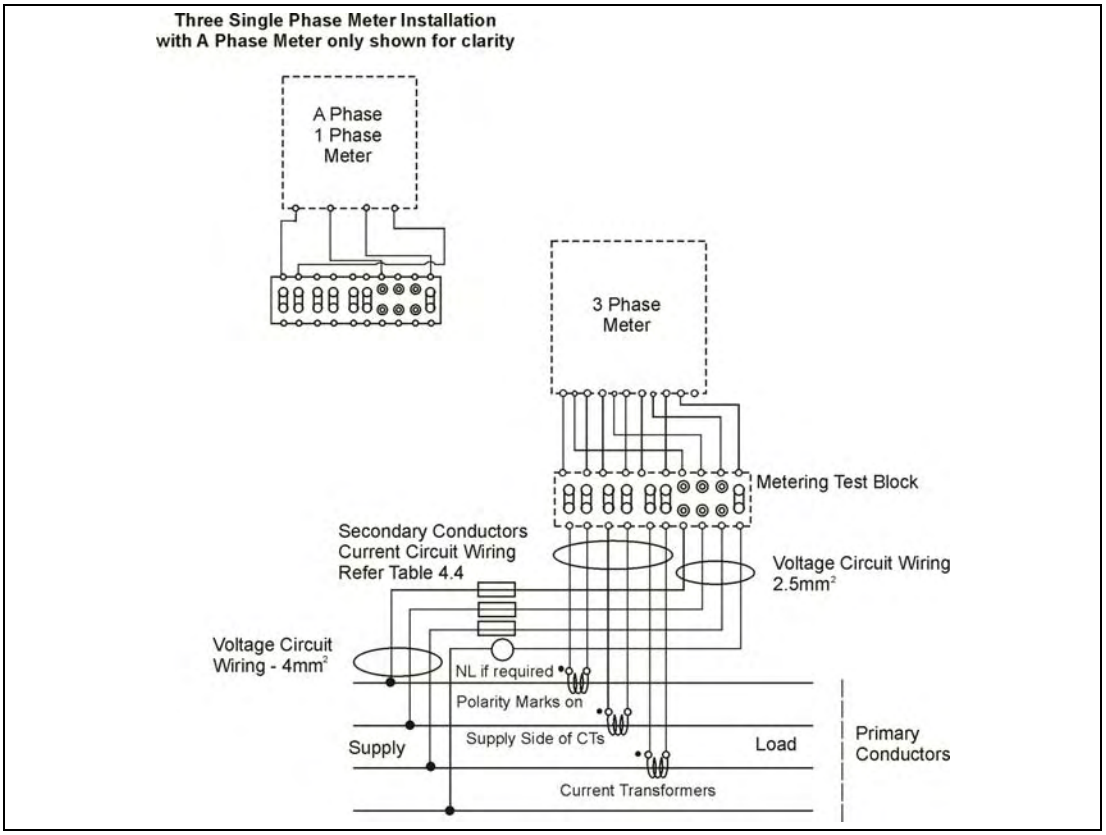


Table 4.4: Identification Coding of Cabling for CT Metering

Use	Size	Circuit	Identification Code		No. of Conductors	Installation
			Option 1 (Colour)	Option 2 (Numbering)		
Voltage Circuit (Fuse to Test Block to Meter)	2.5 mm^2 (no limit on route length)	A phase B phase C phase Neutral	red white blue black	7 8 9 10	4 per CT metered position (includes a neutral)	Single cables in common conduit with current circuit cables or 1 multicore
Current Circuit (CTs to Test Block to Meter)	Refer to Table 4.5	A polarity A non-polarity B polarity B non-polarity C polarity C non-polarity	red black white orange blue grey	1 2 3 4 5 6	6 per CT metered position	Single cables in common conduit with voltage circuit cables or 1 multicore.
Earthing	2.5 mm^2 (no limit on route length)		Green/yellow	Green/yellow	1 per CT metered position	With voltage circuit or separately with cable run
Summation Equipment	1.5 mm^2 (no limit on route length)		coloured or numbered	coloured or numbered	6 per remote CT metered position	Single cables in conduit or 1 multicore
Contactor Control Wiring	2.5 mm^2		red or black	red or black	1 per CT metered position	Twin cables in one sheath

Notes to Table 4.4:

1. Voltage circuit wiring in Figure 4.20
2. All cables must have stranded copper conductors.
3. Where Option 1 identification code of cables is used the current circuit cable size cannot be the same as the voltage circuit.
4. The voltage and secondary current circuits are to be numbered or colour coded throughout their entire length.

4.19.2 Current Circuit Wiring

The customer must install six CT secondary current circuit conductors between the CTs and the meter panel (see Table 4.4).

The cross-sectional area required for the CT secondary circuit conductors is dependent upon:

(a) The route length of the wiring between the meter panel and the CTs.

(b) The transformer characteristics.

It must not be less than that shown in Table 4.5.

Note: Existing 4 wire current circuit wiring systems do not require upgrading to a 6 wire system for a meter change in the existing installations.

Table 4.5: Maximum route length of Current Circuit Wiring (m)

* Maximum demand up to & including 400A	* Maximum demands in excess of 400A	Conductor csa mm^2
10	20	2.5
16	32	4
25	55	6
40	90	10

*The maximum demand must be determined in accordance with AS/NZS 3000 unless otherwise advised by the electricity distributor. Consult the electricity distributor if the route length is likely to exceed these values.

4.19.3 Voltage Circuit Wiring

The customer must provide the following facilities:

4.19.3.1 Primary Conductor to Fuse

Install a single core insulated and sheathed 4mm^2 cable between each primary conductor and the voltage circuit fuses.

Sheathing may be achieved by using single core insulated cable enclosed in 6mm diameter clear PVC tubing with a wall thickness of 1.5mm.

Make the connection to the primary conductor on the line side and as close as practicable to each current transformer. Refer to Figures 4.18 and 4.20.

The cables must be:

(a) No longer than 500mm as specified in AS 3439.1 'Low-voltage switchgear and control gear assemblies - Part 1 Type-tested and partially type tested assemblies'.

(b) Connected to the voltage circuit fuses.

(c) Protected against mechanical damage.

(d) Rigidly supported.

4.19.3.2 Fuse to Meter

Install four voltage circuit conductors, identified as per Table 4.4, from the voltage circuit fuses and the neutral link to the meter panel.

4.19.3.3 Neutral Cable

The customer must provide a connection facility for the metering neutral conductor. It must be in a readily accessible location close to the CT position.

The connection facility may be:

(a) A suitable tunnel terminal, or

(b) A set screw in a neutral bar. The neutral bar may be the neutral conductor for the whole installation or for the portion of the installation being metered.

Alternatively, the connection facility may be in the form of a suitable neutral link installed on the same panel as the voltage circuit fuses. It must be connected by means of 2.5mm^2 cable to an approved neutral conductor as follows:

(c) Connect the neutral cable to a busbar using a suitable lug.

(d) Secure the lug with a 6mm diameter set screw into a tapped hole.

(e) Make the connection clearly visible from the position of the current transformers.

4.19.3.4 Sealing

Provide separate sealing facilities for these connections if they are not contained within a sealed portion of the switchboard.

4.19.4 Meter Test Block

The customer must provide and install a meter test block at the meter panel.

The test block must:

(a) Be front connected with a current, rating of 20A and a voltage rating of 660V.

(b) Comply with AS/NZS 3000.

(c) Be capable of accepting two external slide links and have the facility to short each current circuit.

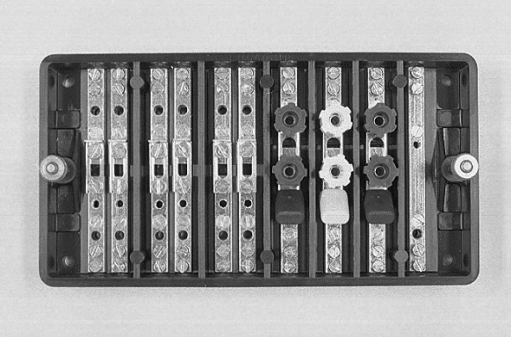
(d) Be fitted with a slide link and two insulated nuts for each voltage circuit.

(e) Have a solid bar without slide link for the neutral circuit.

(f) Have a sealable insulated cover that when in position no conductor or any mounting screw is exposed.

Make the connection of the current circuit and voltage circuit wiring as required by the electricity distributor. Refer to Figure 4.19 for an example of a meter test block.

Figure 4.19: Example of a Meter Test Block



4.19.5 Summation Equipment Wiring

Refer to the electricity distributor or meter provider for details of their summation metering requirements.

4.19.6 Load Control Device and Contactor Wiring

If you provide a contactor in accordance with clause 4.20 you must install a pair of 2.5mm^2 cables between the CT metering panel and the contactor as follows:

(a) The contactor must comply with the requirements of clause 4.11.3.

(b) It must be controlled and protected by a suitably rated 10A circuit breaker, both of which have provision for sealing.

(c) The pair of cables for the contactor may be grouped with other metering cables provided they are visually distinguishable from them.

4.19.7 Earthing of Meter Surround

The customer must connect an earthing conductor to the metal surround of the meter panel in accordance with the provisions of AS/NZS 3000.

4.19.8 Supply for National Electricity Rule Compliant Communications Equipment

Where code compliant CT metering is installed, unmetered supply may be taken for rule compliant data and communications equipment only. This equipment must be connected to a sealable link on the load side of the meter test block (between the test block and the metering).

Where rule compliant whole current metering is installed, metered supply must be taken for rule compliant data and communications equipment. This equipment must be connected to a metered link on the line side of the main switch.

Communications which requires mains supply equipment must be protected by a sealable current limiting (HRC) fuse or circuit breaker with a maximum rated current of 4A (to grade with the 10A current limiting (HRC) meter potential fuse, where CT metering is installed). This equipment does not need to be controlled by a separate main switch and must be hard wired to the supply (socket outlets are not permitted).

Alternatively communications equipment integrated in the meter may obtain a protected supply internally from the meter.

4.20 CONTROLLED LOAD FOR CT METERING

The customer must supply and install a contactor if electricity is to be supplied (in accordance with the provisions of a tariff) to a CT metered portion of an installation only during certain hours.

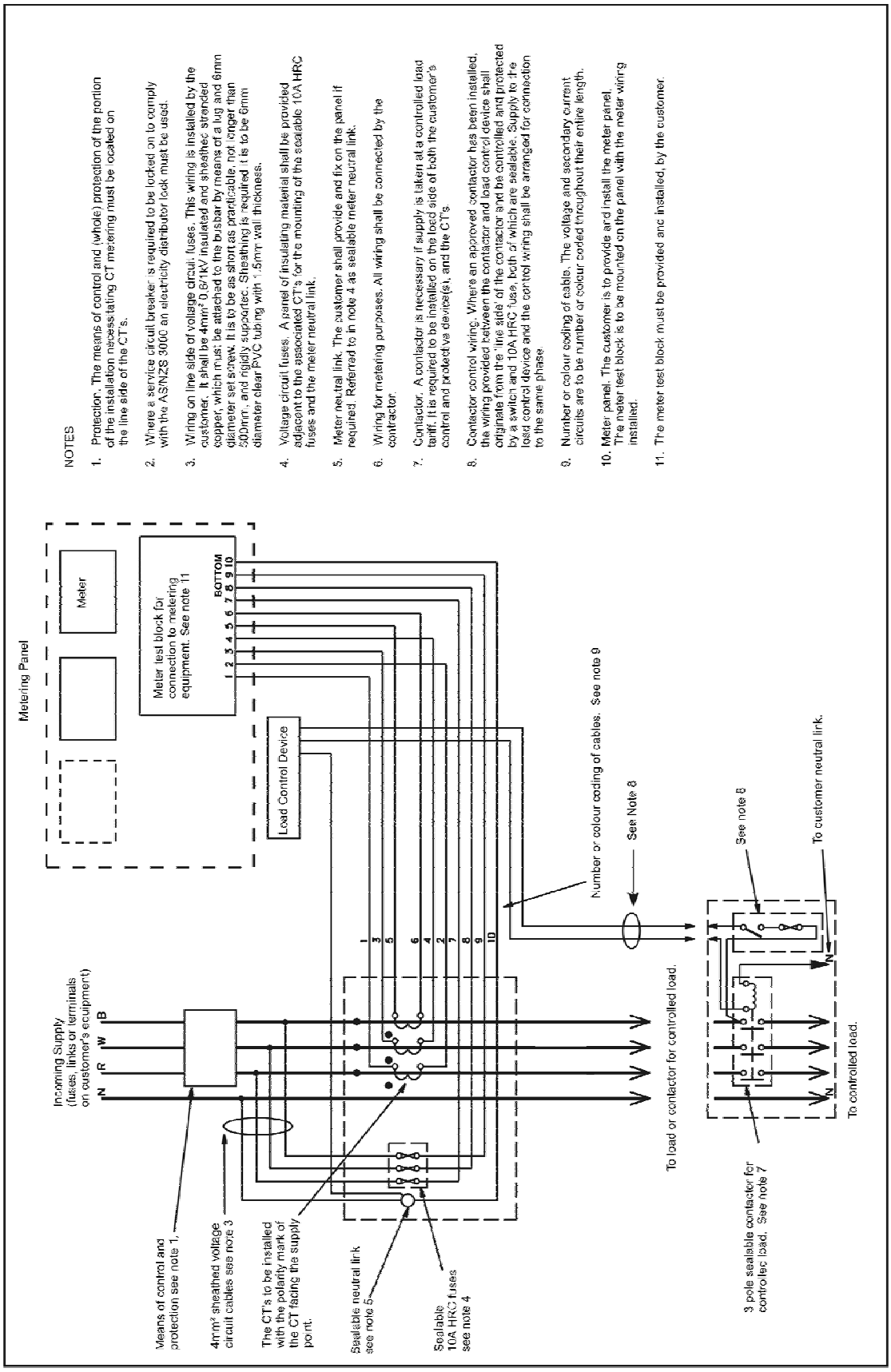
Arrange the contactor so that it is operated by the electricity distributor's nominated load control device. The contactor must be of a type approved by the electricity distributor. It must:

(a) Have the terminals and mechanism enclosed in a manner which facilitates sealing.

(b) Have a 240 volt operating coil and be designed to close and open simultaneously with the load control device.

Install the contactor at the meter position or, alternatively, adjacent to the controlled load current transformers. A typical wiring diagram of a CT metering installation including a controlled load contactor is shown in Figure 4.20.

Figure 4.20: CT Metering Circuit with Controlled Load



4.21 LABELLING

Install warning labels on a customer's main switchboard.

Warning labels must satisfy the following requirements:

(a) All warning labels on the main switchboard must have WHITE lettering, minimum 6 mm high, permanently engraved on a RED background.

(b) Labels for all main switches must be readily distinguishable from all other labels, in accordance with AS/NZS 3000. Different colours may be used for identification so they can be operated quickly in an emergency.

(c) Provide a schedule for each distribution section within a main switchboard to identify outgoing submains and final sub circuits.

(d) Equip each combination fuse-switch (CFS) unit with a label stating the maximum current rating of replacement fuses to be installed. Make sure the ratings for the fuses match:

  i) The current rating of the outgoing submains, and/or

  ii) The fault current limiting requirements for downstream equipment

  whichever is less.

(e) Provide each main switchboard with a permanently engraved label with the following information:

  i) Fault rating for 1 second.

  ii) The Manufacturer's name or trademark.

  iii) Type, designation or identification number or other means of identification so that anyone can get relevant information about it from the manufacturer.

  iv) IP rating.

4.21.1 Guide to Labelling Electrical Equipment on Switchboards

This clause cannot cover all the labelling requirements in every situation. To establish consistency and improve safety, the NSW electricity distributors are providing preferred and acceptable examples in known problem situations.

No reference is made to specific clauses in AS/NZS 3000 as electricity distributors do not intend to indicate precise labelling acceptance criteria.

This clause does not remove responsibility from the customer or their representative in complying with:

(a) Other Australian Standards.

(b) Requirements of other relevant Regulatory Authorities.

(c) Other publications if applicable to the situation.

Note: Inadequate labelling, or lack of labelling of equipment at the time of inspection may prevent the connection of electricity.

Avoid temporary labelling - it should not be necessary.

Labelling of equipment needs to be standardised to an acceptable degree so that:

(a) Authorised persons operating switchgear know which section of the installation the equipment controls.

(b) Authorised persons working on an installation can do so safely.

(c) Electrical contractors, equipment suppliers and switchboard manufacturers know what labelling is acceptable.

Wording on labels should be concise, easy to understand, and contain sufficient information to convey the message effectively without ambiguity.

If you use words like "essential", "emergency", "normal" etc, make sure they cannot be confused with words on labels for equipment associated with lifts and fire services.

For example:

(a) "Essential lighting" would be confused with emergency evacuation lighting (see AS 2293 'Emergency evacuation lighting for buildings').

(b) Some air conditioning equipment may be essential for a manufacturing process, but the labelling of equipment as "Essential air conditioning" would cause confusion with fire and smoke control equipment.

One example of an acceptable label would be:

Air Conditioning
Motor Control Cubicle. Basement
Do No Turn Off Without
Consulting Supervisor

Label 1

4.21.2 Examples and Explanations of Labelling

4.21.2.1 Fault Current Limiters

Examples of acceptable labels are labels 2 to 5.

Fault Current Limiters for
.....Circuits
Mounted Behind This Cover

Label 2

WARNING:
Do Not Re-energise Fault Current Limiters
Until Fault Has Been Cleared
Replace With Identically Rated
Fault Current Limiters

Label 3

WARNING:
These Fault Current Limiters Are Not Controlled
By a Switch

Label 4

WARNING:
Use Insulated Handle to Remove and
Replace These Fault Current Limiters

Label 5

4.21.2.2 Main Switches

For labelling main switches use a different background colour to the background colour used for labels of other equipment.

Use white lettering on a red background for warning labels. Also use white on red for labelling main switches for lifts and fire services and associated equipment. (See AS 1319 'Safety signs for the occupational environment').

For switchboards rated at 100A or less, the colour of labels for main switches can be the same as the labels for other equipment.

Abbreviations such as DB 7, FIB, EWIS, and MCC2 are unacceptable.

Examples of acceptable labels are:

(a) Main Switch - Tenant's light and power, Levels 7, 8 and 9

(b) Main Switch - House Services light and power, Levels 1-15

(c) Main Switch - Motor control panel No. 2, Level 12

(d) Main Switch - Distribution board, Level 3

(e) Main Switch - Air conditioning board, Level 14.

4.21.2.3 Switches for Fire and Smoke Control Equipment

Examples of acceptable labels are:

(a) Main Switch - Fire hydrant pump. Level 20.

(b) Main Switch - Fire sprinkler pump. Level 2.

(c) Main Switch - Fire hose reel pump. Level 7 to 10.

(d) Main Switch - Fire Indicator Board.

(e) Main Switch - Emergency warning intercommunication system.

(f) Main Switch - Smoke control fans switchboard, Level 9.

(g) Main Switch - Lift 1, High rise, Level 19.

4.21.2.4 Installations in Separate Buildings

An acceptable label is shown as label 6 below.

Use internal building numbers wherever possible. Avoid names of companies.

Main Switch (Location)
Light, Power, Air Conditioning,
Lifts and Fire Services

Label 6

4.21.2.5 Main Switchboard Enclosures

Refers to labels 7 and 8 below.

If necessary, the label should also include some means of identifying the premises, eg 7-19 Phillip Street.

Main Switchboard Electrical Services

Label 7

Main Electrical Switchroom

Label 8

Place signs in large and complex installations at the Fire Indicator Board and at, or adjacent to, the tenant's directory board.

An example of a sign would be label 9 as shown below.

Main Electrical Switchboards
Located On Levels B2, 10 & 27.
Private Generation Switchboard on Level 28

Label 9

4.21.2.6 Switchboard Equipment

Abbreviated labels such as DB 7 or MCC2 are not acceptable. Labels should indicate the floor or level number or location and, if necessary, the type of load, eg:

(a) Light and power, Level 17, North side.

(b) Air conditioning board, Level 2.

The use of suitable diagrams mounted on or near the switchboard would be acceptable in complex installations where direct labelling would be excessive and confusing. Make a reference on the switchboard to any diagrams.

4.21.2.7 Segregation of Supplies

Labels 10-15 shown below are acceptable examples.

Main switchboard No. 1
Electricity Distributor Supply No. 1
Circuits 1-18 Main Switchboard No. 2
is Located .....

Label 10

Main Switchboard No. 1
Electricity Distributor Supply No. 1
Supplies Areas as Shown In Diagram
Main Switchboard No. 2
is Located.....

Label 11

Main Switchboard No. 1
Electricity Distributor Supply No. 1
Supplied From Substation No. 12345
Main Switchboard No. 2
is Located .....

Label 12

Distribution Board Level 7
Supplied From No. 1 Main Switchboard

Label 13

Electricity Distributor Supply No. 1
Supplies Main Switchboard No. 1
Located on Ground Floor

Label 14

Electricity Distributor Supply No. 1
Supplies Main Switchboard No. 1
Located on Ground Floor
Private Generation Supply Also Available,
Isolate at Generator Switchboard on Level 7

Label 15

4.21.2.8 Alternative Supplies

Display a notice prominently on the main switchboard, distribution board or change-over equipment cubicle in accordance with Section 8.

The circumstances to consider are:

(a) Isolation of the alternative supply to the main switchboard, distribution board or change-over equipment cubicle.

(b) Isolation of an outgoing circuit from the normal supply switchboard.

(c) Isolation of a switchboard remote from the switchboard containing the change-over equipment.

Examples of acceptable labels would be:

WARNING
Private Generating Plant Will
Automatically be Connected To
This Switchboard on Loss Of
Electricity Distributor Supply.
Isolate Private Generating Plant
in Lower Basement

Label 16

Main Switch
Tenant's Light And Power, Levels 1-11
WARNING
Alternate Supply Available
Isolate Also at Circuit Breaker No. 2
on Private Generating Plant,
Switchboard on Level 17

Label 17

Main Switch
Controls Circuits 4, 5, 6 & 7
WARNING
Alternate Supply Available To Circuit 8.
Isolate Also at Circuit Breaker No. 3
on Private Generating Plant
Switchboard on Level 17

Label 18

4.21.2.9 Miscellaneous

Isolators, automatic transfer switches, mode selector switches and similar unusual equipment, are usually installed so that they are not readily accessible.

Labelling of this equipment on the outside of the switchboard would not normally be necessary.

If labelling is required, it must not cause confusion. Labelling of this equipment on the inside of the switchboard is necessary to explain the purpose of the equipment.

If an automatic transfer switch is to be used as a main switch, then the associated supervisory control switch will need to be accessible. Label it to indicate that it is a main switch and it will isolate both the electricity distributors and the private generation supplies.

Label voltmeter and ammeter selection switches as voltmeter and ammeter selection switches.

4.21.2.10 Circuit Breakers - Cascade

Where cascade or series connected circuit breakers are installed for current limiting purposes, the following warning label must be installed adjacent to the circuit breakers.

At upstream circuit breakers.

WARNING
All protective devices on this switchboard have been selected to cascade with the downstream circuit breakers. Replace only after consulting manufacturer.

Label 19

At downstream circuit breakers.

WARNING
All protective devices on this switchboard have been selected to cascade with the upstream circuit breakers. Replace only after consulting manufacturer.

Label 20

4.22 LIST DELETED

Figure 4.21: Figure Deleted