CITIPOWER

Victorian Service & Installation Rules

EASTERN energy

Powercor AUSTRALIA

Solaris POWER

UNITEDenergy

Code of Practice for the Connection of Electrical Installations to Distribution Companies Mains 1996

Victorian

Service & Installation Rules

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Foreword

The Service and Installation Rules have been compiled jointly by the distribution companies; namely: Citipower Ltd, Eastern Energy Ltd, Powercor Australia Ltd, Solaris Power Ltd and United Energy Ltd in conjunction with the Office of the Chief Electrical Inspector and these Rules supersede the 1994 edition.

This edition of the Service and Installation Rules has been researched thoroughly and developed through an agreed consultation process, supported by the Office of the Regulator-General, as part of the Distribution Code Change Mechanism.

These Rules are to be used by electrical contractors, licensed electrical mechanics, consulting engineers, architects, customers, distribution company personnel, representative organisations (unions, associations, etc) and all other relevant people directly concerned with the connection of electrical installations to the electrical distribution network of distribution companies in Victoria.

The changes to this new version of the Service and Installation Rules were circulated to a wide range of people, companies and organisations directly and indirectly involved in the Victorian Electrical Supply Industry who are required to use these Rules as part of their work.

The Rules require customer electrical installations to comply with distribution companies' electrical supply arrangements, including service cables and consumer's mains, metering, multiple occupancies, high voltage installations and private overhead electrical lines.

The information has been arranged so that relevant drawings are included within the relevant section of the document to reflect specific topics to assist the reader.

Words and expressions defined in the 1992 Wiring Regulations or successor documents have the same meaning when used in these Rules.

Following the establishment of the Office of the Regulator-General, distribution companies were provided with a distribution licence to supply electricity to customers. The distribution licences refer to the relevant codes which reflect the standards to which distribution companies and customers are required to comply. The Service and Installation Rules are included in the Distribution Code as a standard and compliance is mandatory.

Further revisions of these Rules will be carried out by a Joint Review Committee through a consultation process. The Joint Review Committee is comprised of representatives from the distribution companies and the Office of the Chief Electrical Inspector with the change process being reviewed by the Office of the Regulator-General.

Any changes to these Rules are carried out through a process that provides for consultation with customers, electrical contractors, relevant organisations and associations, manufacturers of electrical equipment, distribution companies, consultants, architects and the Office of the Chief Electrical Inspector.

The change process is designed to encourage diversity of technically acceptable materials, products, equipment and work practices that will deliver increased value to the customer, safe connection of electrical installations to the electrical distribution network of distribution companies, increased competition within the Victorian Electricity Supply Industry and the opportunity for electrical equipment to be used across Australia.

Comments or suggestions for changes to these Rules should be directed in writing to the appropriate person nominated in Clause 1.5 of these Rules.

Allan Driver
Chairman, Service and Installation Rules Joint Review Committee
Victorian Electrical Supply Industry

Note to User

This document has been produced by Citipower, Eastern Energy, Powercor Australia, Solaris Power and United Energy. It has been compiled using drawings, guidelines and information that comply with relevant acts and regulations of the State of Victoria that have been in force from time to time. It is the responsibility of the end user to determine the suitability of the material contained herein to the particular application or purpose of which it is used. Electricity supply publications are revised when necessary by the issue either of revised pages or complete new editions. It is important that users of such publications ascertain that they are in possession of the latest issue.

Citipower, Eastern Energy, Powercor Australia, Solaris Power and United Energy expressly disclaims any liability to anyone including, without limitation, any end-user of the document, in respect of anything done or not done by them in reliance in whole or in part upon the contents of this document.

Convenor, Service and Installation Rules Working Group
Victorian Electricity Supply Industry
c/o Eastern Energy Ltd
Locked Bag 15
Croydon Vic 3136

FESI06116B

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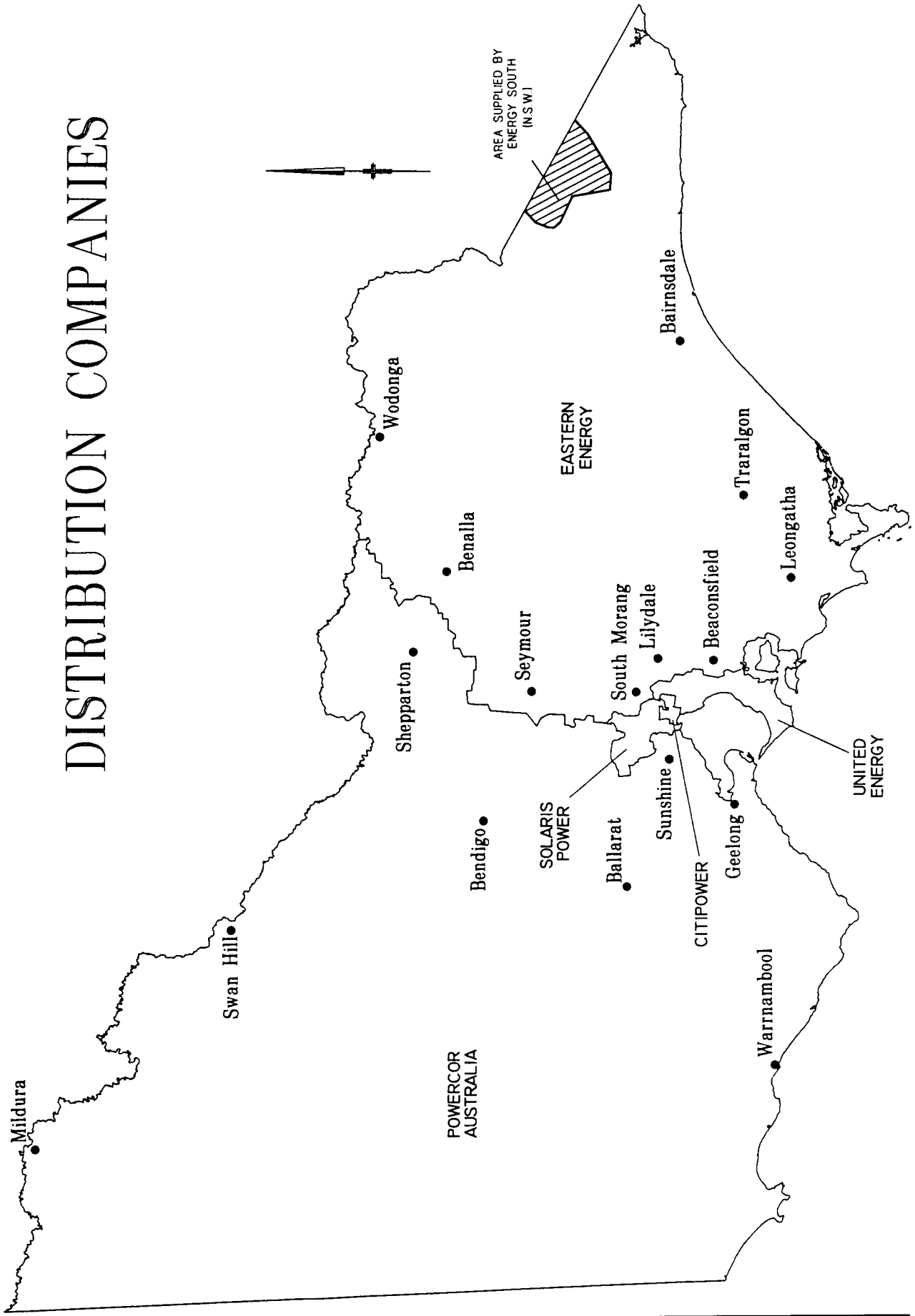
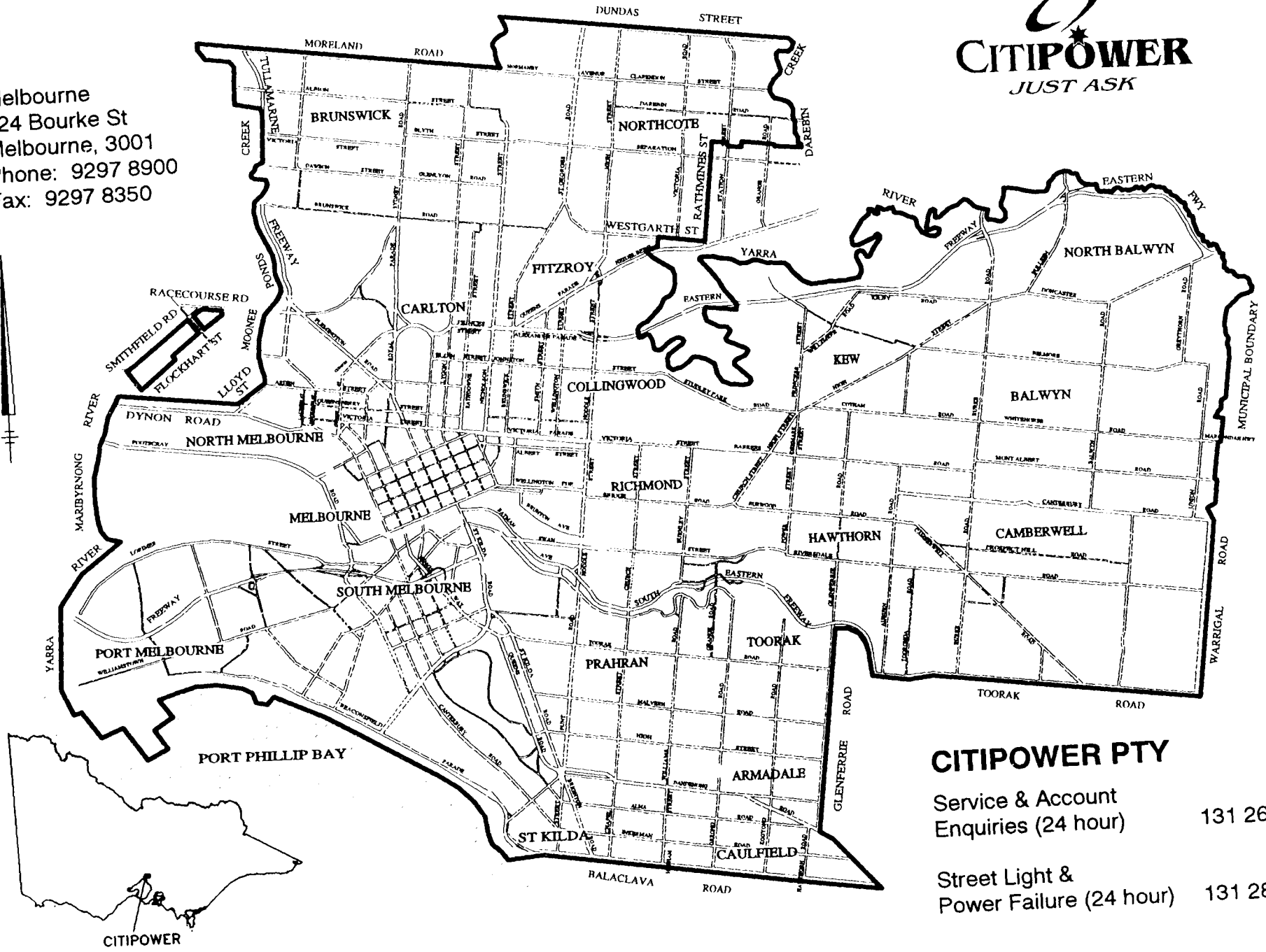
Areas of Supply



Melbourne
624 Bourke St
Melbourne, 3001
Phone: 9297 8900
Fax: 9297 8350

CITIPOWER
JUST ASK

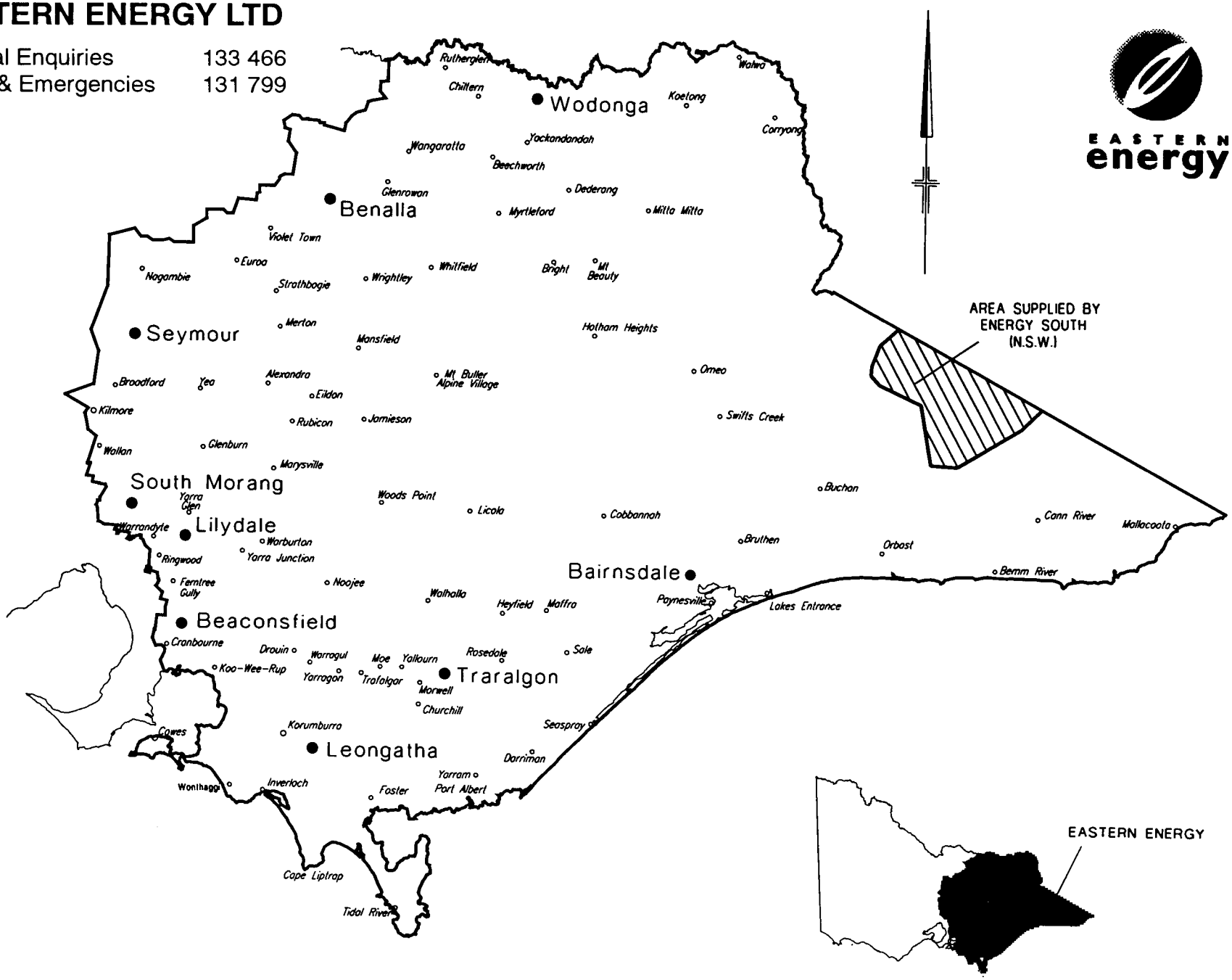


CITIPOWER PTY

Service & Account Enquiries (24 hour)	131 260
Street Light & Power Failure (24 hour)	131 280

EASTERN ENERGY LTD

General Enquiries 133 466
Faults & Emergencies 131 799



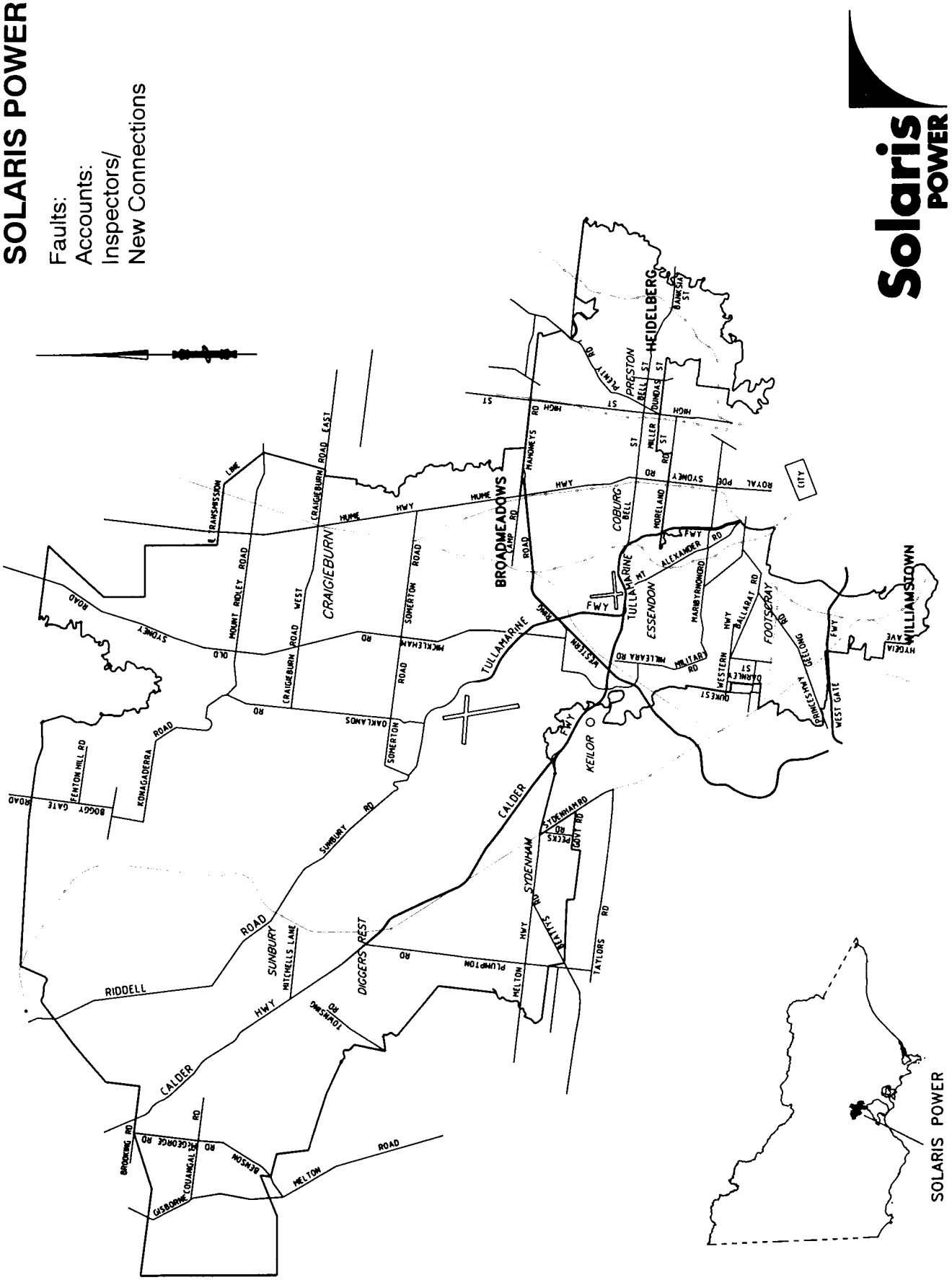
POWERCOR AUST LTD

Powercor AUSTRALIA

24 Hour Telephone Service	
Residential Customers	
General Enquiries	132 114
Service Difficulties	132 412
Hot Water Hot Line	1 800 658 901
Business Customers	
All Enquiries	132 334

SOLARIS POWER PTY LTD

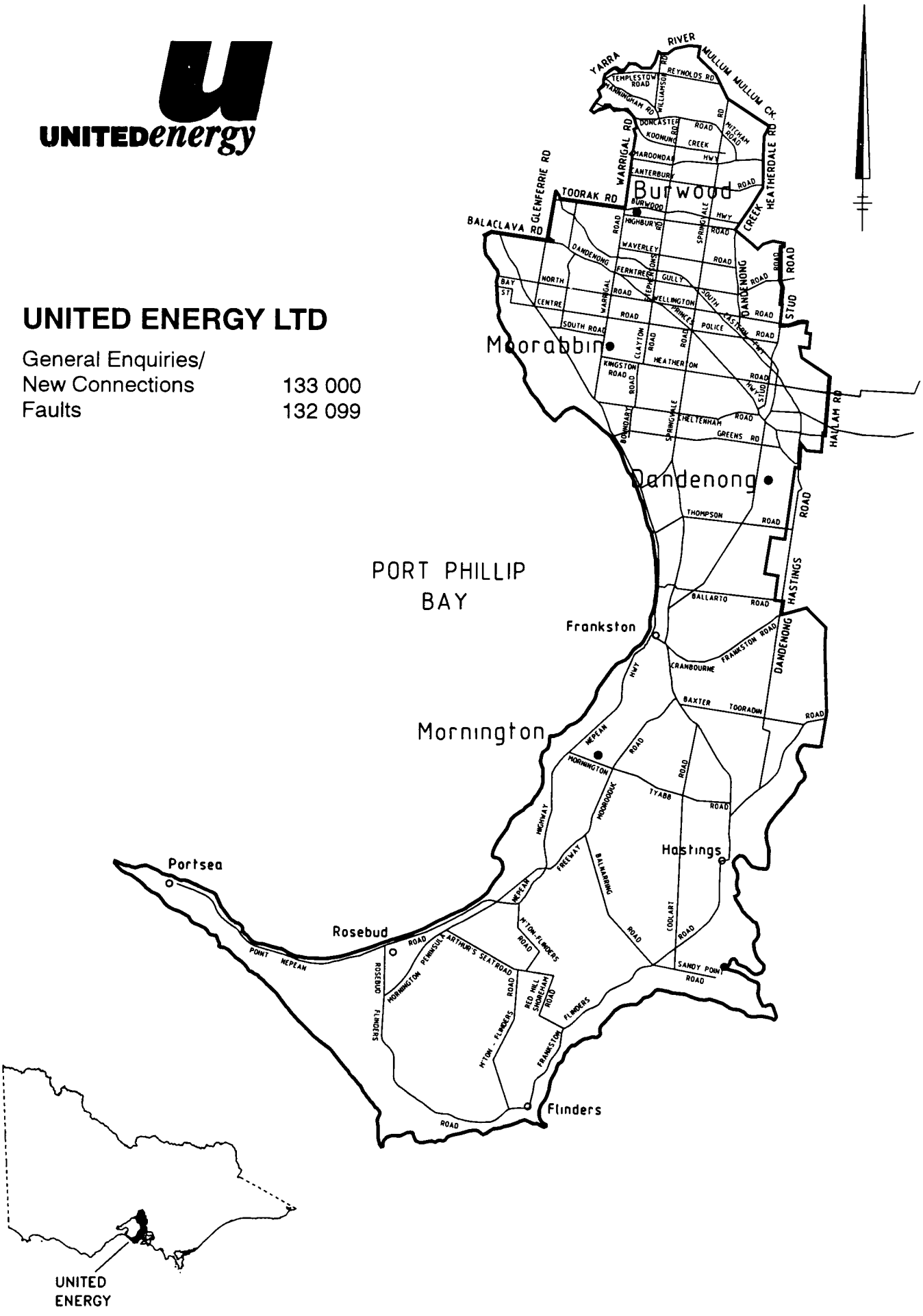
Faults: 131 626
Accounts: 131 646
Inspectors/
New Connections 9201 2000



UNITEDenergy

UNITED ENERGY LTD

General Enquiries/
New Connections 133 000
Faults 132 099



Introductory Information

Introductory Information Contents

A Conditions of Supply

The Supply and Sale Code sets the minimum conditions under which Distributors sell electricity to Franchise Customers.

Non-Franchise Customers are subject to special conditions of supply to be negotiated with the DistCo.

B Tariffs for Supply of Electricity

A Schedule of Electricity Prices is published by each electricity supplier setting out pricing conditions for Franchise Customers. Copies of this schedule are available from your supplier. At all times the customer remains responsible for selecting the particular tariff most appropriate for their requirements.

C Negotiations for Obtaining / Altering an Electricity Supply and Warning Against Premature Expenditure

For supply to a new installation, or to an addition to, or alteration of, an existing installation, negotiations should be commenced with the DistCo as soon as the decision to proceed is made. Sufficient time must be allowed for the DistCo to consider, and if necessary alter the existing supply arrangements.

No expense should be incurred by a prospective customer until negotiations for supply have been made with the DistCo and advice received as to the conditions under which the DistCo would agree to the connection of the load and the provisions to be made by the customer for the installation of the DistCo's equipment on the premises.

Adequate written notice of the customer's requirements should be submitted, particularly where the load is relatively large or the supply is required in a remote location, as considerable time may be necessary for negotiations and construction. In addition the customer may be required to meet the costs involved.

Matters which may affect the design of a building project, such as the determination of the "Point of Supply", the position of the metering and servicing equipment, the point of attachment of an aerial service cable or the point of entry of an underground service cable, and the position of any substation on the premises should be resolved with the Responsible Officer at an early stage of planning.

When contemplating the connection of equipment such as described in Clause 2.6 or 2.7 particular care should be taken to ascertain the DistCo's requirements relating to the prevention of interference with the supply to other customers.

D Application for Connection of Electricity Supply

Application for supply to a new installation or an existing installation should be made to the relevant DistCo or Retailer.

Where the DistCo requires the Franchise Customer to make a written application for connection of electricity to a premises or to provide proof of the Franchise Customer's identity, such proof shall be to the satisfaction of the DistCo.

Non-Franchise Customers are subject to special conditions.

E Necessity for Employing a Licensed Person

In Victoria, regulations only permit suitably licensed and/or qualified persons to work on electrical installations. In addition, conditions apply to the actual undertaking, or contracting to perform such work.

Inquiries regarding licensing, the qualifications to work, to undertake work, and/or to contract to perform electrical work on electrical installations should be referred to the Officer in Charge, Electrical Licensing, Office of the Chief Electrical Inspector, Level 3, Building 2, 4 Riverside Quay, South Melbourne, 3205. Telephone Freecall 1800 815 721. Facsimile (03) 9686 2197.

General

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Section 1 Contents

1.1 Scope

These Service and Installation Rules, hereafter referred to as "Rules", apply in respect of electricity supply to premises throughout Victoria.

Further detail regarding the matters covered by these Rules is available from the DistCo.

1.2 Definitions

Unless otherwise stated, the terms used in these Rules are as defined in the [Victorian] State Electricity Commission Act 1958 and the Wiring Regulations. Current and voltage are expressed as the r.m.s. value.

Aerial Consumers Mains (ACM's) - comprise that portion of the consumers mains erected in the form of a private overhead electric line.

Authorised Person - the person in charge of the premises, or the registered electrical contractor or licensed electrical mechanic or other person appointed or selected by the person in charge of the premises, to perform certain duties associated with the electrical installation on the premises.

Common Mains - means Consumer's Mains or unmetered Submains which provide supply to a point of distribution for two or more separately metered occupancies

Common Property
Common Property is all that part of a subdivided site that is not within the lots or reserves on the plan of subdivision.

The common property is owned by the registered proprietors of the lots on the plan of subdivision as noted as tenants in common in shares proportional to their "lot entitlement".

Consumer's Terminals - are defined in the Wiring Rules and are the junction of the DistCo's conductors with the Consumer's Mains.

Customer - means the person or body which requires electricity to be made available to an electrical installation on a property, and includes the owner, occupier or tenant as the case may require or a group of bodies acting as one in the provision of electricity to their property.

Chief Executive Officer (CEO), Managing Director (MD) - means the officer appointed either permanently or temporarily by the DistCo to manage all matters related to electricity supply in their respective geographical areas of supply.

Determined Maximum Demand - means the demand imposed on the DistCo's supply system as assessed by the Responsible Officer. This demand may, but need not necessarily, align with that calculated in accordance with the Wiring Regulations for the consumer's mains.

DistCo - means:
The Distribution Company responsible for supply to a particular electrical installation as follows:
(a) CitiPower Ltd ACN 064 651 056;
(b) Eastern Energy Limited ACN 064 651 118;
(c) Powercor Australia Limited ACN 064 651 109;
(d) Solaris Power Ltd ACN 064 651 083; or
(e) United Energy Ltd ACN 064 651 029.

Distribution Code - means a code prepared by a Distributor and approved by the Regulator-General relating to, among other things, connection to and use of that Distributors Distribution System.

Distribution Licence - means a licence to Distribute electricity granted under Section 162 of the Electricity Industry Act 1993.

Distributor - means a holder of a Distribution Licence or a person who has been granted an exemption under Section 162 of the Electricity Industry Act 1993.

Dual Occupancy

A dual occupancy is the construction of two dwellings on one lot which may be subdivided into two lots each containing a dwelling. The construction of the dwellings does not constitute a subdivision of the lot and they cannot be sold or transferred separately without a subdivision taking place.

Electrical installation - In general, means any electrical equipment that is fixed (or to be fixed) in, on, under or over a Customers premises, but does not include:

(a) any electrical supply main or service line of a DistCo;

(b) any electrical equipment:

  (1) that is fixed (or to be fixed) in, on, under or over any premises owned or occupied by a DistCo; and

  (2) that is not used:

  - for the consumption of electricity on those premises; or
  - solely for purposes incidental to that consumption.

(c) any Connections to a Consumer's terminals for the purpose of providing Supply; or

(d) any Metering Equipment owned by a DistCo.

Note: An electrical installation is specifically defined in the SEC Act.

Embedded Generating Unit - means a Generating Unit which is Connected to a Distribution System.

Franchise Customer - has the meaning ascribed to it in Part 12 of the Electricity Industry Act 1993.

LEM - means Licensed Electrical Mechanic.

Point of Supply - In general, "Point of Supply" means the point at which electrical energy is delivered by the DistCo to an electrical installation and at which responsibility for the conveyance of electricity within the property passes from the DistCo to the customer. The Point of Supply is specifically defined in the SEC Act.

Private Electric Line - means any L.V. electric line intended to convey energy from the "Point of Supply" for a property to consuming apparatus within the property, including consumer's mains, sub-mains and final sub-circuits. (Defined in the SEC Act).

Private Overhead Electric Line (POEL) - comprises all of the LV aerial conductors and all supporting structures, including conductors supported by a catenary wire within an electrical installation for the purpose of taking electrical energy from the point of supply for that installation or distributing electrical energy within that installation.

Property - means a parcel of freehold or leasehold land, or Crown Land held under lease or licence, which may be traversed within its boundaries without crossing a public reserve [including road reserve] or land occupied by a separate person or body.

A single property may include several contiguous titles or leaseholds under the control of a single person or body or it may contain one or more structures or occupancies. Such titles or structures shall be ignored when considering the limits of a single property.

Note: An applicant for supply would be prudent to consider the likely future title holdings as change of ownership may invalidate the arrangement of the installation and thus require expensive modifications. Private electric wiring shall not extend beyond the boundary of a property. [Refer Section 6, Electric Light and Power Act 1958].

'For the purpose of determining the "Point of Supply", where a subdivision comprises lots and common property which provides access to the lots, the DistCo may regard all lots and common property as constituting the one property. Under these circumstances, any common or individual mains or submains leading from the point of supply to lots shall run through the common property and not pass through other lots.'

Land vested in a public authority such as a Municipal Council, other than a road reserve, is regarded as private property for the purpose of these Rules.

Non-Franchise Customer - has the meaning ascribed to it in Part 12 of the Electricity Industry Act 1993.

REC - means Registered Electrical Contractor.

Responsible Officer - means the officer appointed by the DistCo and responsible for the administration of requirements detailed in these Rules.

Retailer - means a holder of a Retail licence, other than any DistCo, or a person who has been exempted from the requirement to obtain a Retail licence under Section 160 of the Electricity Industry Act.

Retail Licence - means a licence to sell electricity otherwise than through the Pool granted under Section 162 of the Electricity Industry Act.

Retail Tariff Metering Code - means the code dated 3 October 1994 as amended or revised from time to time which:

(a) regulates the basis for installation for new Metering Equipment and the operating and maintenance of existing Metering Equipment and new Metering Equipment in connection with Electrical Installations of certain Customers;

(b) establishes rights and obligations in respect of metered data; and

(c) is certified by the Office of the Regulator-General.

Service Cable / Line - means an overhead or underground service cable owned and maintained by a DistCo, through which electrical energy is or may be supplied to the point of supply for an electrical installation.

Service Equipment - means DistCo owned equipment including all such equipment installed within the premises of a customer

Service Protective Device - A fuse or circuit breaker intended to disconnect supply under short circuit conditions.

Shall - is to be understood as mandatory.

Should - is to be understood as non-mandatory, i.e. advisory or recommended.

Subdivision

Subdivision means the division of land into two or more parts which can be disposed of separately. (Section 8A of the Sale of Land Act 1962 deals with this matter.)

Suitable (or suitably) - means to the satisfaction of the DistCo's Responsible Officer.

Supply and Sale Code - means the code dated 3 October 1994 as amended or revised from time to time which:

(a) regulates the terms and conditions on which electricity is Supplied and sold to certain Franchise Customers; and

(b) is certified by the Office of the Regulator-General.

Underground Reticulated Distribution (URD) - is defined as an underground cable network used in areas where no electrical protective device is provided at the origin of the individual service cable.

Wiring Regulations - means the SEC Wiring Regulations and any duly authorised amendment, addition to or alteration thereof.

Wiring Rules - means the Australian Standard 3000 - SAA Wiring Rules

1.3 Customer's General Obligations

The customer shall make available to the DistCo's officers or agents, together with their equipment, safe, convenient and unhindered access to the equipment of the DistCo on the customer's premises for any purposes associated with the supply, metering or billing of electricity or the inspection and/or testing of the customer's electrical installation, provided that official identification is produced by the officers or agents on request. The customer must provide protective equipment to officers or agents of the DistCo if that is necessary to ensure safe access to the customer's premises.

1.4 Failure to Comply with These Rules

In the event of the customer or REC failing to comply with the requirements of these Rules, the DistCo may refuse to supply or may disconnect the supply to the installation or any portion thereof. A charge may be made for subsequent visits for the connection or reconnection of supply. (refer Clause 3.2)

1.5 Exceptional Circumstances

In exceptional circumstances the stated requirements contained in these Rules may be waived or modified. Any request in this regard shall be addressed in writing to the Nominated Officer of the DistCo responsible for supply to the particular installation as follows:

Title Manager, Customer Service Operations

Citipower Ltd

Address: Locked Bag 14031 Melbourne City Mail Centre 8001

Title Supply Liaison Officer

Eastern Energy Ltd

Address: Locked Bag 15 Croydon 3136

Title : Installations Manager

Powercor Australia Ltd

Address: Locked Bag 14090 Melbourne City Mail Centre 8001

Title: Installations Inspection Co-ordinator

Solaris Power Ltd

Address: 30-40 King William St Broadmeadows 3047

Title: Installations Policy Officer

United Energy Ltd

Address: Locked Bag 13 Mount Waverley 3149

Every request shall be accompanied by a detailed statement of the reasons why non-compliance with these Rules is sought, together with a 'Statement of Consent' from the owner or controlling body of the installation.

No action should be taken until a written reply to such a request has been received.

1.6 Point of Supply

Where low voltage [L.V.] electricity is provided to a property, the Point of Supply shall be as defined in the SEC Act. This means the Point of Supply shall normally be one of the following points, as appropriate to the particular property and method of supply:

- an underground cable - at the point at which the cable crosses the boundary of the property.
- an aerial service cable - at the first point of attachment of that service cable within the property.
- a high voltage line and substation within the property - at the L.V. terminals of that substation.

For supplies to properties in existence at the date of this publication, the Point of Supply on a L.V. line [located on an easement in favour of the DistCo] within the property shall be at the L.V. terminals established on the DistCo line.

The Consumers Terminals may not coincide with the Point of Supply. This will depend upon the practicability of effecting the physical connection of the DistCo's and customers wiring at that point.

Where electricity is provided at other voltages, the Point of Supply shall be determined by the Responsible Officer.

Note: For electricity supply beyond property boundaries, reference should be made to the Electric Light and Power Act.

1.7 Alterations and Additions

The customer should ascertain that the required supply is available before incurring any expense; as indicated in the introductory information. If an alteration or addition to an existing installation makes it necessary to alter or install additional DistCo equipment, the customer shall make provision for mounting and connection of that equipment to the satisfaction of the Responsible Officer.

In other cases, arrangements shall be made to the satisfaction of the Responsible Officer, including the provision and installation of the required meter panel/s in accordance with Section 6 of these Rules.

Where additional metering and control devices can be accommodated on an existing meter board or panel, the Responsible Officer will arrange the fixing of such equipment to the board or panel and connection to suitable wiring provided by the customer.

Where plug-in metering is requested to be installed, the plug-in base shall be supplied, fixed and the wiring prepared by the customer's REC as detailed in Section 6.

Note: See Clause 3.2 regarding Charges Applicable.

1.8 Offences

A person, other than a person authorised by the DistCo to carry out such work, shall not insert or remove a fuse-link of a service protective device, make or break any connection (including seals or locks), dismantle any component part of the DistCo's equipment or detach such equipment from its fixing point.

Sections 49 to 52 of the Electric Light and Power Act 1958 prescribe various offences relating to the tampering with, including damage to, any service equipment belonging to the DistCo and includes such things as electric lines, transformers, metering equipment and seals.

Notes:

- Attention is directed to Clause 6.3 regarding provisions for sealing.
- If a person is found guilty of an offence, it could result in the imposition of substantial fines together with an order for damages to compensate the DistCo for any loss and court costs but it may also cause that person to have a criminal record.

1.9 Connection of Embedded Generating Units

The installation of an Embedded Generator Unit which is or is intended to be connected must comply with these Rules, the Distribution Code and the relevant Australian Standards. Refer to clause 4.6 regarding Sources of Alternative Supply.

1.10 Labelling

Every label shall be permanent, indelible and legible and also be suitable for the purpose for which it is intended. For guidance reference should be made to Section 7 "Marking" of AS3100 "Approval and Test Specification - General requirements for Electrical Equipment".

1.11 Victorian Power Industry Lock

Where a Customer is required to or wishes to install a locking system to doors and enclosures which require dual access by both the Customer and DistCo representatives, it shall be subject to the following conditions:

- The locking system used is a Victorian Power Industry Lock which is available through major retail hardware outlets throughout Victoria. This enables the use of a Master Key by DistCo representatives only. (Further information is available from the DistCo); and
- The locking system is only used where specifically referred to and permitted by these Rules.

Notes:

- Reference should also be made to Clauses 5.4.3.7(a), 6.2.1.1 and 6.4.4.
- Other locks may be keyed to this system but the Master Key will only operate the Power Industry Lock.

Statutory Regulations

2

Section 2 Contents

Section 2 Contents

2.1 General

2.1.1 Safety

All persons and contractors are responsible for all aspects of safety related to work performed by the said persons or contractors and employees or agents thereof.

Notes – Attention is directed to:

- the Occupational Health and Safety Act 1985 and the Regulations and Codes of Practices under the jurisdiction of this Act;
- Clause 5.4.1.1 regarding safety aspects for underground cables;
- Clause 5.5.1.4, 5.5.1.5 and 5.5.1.6 regarding clearances of aerial service cables; and
- Clause 8.9 regarding installation of high voltage conductors.

2.1.2 Compliance with Regulations

Every new installation or addition to an installation to be connected to the DistCo's mains shall comply with the current edition of the Wiring Regulations and with these Rules.

Note: Attention is directed to Section E of the Introductory Information regarding the necessity for employing a licensed person.

2.1.3 Submission of Notices

The LEM in charge of carrying out electrical installation work shall submit notification of such work on an approved pro-forma, as required by the current Wiring Regulations.

Further to the above, additional information required by the DistCo shall be included on the notices and, a copy is to be provided to the customer as required by these rules.

In general, notices shall be submitted to the DistCo unless otherwise agreed to by the Responsible Officer in a specific instance.

Notices from the current Electrical Installation Work Notice Book shall be submitted as follows:

- **To the Distribution Companies**

Within 48 hours of the commencement of work, a separately completed Notice of Installation Work (NIW) and within 48 hours of the completion of work, a separately completed Notice of Completion of Electrical Work (NOC) shall be provided by the LEM in charge, to the DistCo for:

  - each new single installation;
  - each new separately metered portion of a multiple installation;
  - mains and submains of a new multiple installation;
  - alterations and/or additions to any installation;
  - repairs carried out requiring DistCo involvement or were subject to the issue of a defect notice.

- **To the Customer**

Within 48 hours of the completion of work, a separately completed Customer's Copy of the NOC shall be provided by the LEM in charge to the Customer.

2.1.4 Testing

The LEM in charge of carrying out electrical installation work shall perform all necessary tests and ensure that the work complies with the requirements of the Wiring Regulations.

Note: Reference may be made to AS 3017 - Electrical Installations - Testing Guidelines.

2.1.5 Polarity Testing

Where supply is available, tests should be carried out to:

- prove correct supply polarity, and
- prove neutral conductors are connected to the supply neutral at all points

Refer Appendix C for a suitable guide for carrying out polarity testing for supply to installations.

2.2 Inspection of Installation

2.2.1 General

Any inspection by a DistCo in accordance with the provisions of the Wiring Regulations of the installation or portion of the installation is limited in its scope, hence neither the inspection nor the connection of the installation to supply shall be deemed as giving assurance of compliance with the Wiring Regulations or these Rules and no certificate of inspection or compliance will be issued by the DistCo.

Furthermore, the inspection and connection shall not be regarded as implying compliance with any specification, nor in any way as giving an assurance of quality.

If inspection or testing shows that the installation does not comply with the Wiring Regulations or these Rules, the DistCo may refuse to supply, or may disconnect, the whole or any portion of the installation.

2.2.2 Re-inspection

A DistCo, before carrying out a re-inspection of an installation to which supply has been refused or defective portions of the installation have been disconnected in accordance with the provisions of the Wiring Regulations or these Rules, may require that the REC / LEM provide notification in writing that the defective portions of the installation have been rectified.

In general, the notification should be forwarded to the DistCo but in special circumstances, providing advice is given to the DistCo by telephone, the Responsible Officer may allow the notice to be left attached to the main switchboard of the installation.

2.3 Voltage Drop

The voltage drop from the Consumer's Terminals to any point on the installation shall be calculated in accordance with the requirements of the Wiring Regulations.

Where an installation is supplied directly from a DistCo transformer installed on the property, application may be made to the Chief Electrical Inspector in accordance with the provisions of Regulation 7 of the Wiring Regulations to increase the allowable voltage drop.

In most cases the DistCo would support an increase in voltage drop to at least 7%.

Note: Attention is drawn to Clause 5.3.2 regarding minimum loading of Consumer's Mains.

2.4 Earthing

2.4.1 General

In general, all installations required to be earthed shall conform to the requirements for the Multiple Earthed Neutral (MEN) System of Earthing as detailed in the Wiring Rules, however, in some remote rural areas the Direct Earthing System is employed.

Any existing installation which is required to be earthed, but is not earthed by the MEN system shall be converted to this system when any addition or alteration is being carried out on an installation, except where the Direct Earthing System has been specified by the DistCo and approved by the Chief Electrical Inspector.

2.4.2 Multiple Installations

In multiple occupancy installations, the MEN connection to the incoming neutral conductor shall be located in a section of the switchboard enclosure which is common to all separately metered occupants associated with that connection. The enclosure and connection shall be clearly and permanently marked "MEN CONNECTION".

2.4.3 Connection of Active Conductors to Earth

No active conductor in an installation shall be connected to earth with the exception of a suitable radio interference suppressor installed in accordance with the Wiring Rules or an acceptable surge diverter.

2.5 Power Factor

Unless otherwise agreed with the DistCo, a customer must, at all times, keep the Power Factor of the electrical installation within the relevant range set out in Table 2.1.

Table 2.1

Supply Voltage (kV)	Power Factor range for Customer Maximum Demand and Voltage					
	Up to 100kVA		Over 100 kVA - 2 MVA		Over 2 MVA	
	Minimum Lagging	Minimum Leading	Minimum Lagging	Minimum Leading	Minimum Lagging	Minimum Leading
< 6.6	0.75	0.8	0.8	0.8	0.85	0.85

If the Power Factor of an electrical installation falls outside the relevant range set out in Table 2.1, the customer must, on receipt of a notice from the DistCo requiring it to do so, restore the Power Factor of the electrical installation within the relevant range.

If the Power Factor remains outside the limits, the DistCo reserves the right, in its discretion, to require the Franchise Customer to pay a regular charge for the provision of supply of reactive power above the Power Factor limits.

Refer to the *"Distribution Code"* and *"Supply and Sale Code"* for further details regarding Power Factor and voltages from 6.6 kV - 66 kV and for electrical installations of Franchise Customers which were installed prior to 3 October 1994.

2.6 Interference with Supply to Other Customers

2.6.1 General

If, in the opinion of the DistCo, a person should use or deal with electricity supplied in such a manner as to cause undue interference with the supply to other customers or to any third party, the DistCo may direct the customer to take corrective action and, in the event of failure to comply with such directions, the DistCo may discontinue the supply of electricity to the premises. The fact that the DistCo may have permitted connection of the apparatus or equipment causing the interference shall not exempt the customer from the application of this Clause.

2.6.2 Equipment Requiring Special Consideration

The DistCo may refuse to permit or apply conditions for the connection of equipment in the following categories if it considers that by such connection, the supply to other customers would be adversely affected -

(a) Equipment which would cause excessive fluctuation of voltage on the DistCo's system as a result of its large or fluctuating demand, e.g. arc furnaces, welding machines, X-ray units, frequently-started large motors, etc.

(b) Equipment which would cause excessive distortion of the wave shape of the DistCo's system voltage, e.g. rectifiers, frequency converters, load control devices using thyristors or saturable reactors, etc.

No expense should be incurred by any customer or prospective customer until preliminary application has been made to the DistCo and advice has been received that the supply will be given and upon what terms and conditions it will be given.

Notes:

- The Distribution Code lists specific requirements for negative sequence voltage, harmonic voltage levels, disturbing loads, current harmonics and inductive interference.
- Further information regarding general limits may be obtained from Australian Standard 2279, "Disturbances in Mains Supply Networks", however, in the case of item (b) above, individual customers are limited to one third of the general limit.
- Refer to Appendix D for Quality of Supply information.

2.6.3 Rectifiers

Alternating to direct current rectifying equipment shall not be connected to the DistCo's system unless-

(a) the rectifier is of the full-wave type; or

(b) a double-wound transformer is interposed between the rectifier and the supply system; or

(c) the rectifier is used in conjunction with an electrical measuring instrument or in similar applications where the rectified current does not exceed 100 milli amperes.

2.6.4 Switching of Apparatus

Individually switched loads rated in excess of the value specified below shall not be connected between an active and the neutral conductor unless the approval of the Responsible Officer has first been obtained. Particular attention should be paid to Section C of the Introductory Information and Clause 2.6.1.

- Single Phase 480/240 Volt areas of supply - 20 Amperes
- Three Phase 415/240 Volt areas of supply - 25 Amperes

2.7 Starting Current of Motors

2.7.1 General

The current taken by a motor of a type mentioned in this Clause under the conditions of starting shall not exceed the values in Table 2.2 and Table 2.3 when measured by the methods outlined in Clause 2.7.2.

2.7.1.1 Three Phase Motors 415 Volts

Table 2.2

MOTOR SIZE	ALLOWABLE CURRENT - I
not exceeding 1.5 kW	I = 26 Amperes
exceeding 1.5 kW, but not exceeding 3.75 kW	I = (kW x 17.5) Amperes
exceeding 3.75 kW	(a) I = (kW x 3.5) + 53 Amperes, or
	(b) I= total kW of motors installed x 1.1 Amperes, or
	(c) I = the starting current of the largest of the other motors installed calculated in accordance with sub-clause (a), whichever is the greatest.

The kW output of motors installed refers to the motors connected to the particular installation from which the proposed motor is to be supplied and includes the proposed motor, provided that no limitation need be placed on the starting current of any three phase motor which is not frequently started and the rating of which does not exceed 10 per cent of the total motor load installed.

In installations which are supplied directly from a substation or where special supply conditions exist, starting currents in excess of those set out in (b) and (c) above may be permitted if permission has been obtained from the Responsible Officer.

2.7.1.2 Single Phase Motors

Table 2.3

MOTOR VOLTAGE	MOTOR SIZE	ALLOWABLE CURRENT - I
240 Volts	all sizes	I = 45 Amperes
480 Volts	not exceeding 1.5 kW	I = 45 Amperes
	exceeding 1.5 kW, but not exceeding 3.75 kW	I = (kW x 9.5) + 26 Amperes
	exceeding 3.75 kW, but not exceeding 30 kW	I = (kW x 6.5) + 35 Amperes
	exceeding 30 kW	I = (kW x 7.4) + 15 Amperes

2.7.2 Test Method of Measurement of Motor Starting Current

The starting currents of alternating current motors shall be determined by either of the following methods -

(a) **Fall in Voltage Method**

The starting current shall not cause a fall in voltage of more than 5 per cent for more than 0.02 seconds when connected to a typical 415/240 volt, three phase, 50 Hz supply having a supply system impedance of -

- 0.2 + j 0.2 ohms (phase-neutral)
- 0.1 + j 0.1 ohms (line impedance per phase)

The fall in voltage shall be determined by the oscillographic method or any other method considered appropriate by the DistCo.

(b) Current Measurement Method

The starting current may be determined by the locked rotor method with low voltage, 50 Hz, as appropriate, applied to the terminals of the motor. In the case of motors having rotors which cannot readily be locked, the current may be measured with a back-stopped ammeter or by other methods approved by the DistCo.

Charges and Tariffs

3

Section 3 Contents

3.1 Agreement to Pay Charges

Where the customer is required to pay a charge for work carried out by the DistCo, the customer shall, if requested, sign an agreement in a form acceptable to the DistCo, before the work is commenced.

The customer may be required to pay in advance of the commencement of works.

A copy of the Approved Charges is available from DistCo offices on request.

Note: Attention is drawn to Sections B and C of the Introductory Information regarding tariffs for supply of electricity and warning against premature expenditure by a customer.

3.2 Charges Applicable

In general, the customer will be required to pay, in accordance with the Approved Charges as determined by the DistCo in respect of the provision of service and/or metering equipment in certain circumstances. Some examples of these charges are as follows, where –

- connection of supply is provided;
- alterations involving the existing service or metering equipment are requested;
- the service or metering equipment is considered by the DistCo to be special or additional;
- the DistCo provides a service protection device in accordance with Clause 5.2;
- an underground service cable is installed within the customer's premises;
- work is requested to be performed outside normal hours; and
- where the customer fails to complete essential preparations or causes excessive delay after arrival of a service truck.

Charges for DistCo work are the responsibility of the person requesting the work, unless alternative arrangements are made.

The customer shall pay all costs involved in any alteration to the supply arrangements which may be required as a result of failure of the customer to comply with these Rules and the conditions under which the supply is made available.

3.3 Load Control Equipment

3.3.1 Prescribed Hours Tariffs (eg. Off Peak Storage – Water or Space Heating)

Where, in accordance with the provisions of a tariff published by the DistCo, electricity is to be supplied only during certain hours, the DistCo will normally provide and install a 1 Pole 240 Volt control device having a rating up to 30 Amperes. Refer to Figures in Section 6 for wiring diagrams.

Where the controlled load exceeds the capacity of the control device, the customer shall supply and install a suitable contactor installed in accordance with the Wiring Regulations and in a position approved by the Responsible Officer. The contactor will be operated by the DistCo's control device. Refer to Figure 6.20 and / or 6.21 for the appropriate prescribed hours load control wiring diagram.

Unless otherwise approved, booster circuits supplied from the off-peak meter are restricted to water heaters used solely for household drinking or washing purposes.

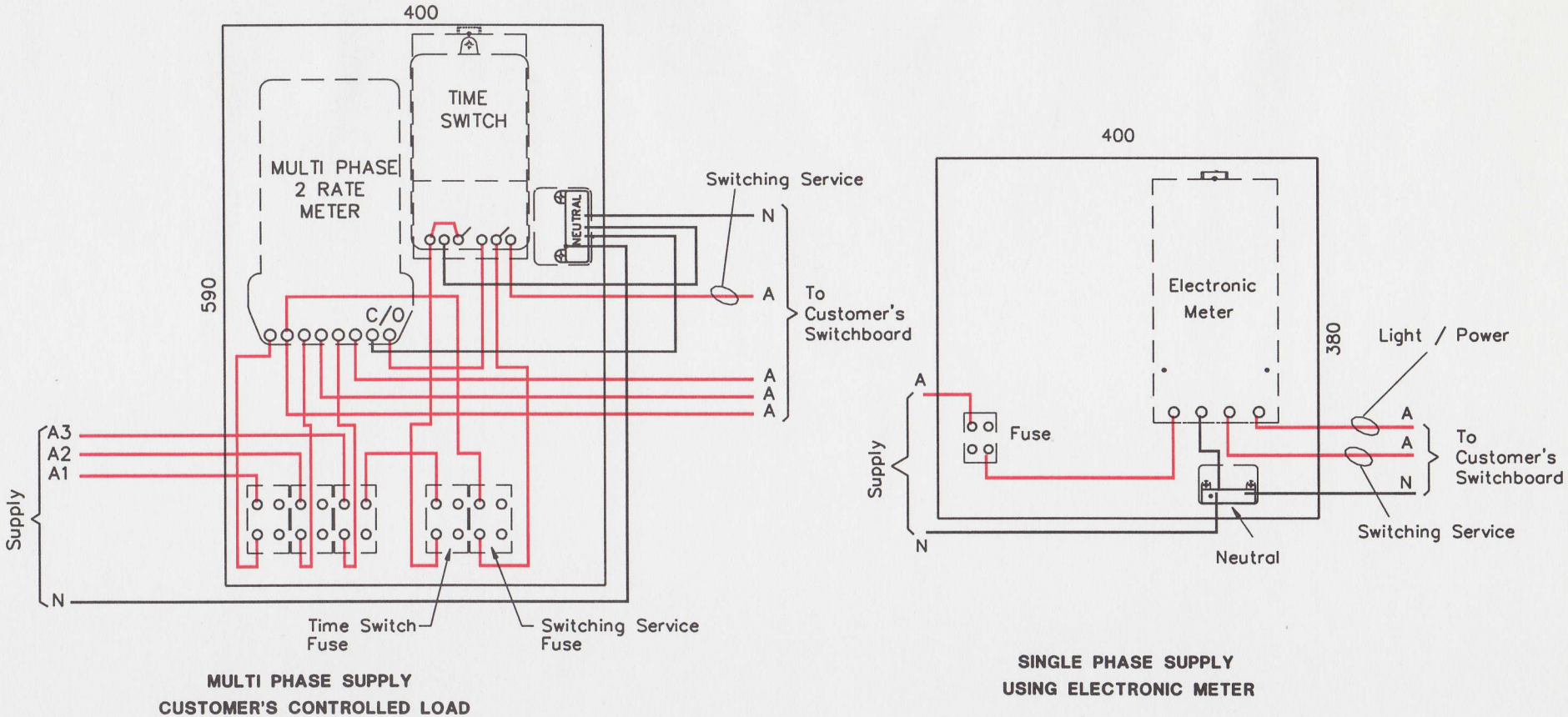
3.3.2 Time-Of-Use (L.V.) Energy Tariffs

A Time-of-Use Energy tariff is where electricity is supplied continuously at different prices during certain hours in accordance with an approved tariff.

The DistCo may in some situations, be able to provide and install at the customer's request and expense, a 1 pole, 240 Volt control device called a "Switching Service", having a rating up to 30 Amperes for control of the customer's apparatus. Refer to the Responsible Officer for details regarding a "Switching Service". (refer Figure 3.1)

3.3.3 Demand Tariffs

Time and energy pulses for the control of Energy Management Systems may be available on a chargeable basis to customers taking supply under a maximum or contract demand type tariff. Customers will be advised of specific services available and the costs involved on request to the DistCo.



MULTI PHASE SUPPLY
CUSTOMER'S CONTROLLED LOAD

SINGLE PHASE SUPPLY
USING ELECTRONIC METER

Notes

1. Meter panel fuses are not required for an overhead supply.
2. All Time switch wiring and metering neutrals to a minimum of 4 mm^2
3. Time Switch and Switching Service fuses are required for all installations other than domestic.
4. Maximum load of time switch contacts 30A.
   For switching loads exceeding 30A refer Fig. 6.21.

Figure 3.1 Typical Arrangement for Customer's Switching Service

Supply Arrangements

4

Section 4 Contents

Section 4 Contents

4.1 System of Supply

The electricity supplied throughout Victoria is in the form of alternating current of approximately sinusoidal waveform at a frequency of 50 Hz. Short term frequency excursions may occur. The nominal supply voltage is 415/240 V from a 3-phase 4-wire system. In some rural areas, the supply may be a single phase 240 V 2-wire or 480/240 V 3-wire system. Supply may also be available at high voltage.

The DistCo may superimpose control signals on the normal supply voltage.

Note: The DistCo endeavours to maintain the voltage at the Point of Supply in accordance with the Distribution Code. Customers should install any equipment necessary to protect apparatus sensitive to voltage variation, transients or loss of one or more phases of supply.

Refer to Appendix D for Quality of Supply information.

Refer to Section 8 for information pertaining to Customer's High Voltage Installations

4.2 Supply System Earthing

The neutral conductor of the low voltage supply system is solidly earthed. Unless otherwise advised, the Multiple Earthed Neutral (MEN) system is used.

4.3 Prospective Fault Current

The customer shall provide protective devices having an interrupting capacity adequate for the prospective short circuit current at the customer's main switchboard or at any other point within the installation as required by the Wiring Regulations.

To meet the requirements of the Wiring Regulations, the installation must be designed to withstand, without damage, the maximum currents which may occur under fault conditions such as a short circuit.

The prospective short circuit current varies throughout the distribution system.

Where supply is provided in a residential underground reticulated distribution mains area, the prospective fault current at the consumers terminals shall be deemed to be 3000 amperes single phase and 6000 amperes three phase symmetrical.

In other locations, the magnitude of the prospective fault current that is available at the consumers terminals may be obtained, upon written request, from the DistCo.

Note: Protective devices controlling outgoing circuits on the customer's main switchboard shall be so selected and arranged that they will interrupt the fault current rapidly enough to avoid, as far as practicable, loss of mains supply.

4.4 Number of Supplies

4.4.1 General

For the purposes of this Clause "a supply" means the establishment of a Point of Supply as detailed in Clause 1.6.

The DistCo, under normal conditions, will provide only one supply to each property. However, where it would not be necessary for the DistCo to carry out augmentation works

solely to provide for an additional supply, more than one supply may be provided to a property in the following circumstances -

(a) separate supply may be given to separate individual structures for different customers on the one property under the arrangement for dual occupancy or if each structure and/or vacant lot has a direct frontage and access to a public road or a DistCo easement; or

(b) subject to the approval of the Responsible Officer, where the magnitude of the customers' load and/or the distance separating the relevant electrical installations, having regard to the type of customer's activities and site conditions, is such that it would be sound engineering practice to provide more than one supply.

The provision in (a) above caters for a multi-unit development where the lots all front to a public road or for free standing buildings on separate allotments abutting a public road.

Typical arrangements for number of supplies are shown in Figure 4.1.

In other exceptional circumstances, as determined by engineering considerations, the Chief Executive Officer (CEO)/Managing Director (MD) may agree to a customer's written request for the provision of a special or additional supply.

The customer may be required to pay the cost involved in providing an additional supply. Before commencement of work, the DistCo must be consulted regarding costs associated with the supply of electricity.

Note: No 'service cable' will be provided where a substation is located on the customer's property as the customer is responsible for all wiring from the substation terminals. See Clause 1.6 - "Point of Supply".

4.4.2 Segregation of Supplies

Where, in accordance with the provisions of Clause 4.4.1, more than one supply is provided, each shall connect a separate and clearly defined portion of the premises without intermixture or electrical interconnection of the portions (either directly or by changeover facilities) unless otherwise approved by the Chief Electrical Inspector, Victoria. Unless the additional supply is provided for the connection of specific equipment, the whole of the installation in any defined portion of the premises shall be connected to the same supply.

The following would be deemed to constitute clearly defined portions of a premises -

- Separate individual structures; or
- Within one structure where clear lines of separation of the portions are readily identifiable by a permanent and legible map which clearly indicates the defined portions of the premises, installed adjacent to each main switchboard. Any such map shall be kept current at all times by the building proprietor.

In addition, where more than one supply is provided to any one building or structure, a prominent notice shall be provided at each set of Consumer's Terminals and main switchboard to indicate the presence and location of other supplies. A label shall also be affixed to each distribution board to indicate the main switchboard from which it is supplied.

The provisions of this Clause need not apply where facilities for the remote control of all main switches are installed to enable opening of every main switch from a single location or, alternatively, from each main switchboard

4.5 Number of Installations per Supply

Where more than one set of Consumer's Terminals (i.e. circuit connection to the DistCo's distribution system) is established to provide supply to -

(a) A number of different occupancies; each set of Consumer's Terminals shall be deemed to provide supply to a separate installation and the provisions of Clause 4.4.2 shall apply.

(b) A single occupancy; such an arrangement is deemed to constitute a single installation.

In addition, where arrangements are made to the satisfaction of the Responsible Officer, two sets of Consumer's Terminals may be established for the following situations –

- A substation on a customer's rural property.
- A customer's dedicated underground supply connection pit or pillar.
- Where two occupancies are located within land locked areas, the perimeter of the building is the property boundary and the main switchboard cannot be located in an area accessible to both occupiers.

Where two sets of consumer's terminals for individual occupancies are established at a single point, and each occupancy is deemed to be a separate installation, the requirements relating to individual consumer's mains supplying one occupancy passing through another occupancy are as follows:-

- **Where consumer's mains associated with one installation pass through a separate occupancy, the section of consumer's mains within that occupancy shall be clearly and permanently identified, by means of marking or attached labels, at intervals not exceeding 2.0 m and the main switchboard of any occupancy through which the cables pass shall be clearly marked to indicate that such consumer's mains are not controlled from that switchboard.**
- **Where the installation is, or may be, subject to subdivision other arrangements may be necessary and the DistCo must be contacted.**

4.6 Sources of Alternative Supply

4.6.1 General

Where the customer installs an alternative source of supply, whether temporary or permanent, such as a standby emergency generator or an uninterruptible power supply, facilities for connection of the alternative source to the electrical installation normally supplied from the DistCo's system shall not be installed unless the proposed arrangements have been agreed to by the Responsible Officer.

Where the system is to operate automatically, a schematic diagram shall be submitted to the Responsible Officer for approval.

4.6.2 Connection of Installation to Alternative Supply Sources

Where the Responsible Officer agrees to the installation of facilities to enable an installation to be disconnected from the DistCo's supply system and connected to a private alternative source, such facilities shall be arranged either directly or by suitable interlocking procedures so that the DistCo's system, service, and metering equipment cannot be energised from such alternative source (refer Figure 4.2).

The interlocking system shall be effective with any associated switchgear door or cover in the open position. A prominent notice shall be fixed on the main switchboard to show that such facilities exist, which sections of the installation they can supply and their point of control.

In addition, if the alternative supply automatically comes into operation on the loss of mains supply, a means of isolating the alternative supply from the DistCo equipment shall be provided on the installation main switchboard or Distribution Switchboard to which the alternative supply is connected.

Where the generator is directly connected under emergency conditions, the interlocking arrangement may be achieved by creating a physical break which requires other than normal operational means to restore.

In general the neutral shall not be switched or broken on the distribution supply side of the M.E.N. connection. Refer also to AS 3010 "Electrical Installations - Supply by Generating Set".

4.6.3 Parallel Generation

Specific technical requirements apply in respect of any proposal to incorporate parallel generation, including 'Co-generation', facilities within an installation. It is therefore essential that the DistCo be formally consulted before any commitment to proceed is made.

4.7 DistCo Substation on Customer's Premises

4.7.1 Accommodation

A customer who, in respect of an electrical installation, has a determined maximum demand over 100 kVA must, if the DistCo is unable to supply or continue to supply that maximum demand without installing a new substation, arrange the sale or lease to the DistCo the land upon which a new substation can be installed by the DistCo in order to allow the DistCo to satisfy that maximum demand.

If, in the opinion of the Responsible Officer, a substation on the premises is necessary to provide new or additional supply, the requirements will be set out with the offer of specific conditions of supply. These conditions will include the following -

(a) For pole-mounted type substations, an easement agreement for the supply line will be required. For other substations, the customer shall provide or arrange with the registered proprietor, a lease agreement and easements in favour of the DistCo for adequate space in the premises to accommodate the substation equipment and the supply mains to and from the substation.

(b) A plan to the satisfaction of the DistCo defining the leased area and the easements for access and the ingress and egress of overhead or underground lines shall be prepared by the customer's surveyor.

(c) The customer shall provide any necessary building or enclosure to the satisfaction of the DistCo and provide and maintain suitable arrangements for vehicular access to the substation on a 24 hour basis.

To assist a customer in the planning of an indoor substation, reference should be made to the publication "Specification for Indoor Substation on Customer's Property".

The DistCo has the right to use all substation equipment and to install additional equipment for the purpose of supplying other premises subject to the existing agreed requirements of the customer on whose property the substation is located first being met.

4.7.2 Extension of High Voltage Mains

The DistCo will, subject to the prevailing terms and conditions for extension of the DistCo's system, provide, install and maintain the high voltage mains necessary to connect DistCo's substations on customer's premises abutting the property boundary at a location agreed to by the DistCo. Should the customer require a substation to be located in such a position as to require the extension of the DistCo's high voltage mains within the property and the DistCo agrees to such extension, the customer may be required to meet the costs involved.

4.8 Type of Supply and Conductor Loading

4.8.1 Determination of Number of Phases of Low Voltage Supply

4.8.1.1 Three Phase 415/240 Volt Areas

Individually metered installations having a calculated maximum demand current not exceeding 80 Amperes will normally be given a two-wire supply.

For individually metered installations having a calculated maximum demand current exceeding 80 Amperes, the provision of a two-wire, three-wire or four-wire supply shall be determined by the Responsible Officer.

4.8.1.2 Single Phase 480/240 Volt Areas

The provision of two-wire or three-wire supply shall be determined by the Responsible Officer.

4.8.2 Balancing of Load and Limitation of the Loading of Apparatus

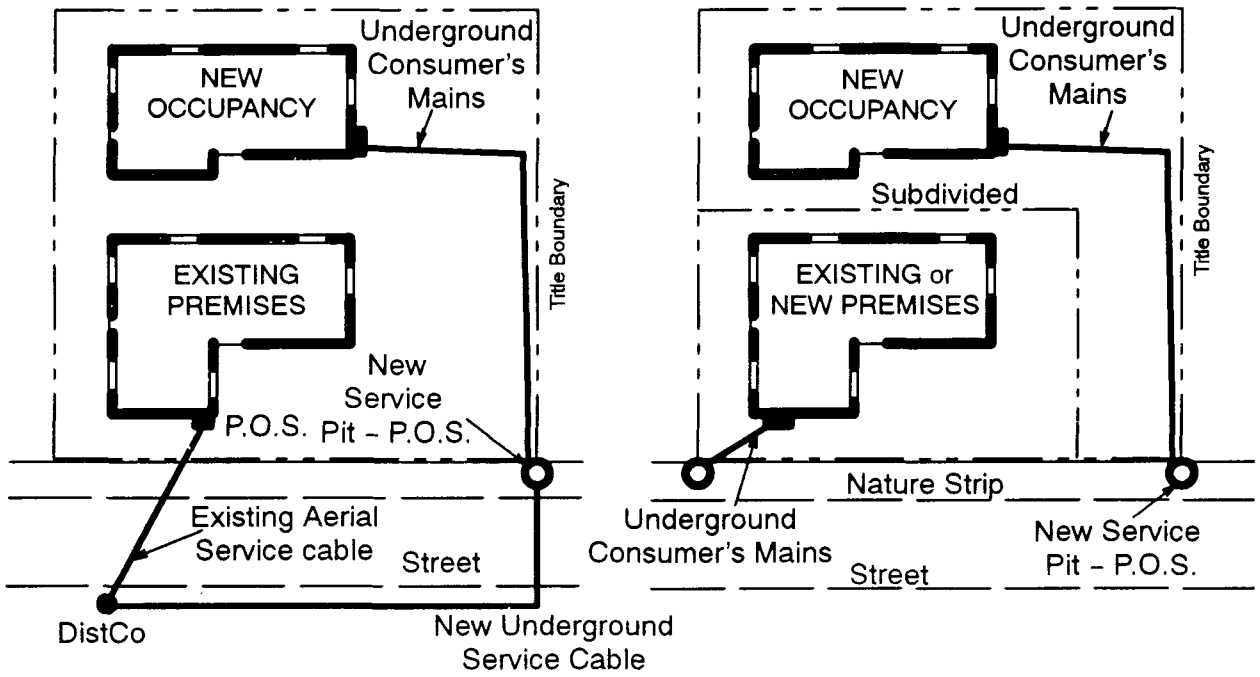
Where a three-wire or four-wire supply is given the load shall be divided as evenly as practicable between the active conductors.

Where an installation is supplied by an aerial or underground service cable having more than one active conductor, the load shall be so arranged that the current in any active supply conductor shall not exceed the current in any other active supply conductor by more than 25 Amperes or 10% whichever is the greater.

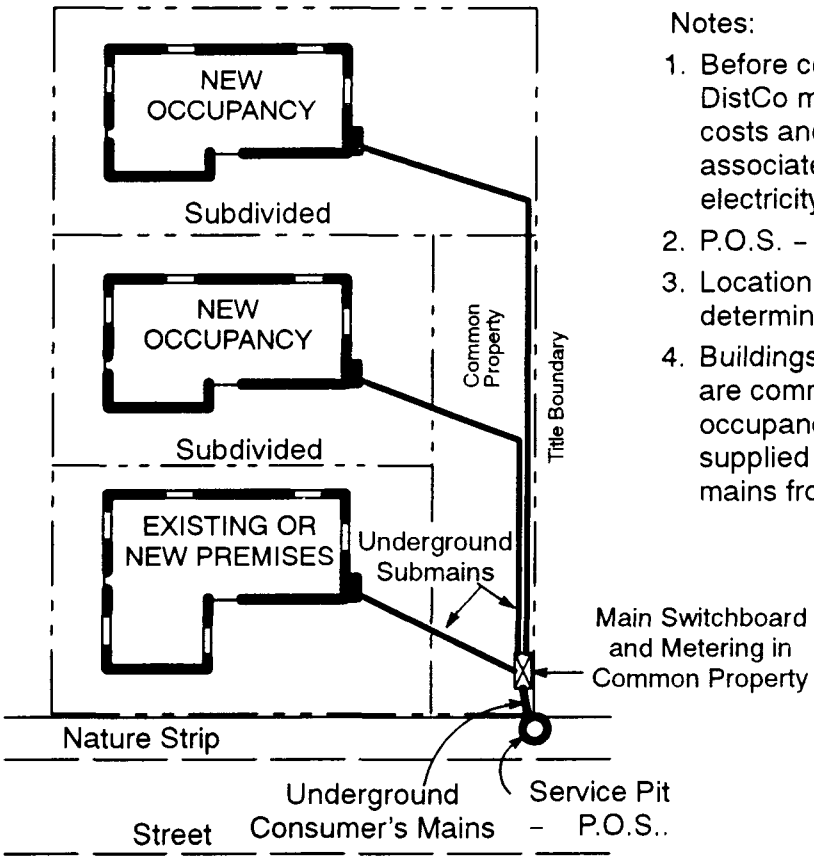
Where the actual load is not known, the arrangement of the load may be determined on the basis of a Calculated Maximum Demand as set out in the Wiring Regulations.

To facilitate balancing, apparatus incorporating a 240 Volt loading should generally be provided with one active terminal for a load up to 25 Amperes and two active terminals suitable for connection to different phases where the total load exceeds 25 Amperes but does not exceed 50 Amperes. Where three active terminals are provided, the components of loading should be arranged so that the loading on any terminal does not normally exceed that on any other terminal by more than 25 Amperes.

See also Clause 2.6 regarding interference with supply to other customers, including limitation of switching of apparatus, and Clause 2.7 regarding limitation of the starting current of motors.



TYPICAL ARRANGEMENTS FOR TWO LOT SUBDIVISION OR DUAL OCCUPANCY WITH POTENTIAL FOR SUBDIVISION.



TYPICAL ARRANGEMENTS FOR MULTIPLE OCCUPANCY SUBDIVISION

Notes:

1. Before commencement of work the DistCo must be consulted regarding costs and supply arrangements associated with the supply of electricity.
2. P.O.S. - Point of Supply
3. Location of service pit to be determined by the DistCo.
4. Buildings on "battleaxe" lots which are commonly created for dual occupancy subdivision shall be supplied by underground consumer's mains from the Point of Supply.

Figure 4.1 Typical Arrangements for a Number of Supplies

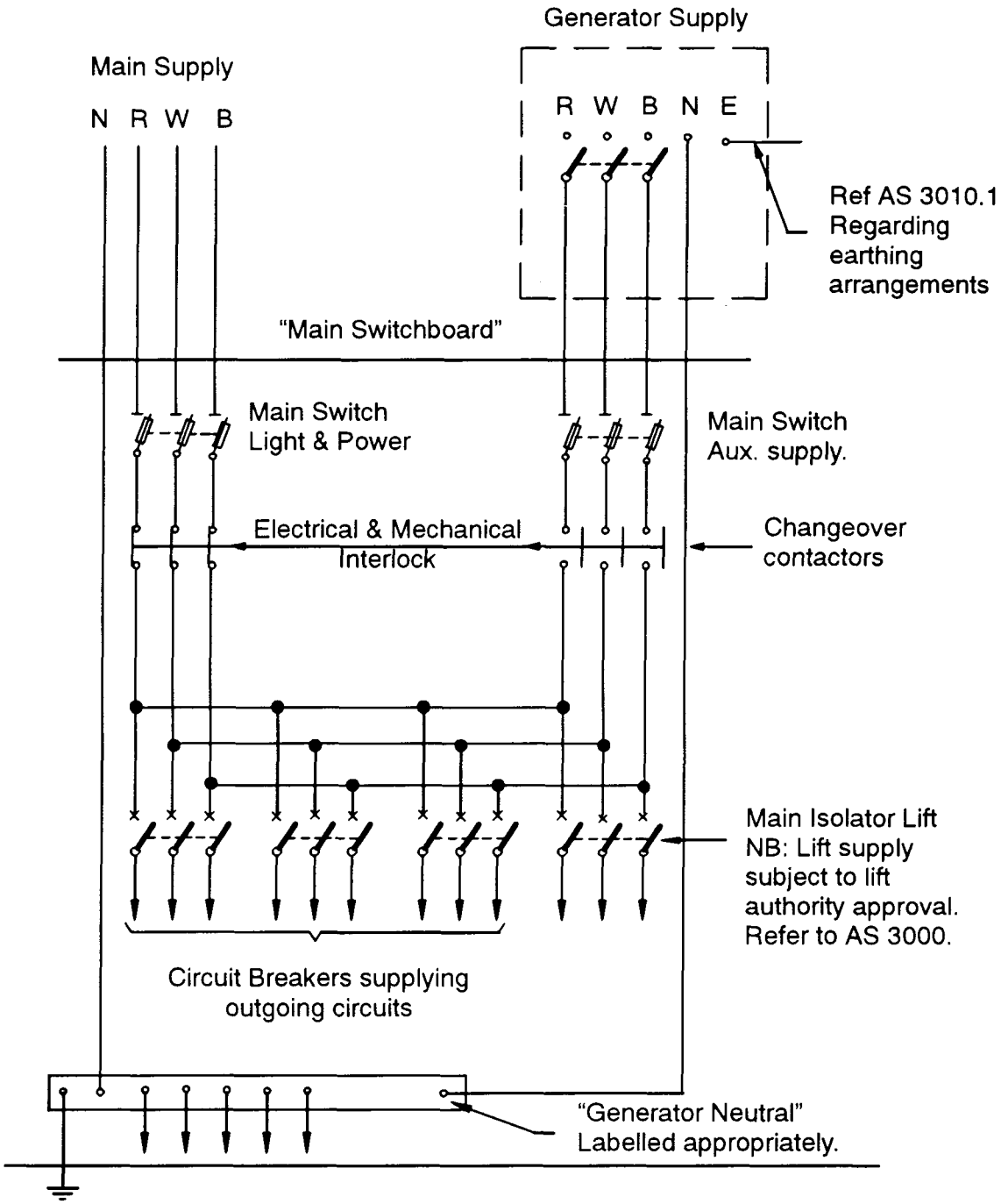


Figure 4.2 Alternative Supply Arrangements (Example Shown)

4.9 Temporary Supplies

4.9.1 General

Where it is not necessary to extend or augment the permanent street mains to make supply available the DistCo. may, subject to the payment of relevant charges, provide a temporary supply in situations where supply to an installation is requested for a limited period. Refer to Approved Charges.

Where it is necessary to extend or augment the permanent street mains to make supply available, the terms and conditions of supply will be subject to negotiation upon receipt of a written request for supply.

The customer should ascertain that a temporary supply could be made available, and of the conditions which would apply before commencement of any works. The DistCo cannot provide a temporary supply unless it is able to energise all the associated DistCo underground or overhead lines.

Where a temporary supply is provided for constructional purposes, it will be disconnected at the time of installation of the permanent service equipment at the premises unless prior arrangements have been made by the temporary supply customer for the retention of such supply and any relevant additional charge paid.

Note: Attention is directed to AS 3012, Electrical Installations- Construction and Demolition Sites. In general, final subcircuits of temporary supplies shall be protected by residual current devices (RCDs).

4.9.2 Temporary Supply Arrangements

4.9.2.1 Customer's Installation

The customer shall arrange for the supply and installation of an approved meter box, meter panel and, when required, an approved pole. Arrangements shown in Figures 4.3, 4.4, 4.5, 4.6 and 4.7 shall be deemed suitable. Construction of all new meter boxes and switchboard enclosures shall comply with the requirements of Figure 4.6. A service fuse as shown in Figure 4.6 shall be provided where supply is underground.

The electrical installation shall be installed in accordance with the Wiring Regulations and adequate protection shall be provided, especially on construction sites, to prevent damage to the DistCo's metering equipment.

Note: Builder's supply poles built prior to the introduction of these Rules and which complied with the previous requirements are acceptable for use, provided they are suitably maintained. It is anticipated that over a period of time, meter boxes complying with previous requirements will be phased out.

4.9.2.2 Method of Supply

In a Category 1 (urban non-fire hazardous) area as detailed in Appendix A the DistCo. will provide either -

- an aerial service cable to a point up to 20 m inside the property boundary and not further than 45 m from the DistCo pole outside the property (Refer also to Clause 5.5.1); or
- an underground service cable to the property boundary.

In a Category 2 (rural or fire hazardous) area as detailed in Appendix A, and in any case where the street mains are underground, the method of supply under normal conditions shall be by underground service cable to the property boundary.

Where an underground service cable is installed, the customer shall arrange for the supply and installation of the Underground Consumer's Mains in accordance with Clause 5.3.

Use of the permanent consumer's mains to supply the temporary installation is acceptable.

In special circumstances, such as where an Underground Service Cable is not installed, the Responsible Officer may approve the use of an aerial service cable in a Category 2 area for a limited period. Unless otherwise agreed by the Responsible Officer this period shall not exceed 12 months.

4.9.2.3 Buildings in Course of Erection

Where a temporary electricity supply is required for constructional purposes, supply may be given when the permanent consumer's mains and metering facilities are installed in their permanent position. The portion of the installation to be connected must be complete and comply with the requirements of the Wiring Regulations and the installation notes on Figure 4.7. Typical arrangements are also shown in Figure 4.7

In such cases an Approved Charge for a Partial Supply in Permanent Position may apply. An Approved Charge may apply to any alterations involving servicing and metering following initial connection.

The customer shall advise the DistCo when the supply is no longer required for constructional purposes to enable adjustment of tariff if necessary.

Note: In accordance with the Wiring Regulations, a separate Notice of Completion of Electrical Wiring Work is required to be submitted upon completion of the permanent installation.

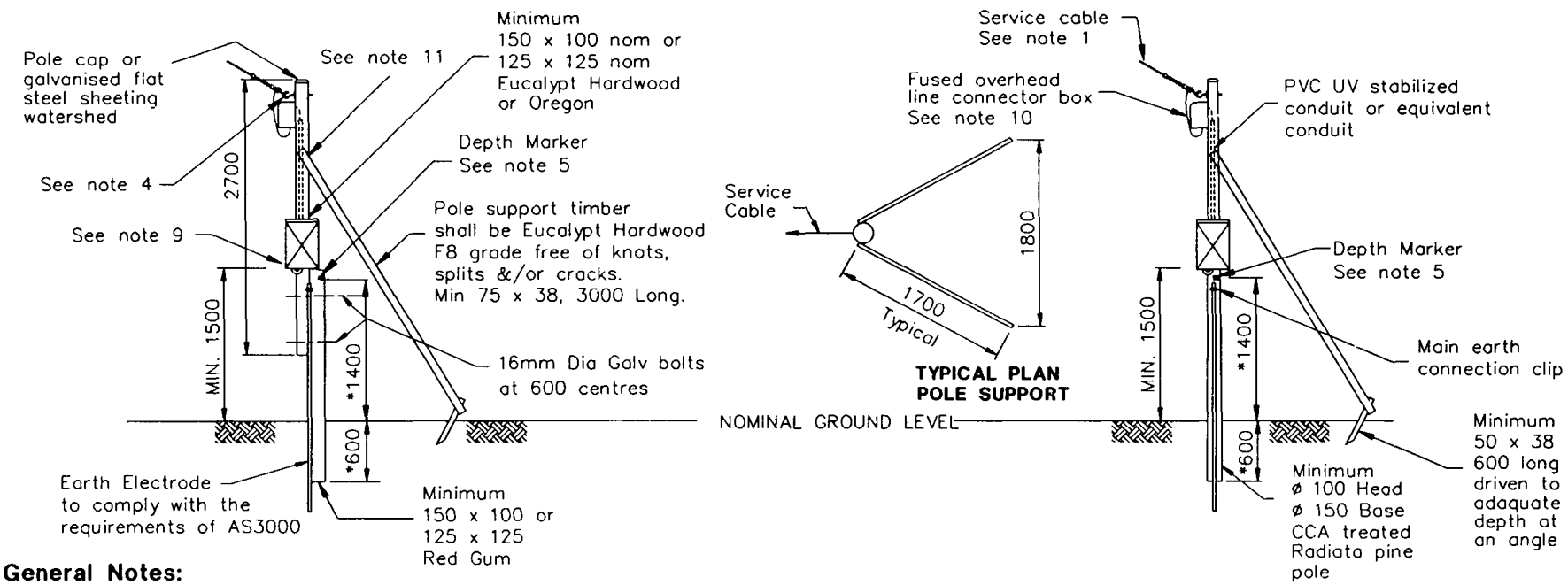
4.10 Public Thoroughfares

Prior to commencement of an electrical installation on Crown land (or road reserves) the customer shall apply to the relevant governing authority administering the land and the DistCo for approval and applicable conditions.

Where, in special circumstances such as a mobile library, television supply or the like, the Responsible Officer approves a temporary supply provided to a box on a DistCo distribution pole, the installation shall be carried out in accordance with Clause 6.2.5 and the "Code of Engineering Practice for Shared Use of Poles" as appropriate.

The customer shall provide any service protective device required and all necessary materials for connection by the DistCo.

Note: Reference shall be made to the Responsible Officer for installations attached to Tramway Poles.



General Notes:

1. Pole should be positioned to ensure service clearances as set out in Fig. 5.14.
2. These installations are also acceptable for underground distribution provided they are installed in accordance with Figures 4.5 & 4.6 as appropriate.
3. All timber to be well seasoned and of select grade.
4. An approved service bracket shall be provided and installed by customer at a minimum height of 3000mm.
5. A depth marker consisting of a saw cut (minimum length of 100mm) filled by a row of at least three galvanised nails shall be made on the pole at a distance of 2000mm from the base of the pole.
6. Supply will be connected to a pole erected at a new site only after a 'Notice of Completion' has been submitted in accordance with the Wiring Regulations.
7. The electrical installation shall comply with the Wiring Regulations.
8. Excavated soil MUST be compacted around pole in 100mm layers and thoroughly tamped.
9. Main switch to be no higher than 2000mm.
10. The FOLCB must be located and installed on the pole in a manner which enables the easy insertion or removal of the service fuse.
11. Pole supports to be securely attached to pole and pegs using a minimum of 2 – 75mm nails at each fixing point.

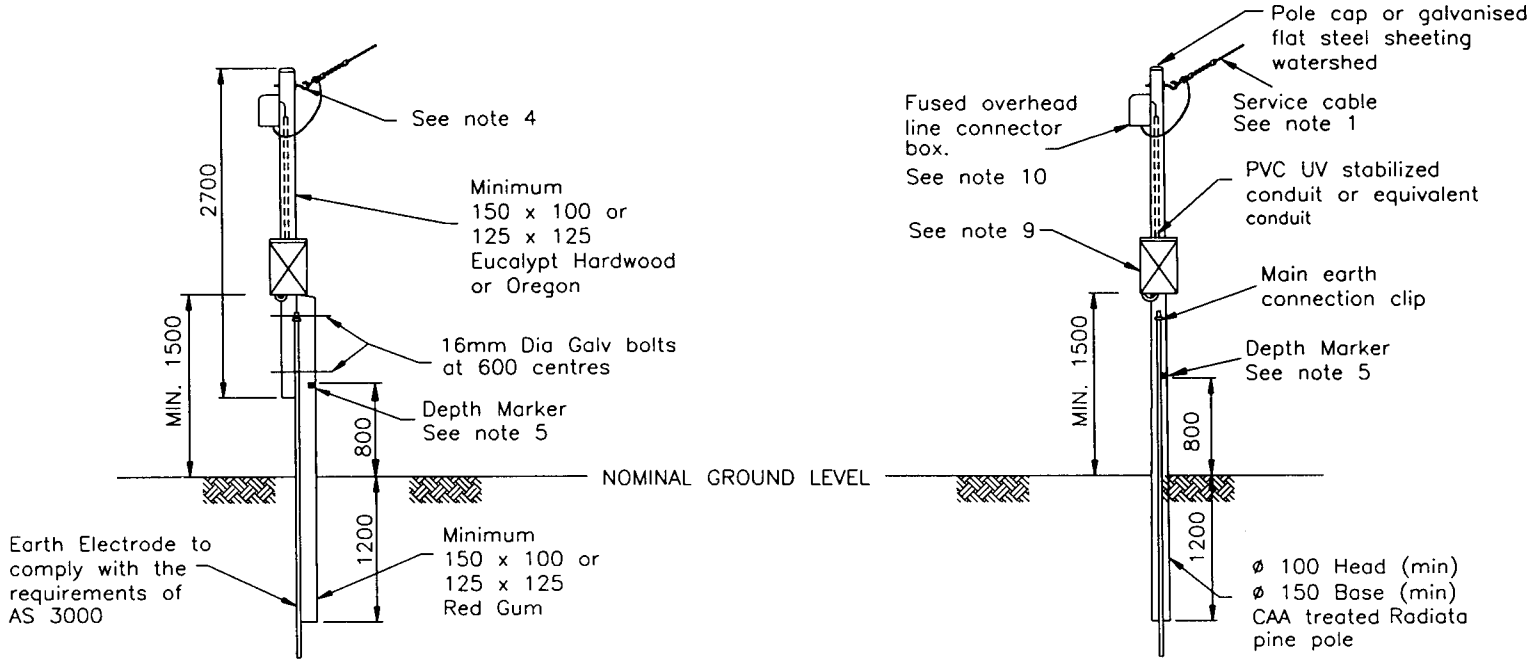
* NOTE: Where footing strength is extremely poor, pole to be installed at a depth of 900mm. ie depth marker at 1100mm above ground level

Alternative Structures:

(a) An alternative arrangement would be to install a pole with 1.2m depth in ground as per Figure 4.4.

(b) Any fabricated alternative arrangement shall be suitably protected against corrosion and be designed to support a load of 2kN at the service bracket. The design shall be carried out by a qualified Structural Engineer or equivalent and shall be submitted to the DistCo for approval.

Figure 4.3 Builders Supply Pole - Alternative 1, 2 Wire Aerial Service



General Notes:

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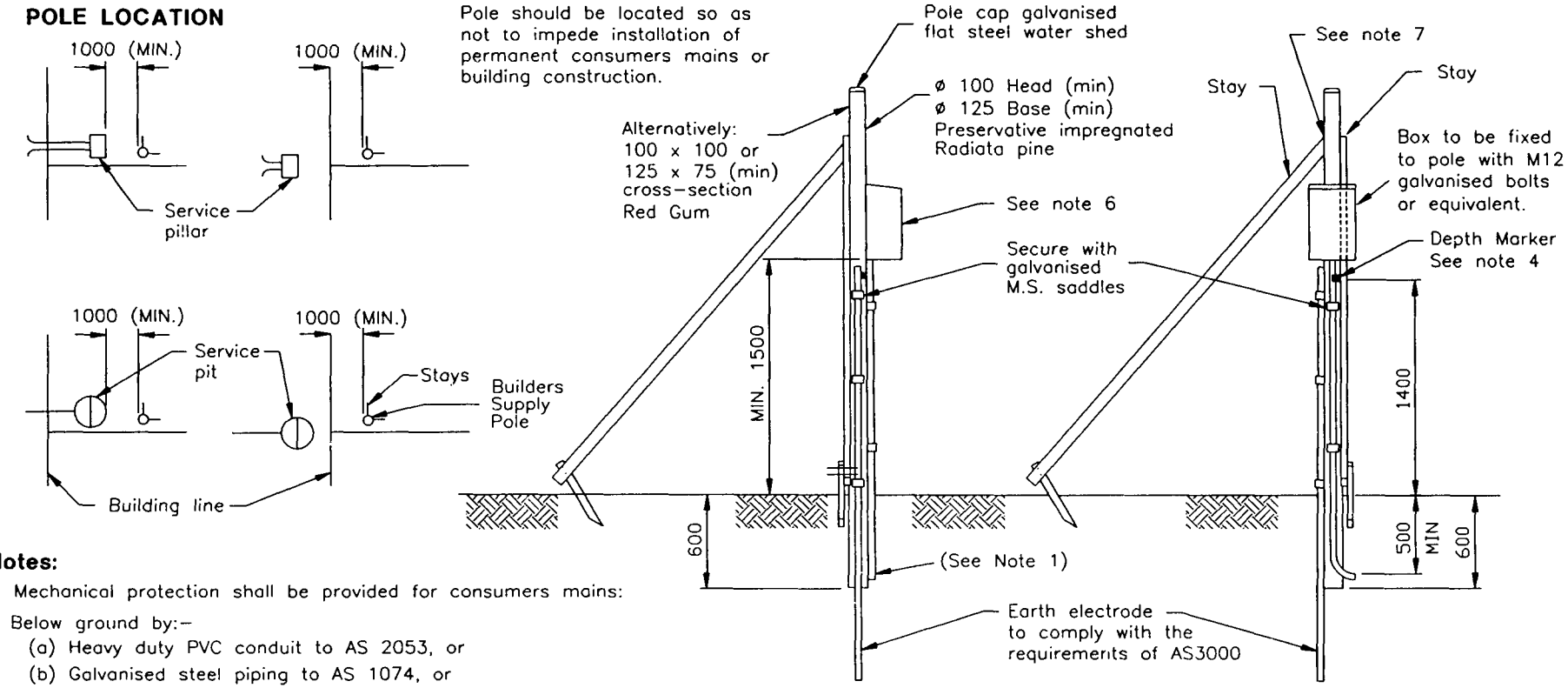
6. Supply will be connected to a pole erected at a new site only after a 'Notice of Completion' has been submitted in accordance with the Wiring Regulations
7. The electrical installation shall comply with the Wiring Regulations.
8. Excavated soil MUST be compacted around pole in 100mm layers and thoroughly tamped.
9. Main switch to be no higher than 2000mm.
10. The FOLCB must be located and installed on the pole in a manner which enables the easy insertion or removal of the service fuse.

Alternative Structures:

Any fabricated alternative arrangement shall be suitably protected against corrosion and be designed to support a load of 2kN at the service bracket. The design shall be carried out by a qualified Structural Engineer or equivalent and shall be submitted to the DistCo for approval.

Figure 4.4 Builders Supply Pole - Alternative 2, 2 Wire Aerial Service



Notes:

1. Mechanical protection shall be provided for consumers mains:

   Below ground by:-

   (a) Heavy duty PVC conduit to AS 2053, or

   (b) Galvanised steel piping to AS 1074, or

   (c) Where permitted by Tables 5.1 and 5.2, reinforced concrete cable cover slabs with a minimum thickness of 40mm and a classification of not less than grade 15 to AS 3600. Cover slabs other than concrete may be used subject to specific approval by the DistCo for the purpose.
   All cover slabs unless light orange in color shall be further identified by the addition of orange marker tape installed in accordance with the Wiring Regulations.

   Above ground by:-

   Galvanised steel piping to AS 1074 or approved galvanised steel cable guards in addition to heavy duty PVC conduit to AS 2053 - or other approved equivalent.

2. Pole to Fig. 4.3 and Fig. 4.4 may be used subject to mechanical protection of cable being equivalent to note 1 above.

3. The electrical installation shall comply with the Wiring Regulations.

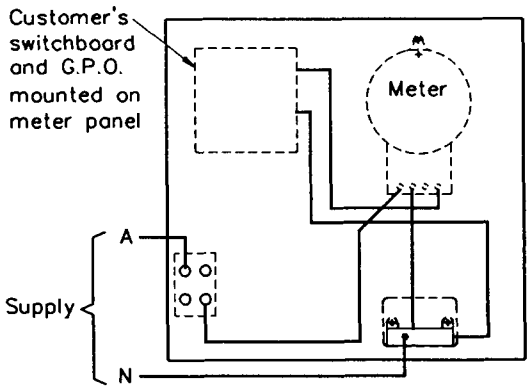
4. A depth marker consisting of a saw cut (minimum length of 100mm) filled by a row of at least three galvanised nails shall be made on the pole at a distance of 2000mm from the base of the pole.

5. Excavated soil MUST be compacted around pole in 100mm layers and thoroughly tamped.

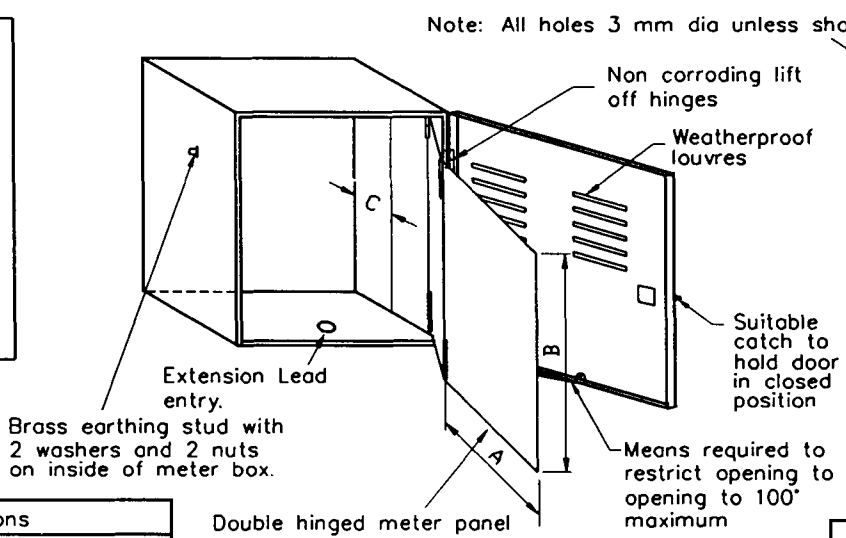
6. Main switch to be no higher than 2000mm.

7. Pole supports to be securely attatched to pole and pegs using a minimum of 2 - 75mm nails at each fixing point.

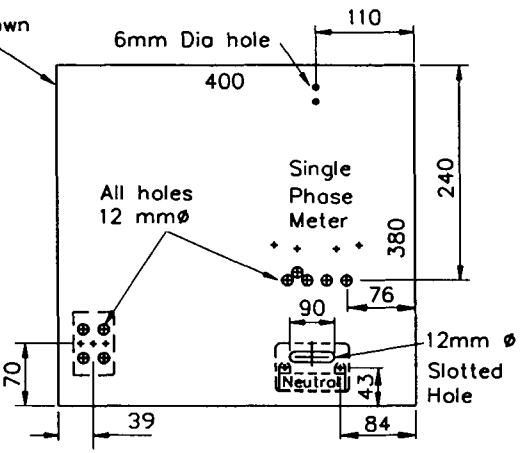
Figure 4.5 Builders Supply Pole - Underground Distribution



WIRING DIAGRAM



ENCLOSURE DETAIL



METER PANEL LAYOUT

Meter Panel Size		Internal Dimensions	
'A'	'B'	Space in front of panel	Space behind meter panel 'C'
400	380	180	75

CAUTION
POWER OUTLETS IN BUILDER'S SUPPLY POLE MUST BE PROTECTED BY RCDs (EARTH LEAKAGE PROTECTION).

Notes:

1. It is not permitted to mount switchboards on meter panels other than for Builder's Supply Poles.
2. Meter box to be constructed of galvanised sheet not less than 1.2 mm thickness.
3. The design and construction of a non-commercially manufactured meter box and panel shall be approved by the Responsible Officer.
4. Provision for sealing is required when the panel is in closed position.
5. Adequate protection to be provided for flexible cords entering meter box against mechanical damage especially when meter box door is closed.
6. Additional reinforcements or bracing may be required to rear of meter box where mounting on a round pole.
7. The meter box shall be constructed having a min. degree of protection of IP 23 to AS1939.
8. The maximum cable size connected to the meter panel, shall be 16 mm^2.

METER PANEL MATERIALS.
The meter panel as shown must comply with AS1795 Type X or Type Z material.

FUSE
Standard service fuse to be supplied, installed and wired by customer's REC on meter panel, but may be omitted where supply is overhead.

Fuse carrier shall be of a type which accepts a cartridge 57 x 22.2 dia. and is capable of being sealed. (Refer to Clause 6.6.1).

Fuse base must be of a type that will prevent inadvertent personal contact with live parts.

INSTALLATION

The meter must be readily accessible and the metal meter box must be earthed. Meter connections are to be brought through holes provided in meter panel in the sequence from left to right:
Line active (from fuse), meter neutral & Load Active (to switchboard).

NEUTRAL LINK

Neutral link must be 100 A 500 V capacity with a removable cover.
Refer to Clause 6.6.1.

Figure 4.6 Typical Arrangement for Builders Supply Pole Meter & Switchboard Enclosures

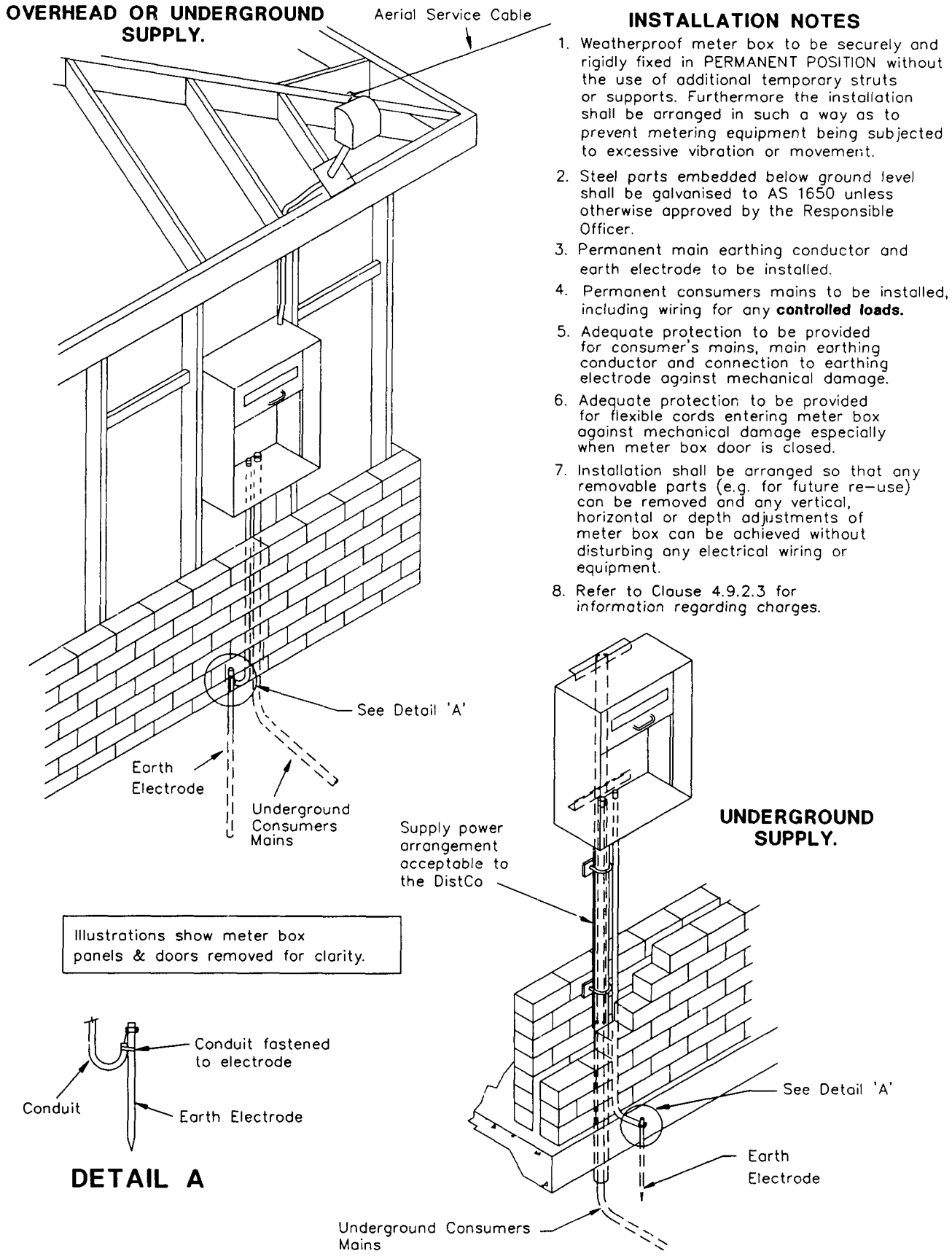


Figure 4.7 Typical Arrangements, Supplies to Buildings in Course of Erection

Service Cables and Consumer's Mains (including Private Overhead Electric Lines)

5

Section 5 Contents

Service Cables and Consumer's Mains (including Private Overhead Electric Lines)

5.1 Service Cables

5.1.1 General

The customer shall provide adequate mounting and installation facilities for DistCo servicing equipment in the positions approved or selected by the Responsible Officer. Service equipment supplied and installed by the DistCo shall remain the property of the DistCo.

Where supply mains are external to the property, the DistCo will generally install and in all cases will maintain the service cable between its system and the customer's Point of Supply.

However, the DistCo may require the customer to arrange the installation of the service cable and conduits at the customer's expense. In all cases, the DistCo reserves the right to determine the location of the Consumer's Terminals and the method of supply.

In general, private poles for termination of aerial service cables on the customer's property are not permitted. Refer to Clause 5.4.1.4 - Private Pole on Property.

5.1.2 Type of Service Cable

5.1.2.1 Urban Areas (Non-Fire Hazardous Category 1 Areas)

In Category 1 areas as detailed in Appendix A, the service cable from overhead mains may be aerial or underground depending on the nature of the installation and subject to all relevant clearances for an aerial service cable being maintained.

For small subdivisions (refer to Section 7) and "dual occupancies", the service cable will normally be underground to a pit or pillar as detailed in Clause 5.4.1.3. However, in certain cases the Responsible Officer may approve the use of an aerial service.

For larger subdivisions, the Responsible Officer shall be consulted - refer to Section 7.

Where overhead mains exist, a customer may, in general, elect to have an underground in lieu of aerial service cable installed. Refer to Clause 5.4.2.3 - Financial Arrangements.

5.1.2.2 Rural Areas (Fire Hazardous Category 2 Areas)

In Category 2 areas as detailed in Appendix A, the service cable will, in general, be underground, except in the case where a structure can be serviced from the Road Reserve by a single span of aerial service cable in accordance with Clause 5.5.1. The Responsible Officer may approve the use of an aerial service cable where it is not practicable to install an underground service cable (due to obstruction, rock, etc).

Note: See Clauses 1.6, 4.8 and 5.2.4 regarding a substation on a customer's premises. Also refer to Clause 5.5.2 - Aerial Consumers Mains.

5.1.3 Connections to Service Equipment

The customer shall provide sufficient length of cable and suitable means of termination for connection of the consumer's mains to service equipment. In general, aluminium conductors, compacted and/or compressed copper conductors are not acceptable for termination directly onto DistCo service equipment.

5.1.4 Special Service Cables

Where a service cable is to be installed in or on a portion of a building (e.g. a shop verandah), the Responsible Officer shall be consulted regarding the location of the Consumer's Terminals and service protection arrangements.

5.2 Service Protection Devices

5.2.1 General

The customer shall provide, install and maintain an approved service protection device (with the exception of the fuse links) located on the customer's property.

However, Where an Underground Service Cable is protected at its origin (e.g. Sub station or Pole, etc.) the service protection device need not be installed on the customer's property.

5.2.2 Protection of Underground Service Cables

For **Single Installations with Determined Maximum Demands 100 A per phase or less,** service protection device/s shall be installed on the customer's meter panel. Alternatively with the approval of the Responsible Officer, the service protection device may be installed in a pillar or cubicle.

For **Single Installations with Determined Maximum Demands exceeding 100 A per phase** and all **Multiple Installations,** service protection devices shall be installed within a pillar or cubicle located on the customer's property or, subject to the approval of the Responsible Officer, they may be located adjacent to, or incorporated in the main switchboard. Refer to Clauses 4.5, 5.2.5 & 5.4.1.3.

Notes:

- Service Protection Devices may be designed to disconnect all phases of supply simultaneously when manually opened except where mounted on meter panels. Refer to Clause 5.4.3.7.
- A Service Protection Device may not be required where customer's unmetered circuit protection devices incorporated in a pillar, cubicle or switchboard provide equivalent means of isolation and protection.

5.2.3 Installations Supplied by an Individual Aerial Service Cable

In general, the service protection device shall be located at the point of attachment free of obstruction, where ready access is available by use of a ladder, and in a position to allow operation from the ground or floor level with a fuse operating stick, not lower than 3 metres and not greater than 6 metres above ground level. (Refer to Clause 5.5.1.2)

For **Non Domestic installations** where the service protection device cannot be located in an accessible position, the Responsible Officer may agree to, one of the following arrangements.

Service Protection Devices for Non Domestic installations with Determined Maximum Demands less than 100 A per phase:

- A junction device fitted at the point of attachment (POA) and the customer will arrange for the consumer's mains to be run to a service protection device in an accessible position (e.g. under shop veranda.) The mains from the junction device to the service protection device shall be provided with substantial mechanical protection;
- An approved service protection device fitted at the POA and an additional service protection device fitted on the meter panel (e.g. where the metering is installed in an external position or forms part of a group metering location).

Service Protection Devices for Non Domestic installations with Determined Maximum Demands 100–170 A per phase:

- A suitable Junction Device mounted at the POA and the consumer's mains run to a Fused Switch Disconnector mounted under the veranda. The mains from the termination box to the Fused Switch Disconnector shall be provided with substantial mechanical protection;
- Subject to the agreement of the Responsible Officer a Fused Switch Disconnector may be mounted on the DistCo pole. The consumers mains shall terminate at a suitable enclosure at the POA;
- Subject to the approval of the Responsible Officer a Fused Switch Disconnector may be mounted at the POA above a verandah (e.g. where it supplies a group metering position).

Note: Where the DistCo agrees to mount the service protection device on the DistCo pole, the customer shall meet all additional costs involved.

Approved Service Protection Device

Where the calculated maximum demand does not exceed 100 A per active conductor the service protection device shall be a fused overhead line connector box of an approved type.

Where the calculated maximum demand is between 100 A and 170 A per active conductor the service protection device shall be an approved Fused Switch Disconnector.

Note: At the time of publication of these Rules, the KRONE Fused Switch Disconnector Model KGH 250, part number 6459 1001-50 is the only DistCo approved Fuse Switch Disconnector for use in Victoria.

Where a customer provides service protection devices incorporating fuses they shall be compatible with the service fuses used by the DistCo, e.g. for supplies up to 100A - type 2a to AS 2005.

Approved Junction Device

For calculated maximum demand less than 100 amperes per active conductor, the junction device shall be a junction box incorporating **fixed** terminal connections of a type approved by the DistCo.

For calculated maximum demand greater than 100 amperes per active conductor, the junction device shall be a suitable terminating box as agreed to by the Responsible Officer.

5.2.4 Service Protection Devices for Supplies from a Substation or DistCo Pole on Customer's Property.

(a) DistCo Pole (including Pole Type Substations)

In general, where supply is provided from a DistCo pole, including a pole type substation, located on the customer's property, a service protection device shall be provided and installed in accordance with Clause 5.4.3.6(c) or Appendix B. Installations located in Category 2 (rural and fire hazardous) areas and supplied by underground consumer's mains the service protection device may be either a circuit breaker or fused overhead line connector box of a type approved by the DistCo for the purpose. See Figure 5.13 for a typical arrangement.

(b) Other Substations

Where supply is provided from other types of substations the provision and location of the service protection device shall be to the satisfaction of the Responsible Officer.

5.2.5 Access to Service Protection Devices

Service protection devices shall be located to allow easy removal and replacement. If subsequent building alterations impede access to the service protection devices, the customer shall arrange for the alterations necessary to restore unobstructed access or arrange for the relocation of the service equipment at the customer's cost.

In the case of a public building or any premises where a number of occupiers are supplied through the same service, the service protective devices must be located in a suitable position in a common use area which is accessible to DistCo personnel at all hours without having

to obtain a key to the premises. Access may be provided to the common use area using a "Power Industry Lock"

Service Protection Devices for individual customers in multiple occupancy premises shall be located in a common use area where access is available to all occupiers of the building supplied through those service protection devices.

5.3 Consumer's Mains

5.3.1 General

The customer is responsible for the provision, installation and maintenance of Consumer's Mains.

In accordance with the relevant Regulations, all electrical wiring work associated with the installation and maintenance of Consumer's Mains shall be carried out, on behalf of the customer, by a Registered Electrical Contractor (REC) to the satisfaction of the Responsible Officer and in accordance with both the relevant provisions of the Wiring Regulations and the additional requirements of these Rules.

Unmetered sub-mains shall be considered as consumer's mains for the purposes of these Rules.

Joints in unmetered mains shall be made in a suitable manner to the satisfaction of the Responsible Officer.

The DistCo reserves the right to determine the location of the Consumer's Terminals. Reference should be made to Clauses 1.6, 5.1 and 5.2 regarding Points of Supply and provision of Service Protection Devices.

Note: Attention is directed to Clauses 5.1.3 and 6.6.2 where the use of aluminium conductors or compacted and/or compressed copper conductors is being contemplated.

5.3.2 Size of Consumer's Mains

The minimum size of consumer's mains for any installation shall be in accordance with the Wiring Regulations and in any case, for individual domestic installations, shall be such that the conductors are capable, under installed operating conditions including those of voltage drop, of supplying a minimum total loading of 8.4 kVA at the occupancy main switchboard. No conductor forming any portion of consumer's mains shall have a cross sectional area of less than 4.0 mm^2.

5.3.3 Identification of Consumer's Mains

Conductors shall be colour coded or otherwise marked to clearly and permanently identify each incoming active conductor and the neutral conductor. In the case of polyphase supplies, the active conductors shall be clearly and permanently identified to indicate each phase, i.e. red, white, blue. Any identification as required above shall be located at a position on the cable not likely to be removed where the cable is stripped for termination.

Where heat shrinkable tubing is to be applied to cable ends, the tubing shall be appropriately coloured to indicate the above.

Where the conductor core of a double insulated cable is to be changed in polarity, e.g. red coloured core to be used as a neutral, the cable shall be sleeved with heat shrinkable tubing of appropriate colour over the conductor core. This shall consist of a minimum layer of medium wall heat shrinkable tubing or two layers of thin wall heat shrinkable tubing.

Note: The Wiring Regulations require the neutral conductor to be coloured black.

5.4 Underground Supplies

5.4.1 General

Where the location of the Consumer's Terminals has not been previously established by the installation of a service pit or similar, the Responsible Officer will determine the location of

the Consumer's Terminals. The customer may be required to provide, install and maintain facilities for the installation of the service cable in accordance with Clause 5.1.

Typical arrangements are shown in Figures 5.1, 5.2 and 5.3.

5.4.1.1 Safety

(a) Substations

Where cables are to be installed on or in a DistCo substation, no excavation work within 10 m of the substation shall commence before the route of the cable has been approved by, and advice regarding the substation earthing system obtained from, the Responsible Officer.

In the case of a "Single Wire Earth Return" (SWER) substation, arrangements SHALL be made with the DistCo to de-energise the substation prior to, and during trenching operations.

Note: Damage to a high voltage earthing conductor can cause an extremely hazardous situation.

(b) Poles

A minimum safe working clearance from any live apparatus of 2.0 m shall be maintained by all persons and apparatus in personal contact therewith. If this clearance cannot be maintained, the DistCo **SHALL** be consulted before proceeding.

Any timber pole marked with a large 'X' cut into or marked on the surface has a limited life and must therefore be considered unsafe to climb or support a ladder.

(c) Service Pits

Any cables within a service pit shall be treated as ALIVE and, hence, shall not be handled without taking appropriate safety precautions.

5.4.1.2 Notice of Proposed Installation

It is essential that the method and Point of Supply be determined with the Responsible Officer at an early date.

Where an Underground Service Cable is to be installed, there is a requirement for the DistCo to ensure various public authorities are notified of the intention to install the cable in a public roadway or, in some cases, to negotiate an easement for the cable on an adjoining property.

In these circumstances, it is necessary that the REC provide a **MINIMUM OF 20 WORKING DAYS** notice before supply is required, to enable the DistCo to effect the notification mentioned above and subsequently to arrange for installation of the Underground Service Cable.

In this regard, the REC shall notify the DistCo **IN WRITING** as required by (a) to (d) below. **FAILURE TO PROVIDE WRITTEN NOTICE AS SPECIFIED MAY RESULT IN CONNECTION TO SUPPLY BEING DELAYED.**

(a) Service Pit not Installed

Where the DistCo nominates a Point of Supply on the property boundary and no service pit exists at that point, the **MINIMUM** notice required is **20 WORKING DAYS.** Notice may be effected by clearly endorsing the "Notice of Installation Work" (NIW) with the words "1, 2 or 3 phase Underground Service Cable requested" and should, in addition, include a sketch plan of the proposed consumer's mains route

(b) Service Pit Installed

Where the DistCo nominates a Point of Supply which has been predetermined by the prior installation of a suitable service pit abutting the property boundary (as occurs in Underground Reticulated Distribution and "rural" subdivisions), the **MINIMUM** notice required is **6 WORKING DAYS.**

(c) Pole or Substation on Property

Where the necessary arrangements and construction of a DistCo substation or line on the customer's property have been completed and the DistCo nominates a Point of Supply on that substation (or DistCo pole), the **MINIMUM** notice required is **6 WORKING DAYS.**

In addition, to satisfy Clause 5.4.1.1 regarding DistCo substations, it may be necessary to co-ordinate DistCo and REC works. Hence, early consultation with the Responsible Officer is essential.

(d) Conversion from Overhead to Underground

Where an existing overhead supply remains operative, notice as required by the preceding sub-clauses shall be provided.

However, in the event that existing Consumer's Mains are defective and it is proposed to install Underground Consumer's Mains and an Underground Service Cable, the REC shall liaise with the Responsible Officer to enable appropriate notification to be given by the DistCo to other Authorities in accordance with the requirements stated earlier in this Clause, **BEFORE COMMENCING** any work.

(e) Notice to Other Authorities

Where it is proposed to cross a major asset of another Authority within the customer's property, the REC shall consult with that Authority and the local DistCo office regarding reasonable requirements of the other Authority or alternative means of providing supply to the property.

5.4.1.3 Location of Consumer's Terminals

For Determined Maximum Demands not exceeding 100 A per phase, the Consumer's Terminals will normally be located within a pit at the property boundary. In special cases and subject to the approval of the Responsible Officer, the Underground Service Cable may terminate in a pillar, meter box, cubicle, or other suitable terminating device at the property boundary. Refer to Clause 5.4.3.7 for further information on facilities required for termination of the service cable.

Where the Determined Maximum Demand exceeds 100 A per phase, the Consumer's Terminals will normally be located in a pillar, cubicle, or switchboard located on the customer's property at the property boundary, however, as good engineering practice, the Underground Service Cable may be extended up to 5 metres into the property to be supplied.

Where the Determined Maximum Demand exceeds 100 A but is less than 150 A, and the service cable is protected at its origin, the Responsible Officer may approve the installation of a pit in lieu of a pillar or cubicle.

In special circumstances, subject to the approval of the Responsible Officer the service cable may be extended beyond 5 metres into the property to be supplied. Any such approval shall be subject to written conditions of contract between the local DistCo and the customer.

The Customer shall be responsible for the cost of the installation and maintenance of that portion of the cable within the property to be supplied, and where required, the provision of a pillar, meter box, cubicle or other suitable enclosure including a service protection or disconnection device on which the cables are to be terminated.

Note: As per Figure 5.10, consumer's mains greater than 50 mm^2 in size shall not terminate in a pit.

5.4.1.4 Private Pole on Property

In general, private poles for termination of aerial service cables on the customer's property are not permitted.

The following requirements apply, where, due to extenuating circumstances (e.g. a major underground drain or channel obstructs an underground cable route) and where no other means of servicing is practicable, a private pole is permitted after consultation with the Responsible Officer:

(a) The pole height and method of termination shall be to the satisfaction of the Responsible Officer. Pole height shall provide necessary clearances for the DistCo service line.

(b) The REC shall terminate Underground Consumer's Mains on the private pole, generally as follows -

- Where the maximum demand does not exceed 100 A per phase, the Underground Consumer's Mains shall terminate in a Fused Overhead Line Connector Box (FOLCB) mounted on the pole between 3.0 m and 6.0 m above ground level or, in cases where a circuit breaker is installed in lieu of an FOLCB the circuit breaker shall be mounted between 3.0 m and 4.0 m above ground level. Refer to Appendix B, Clause B3.3 for further information on poles.
- Where the maximum demand is between 100–170 A per phase, the Underground Consumer's Mains shall terminate at the point of attachment of the overhead service line as detailed by the Responsible Officer. Refer to Clause 5.4.3.6(c).

Note: Refer to Clause 5.4.2.3(a) - Financial Arrangements - Compulsory Underground Supply.

5.4.2

UNDERGROUND SERVICE CABLES

5.4.2.1 Identification of Property Boundary

Where an Underground Service Cable is to be installed to a property, the Responsible Officer shall nominate the location on the property boundary at which the Point of Supply will be established.

In the event that the boundary of the property to be supplied is not clearly defined, the prospective customer shall be responsible for the provision of such written information as the Responsible Officer may require to identify that boundary.

In general, Private Electric Lines shall not extend outside the boundary of the property on which the Point of Supply is established.

5.4.2.2 Conditions for Underground Supplies from Overhead Distribution Mains

There are two different conditions under which L.V. Underground Service Cables may be installed from the DistCo's overhead reticulation system to a property, namely -

1. ***"Compulsory" Underground Supply*** - where the service cables are required to be installed underground.

This will normally occur where -

- The DistCo requires the consumer's mains to be placed underground in fire hazardous areas, (refer to Appendix A and Clause 5.1.2.2) and will, where practicable, provide an underground service cable to the property;
- The formal conditions under which supply is to be provided, specify an underground service cable;
- The required clearances for an aerial service cable cannot be achieved and/or, maintained or
- The Determined Maximum Demand to be provided from the L.V. overhead distribution mains exceeds 170 A per phase.

In all cases the underground service cable shall be installed from the distribution system to the Point of Supply for the property as detailed in Clause 5.4.1.3 and Figures 5.1, 5.2 or 5.3.

Exceptions to the mandatory use of an Underground Service Cable and consumer's mains will be considered where -

- due to physical constraints, it would not be practicable to underground the cables (e.g. a major underground drain or channel obstructs the necessary route);
- the customer would be involved in significant added costs in relocating an existing overhead Point of Supply provided that a suitable aerial service can be erected to satisfy all other conditions and clearances required by these Rules.

2. ***"Elective" Underground Supply*** - where the customer would normally be provided with an overhead service to the property but has, for aesthetic or other reasons, chosen an Underground Service Cable.

In all cases the provision and installation of an Underground Service Cable shall be subject to the approval of the Responsible Officer and, where approved, shall be installed from the distribution system to the Point of Supply for the property as detailed in Clause 5.4.1.3 and Figures 5.1, 5.2 or 5.3.

In rural areas, new installations will generally be in the category of compulsory underground supply. Refer to Clause 5.1.2.2 - Type of Service Cable - Rural Areas.

5.4.2.3 Financial Arrangements

(a) Compulsory Underground Supply

The conditions for provision of electricity supply, may in general, include the payment of fees. Details of current charges should be obtained from the relevant DistCo at an early date.

Where it is not practicable to install an Underground Service Cable (due to obstruction, rock, major drain or channel etc) and **SUBJECT TO PRIOR APPROVAL** by the Responsible Officer, the DistCo will normally provide an aerial service to the property. In such cases, the customer shall provide, install and maintain an approved service cable termination - including a pole where necessary - for the purpose of termination and connection of the DistCo's aerial service cable. Refer to Clause 5.4.1.4 - Private Pole on Property.

(b) Elective Underground Supply

In areas and situations where supply would normally be provided by means of an aerial service cable, a customer may elect to have an Underground Service Cable installed to the property. However, the provision of an underground service cable in this situation is conditional upon both the DistCo's agreement thereto and the customer undertaking responsibility for meeting all additional costs incurred by the DistCo in providing the Underground Service Cable.

5.4.3

UNDERGROUND CONSUMER MAINS

5.4.3.1 Cable Route

(a) General

Private Electric Lines should not extend outside the boundary of the property on which the Point of Supply is established.

The route of Underground Consumer's Mains should, to the extent which is practicable, be selected with due regard to the following -

- Follow straight lines between identifiable points.
- Comply with the requirements of Clause 5.4.3.1(e) in Underground Reticulated Distribution areas of supply.

- Keep clear of fencing repair/replacement works.
- Avoid substation earthing systems.
- Avoid unnecessary crossing of other services.
- Subsequent cable location, fault location and repair.
- Restrictions, such as hazardous areas (e.g. petrol service stations,etc) imposed by the Wiring Rules.

(b) Record of Cable Route

The route of all Underground Consumer's Mains in all installations and any underground submains supplying individual occupancies forming portion of a multiple installation shall be permanently recorded on a durable card or other suitable material which shall be completed and fixed within the meter box (or other suitable position in the absence of a meter box) to provide a permanent guide for the use of the customer and other interested parties.

In all cases, sufficient points should be recorded by way of running distances and offsets from the boundary fences and/or the lines (or the projection thereof) of permanent structures so that the position of the cable at any point can be determined with an accuracy of ± 0.2 m.

Marking on the inside of a meter box door with a permanent marker pen, laminating of plans or enclosing plans in a suitable plastic wallet is acceptable.

Samples of completed cards are shown in Figure 5.4.

In the case of a multiple installation, a guide shall be installed at each occupier's installation and shall include the complete route from the Point of Supply to the particular installation.

As an alternative where there is insufficient space on a cable location card to record all the relevant information, it is recommended that a durable drawing protected by a plastic wallet or by laminating, be placed within the main switchboard and/or group metering enclosure. Notice of the location of this drawing shall be affixed on or adjacent to each multiple occupancy switchboard.

(c) Major Assets of Other Authorities

A Private Electric Line may cross an asset of another Authority only where that asset is located within the boundaries of the private property. Any charges associated with establishing or maintaining such a crossing shall be met by the customer.

Any crossing of another Authority's asset/easement shall be constructed in accordance with the requirements of these Rules and, **IN ADDITION**, with any reasonable special conditions of the other Authority. Refer to Clause 5.4.1.2 (e).

Where a major asset (such as a major drain or channel , etc.) is installed parallel with and abutting the property boundary facing the road reserve or property from which electricity supply is to be obtained, the DistCo may provide an overhead service line across the asset to a private pole at a location within the property nominated by the DistCo.

In cases where the other Authority owns the land on which its asset is placed, the DistCo will provide supply to the (separate) property across the Authority's land at an appropriate location and in accordance with the DistCo's prevailing terms and conditions for an extension of the DistCo's distribution system.

(d) Entry to Building

Provision should be made in the building at construction stage for the consumer's mains to pass through the building foundations and into the metering position, as shown in Figures 5.5 and 5.6.

If provision has not been made at the initial building stage, the consumer's mains shall be installed at not less than the minimum depth specified to a point directly below the outside

of the exterior wall foundations. The conduit shall then be enclosed in galvanised steel tube or approved equivalent from the conduit bend or elbow as it ascends vertically upwards, negotiates the foundations and enters the wall cavity, as shown in Figures 5.7 and 5.8.

Note: Care must be taken to arrange underground cable enclosures in such a manner as to prevent moisture entering the building via the enclosure; particularly where a pit or conduit end is installed at a higher level than the entry to the building.

(e) Underground Reticulated Distribution (URD)

Where supplied from Underground Reticulated Distribution, the consumer's mains shall be installed underground to a point directly below the metering position and the length of consumer's mains extending from ground level to the metering position shall be kept to the practicable minimum. The cable route may pass under a concrete slab floor or through a footing where appropriate.

Where the design of the structure restricts compliance with the above, the Responsible Officer shall be consulted **PRIOR TO INSTALLATION,** to consider alternative methods of achieving an equivalent degree of protection.

5.4.3.2 Inspection

A DistCo may require an inspection of cable trenches for underground unmetered consumer's mains, accordingly any such cable trench shall not be back filled until the DistCo is notified and authorisation to backfill has been received. Such authorisation shall be within an agreed time frame.

Consumer's mains in Underground Reticulated Distribution areas:

Any portion of unmetered consumer's mains between the Consumer's Terminals and the first electrical protective device (e.g. fuse or circuit breaker) which is installed within a building other than as in Clause 5.4.3.1 (e) shall not be hidden from view by any structural lining until permission has been obtained from the Responsible Officer. Refer to Clause 5.4.3.1 (e) .

At an appropriate stage of the construction, the REC shall advise the Responsible Officer to enable any required inspection to be made and approval obtained.

5.4.3.3 Cables

(a) Minimum Size

The minimum size for Underground Consumer's Mains shall be in accordance with the Wiring Rules and Clause 5.3.2.

(b) Minimum Insulation Resistance Level

- Between conductors; and
- between conductors and earth or metallic sheath,

The insulation resistance of unmetered underground consumer's mains shall be not less than the following value when tested using a 500 V insulation resistance tester -

- For cables up to 50 m route length - 50 megohms.
- For cables in excess of 50 m route length, a reduction of 5 megohms for each additional 25 m route length is acceptable subject to an absolute minimum of 5 megohms being obtained.

(c) Wiring Systems ("Cables")

Underground Consumer's Mains shall be installed in such a manner that, in the event of future accidental damage being sustained, the likelihood of such damage producing a short circuit between conductors and, hence, reliable operation of electrical protection is enhanced.

Unsheathed Thermoplastic Insulated (single insulated) cables should not be used for unmetered underground consumers mains.

Where supplied from Underground Reticulated Distribution, the wiring system shall be one of those specified in Table 5.1.

In other cases, the wiring system should be one of those specified in either Table 5.1 or Table 5.2 unless otherwise approved by the Responsible Officer in special circumstances.

Where installed in a pipe or conduit all conductors shall, except as provided below, be contained in the one pipe or conduit.

More than one non-metallic conduit may be used provided that not less than two conductors of different polarity or phase are included in each conduit and follow substantially the same route.

Single core, insulated and sheathed cables of less than 95 mm^2 cross sectional area shall be enclosed where required by Tables 5.1 and 5.2.

Where indicated in Table 5.2, single core, insulated and sheathed cable of 95 mm^2 cross-sectional area or greater, may be buried direct and protected by approved cover slabs provided the cables are neatly and securely lashed together to form a bundle during installation.

Note: See Clauses 5.1.3, 5.3.1 and 5.4.3.8 (c) regarding limitations on the use of certain wiring systems where connected within a pit.

Table 5.1 Wiring Systems: Underground Reticulated Distribution

TYPE OF CONSUMER'S MAINS CABLE	MINIMUM COVER ABOVE CABLE PROTECTION / ENCLOSURE		
	Heavy Duty Non-Metallic Conduit to AS 2053	Medium or Heavy Galvanised Steel Tube to AS 1074	Buried Direct using Approved Cover Slabs
Single Core cable, stranded copper conductor with elastomer, thermoplastic or xlpe **insulation** and **sheathing**, complying with AS 3116, AS 3147 or AS 3198 for underground cable.	0.5 m	0.5 m	Not Permitted
Multi-Core cable, stranded copper conductor with elastomer, thermoplastic or xlpe **insulation** and **sheathing**, complying with AS 3116, AS 3147 or AS 3198 for underground cable.	0.5 m	0.5 m	0.5 m
Neutral Screened Cable, stranded copper conductor, complying with AS 3155 for underground cables.	0.5 m	0.5 m	0.5 m

Notes:

1. Compacted and/or compressed stranded copper conductor will not be terminated to a DistCo service cable in a pit, without the prior approval of the Responsible Officer.
2. Where difficulty is encountered in achieving the minimum cover specified, refer to Clause 5.4.3.5 - Laying Below Ground (a) Minimum Depth.
3. Maximum size Underground Consumer's Mains which can be directly connected to DistCo service cable in pit is 50 mm^2 copper.

Table 5.2 Wiring Systems : Other Than Underground Reticulated Distribution

TYPE OF CONSUMER'S MAINS CABLE	MINIMUM COVER ABOVE CABLE PROTECTION / ENCLOSURE		
	Heavy Duty Non-Metallic Conduit to AS 2053	Medium or Heavy Galvanised Steel Tube to AS 1074	Buried Direct Using Approved Cover Slabs
Unsheathed, thermoplastic insulated cable (single insulated) complying with AS 3147	Refer to Clause 5.4.3.3 - (c) Wiring Systems ("Cables")	Not Permitted	Not Permitted
Single Core cable, stranded copper conductor with elastomer, thermoplastic or xlpe **insulation** and **sheathing**, complying with AS 3116, AS 3147 or AS 3198 for underground cable.	0.5 m	0.5 m	0.5 m Restricted. Refer to Clause 5.4.3.3 - (c) Wiring Systems ("Cables")
Multi-Core cable, stranded copper conductor with elastomer, thermoplastic or xlpe **insulation** and **sheathing**, complying with AS 3116, AS 3147 or AS 3198 for underground cable.	0.5 m	0.5 m	0.5 m
Neutral Screened Cable, stranded copper conductor, complying with AS 3155 for underground cables.	0.5 m	0.5 m	0.5 m
Multi-Core Armoured Cable, paper insulated lead sheathed with hessian serving or pvc outer sheath, complying with AS 1026	0.5 m	0.5 m	0.5 m
Multi-Core Armoured Cable, elastomer thermoplastic or xlpe insulated with bedding and sheathing or serving complying with AS 3116, AS 3147 or AS 3198	0.5 m	0.5 m	0.5 m
Mineral Insulated Metal Sheathed Cable, complying with AS 3187 and AS 3000 for underground use.	0.5 m As Reqd by Clause 5.4.3.5 - (a) Minimum Depth	0.5 m As Reqd by Clause 5.4.3.5 - (a) Minimum Depth	0.5 m As Reqd by Clause 5.4.3.5 - (a) Minimum Depth

Notes:

1. Compacted and/or compressed stranded copper conductor will not be terminated to a DistCo service cable in a pit, without the prior approval of the Responsible Officer.
2. Stranded copper required for pit connections. Refer to Clause 5.4.3.8 (c) Pit at Property Boundary.
3. Where difficulty is encountered in achieving the minimum cover specified, refer to Clause 5.4.3.5 (a).
4. Maximum size Underground Consumer's Mains which can be directly connected to a DistCo service cable within a pit is 50 mm^2 copper conductor.

5.4.3.4 Mechanical Protection of Cable

Acceptable protection for Underground Consumer's Mains is detailed in the following sub-clauses and Tables 5.1 and 5.2.

(a) Cover Slabs

Concrete cover slabs shall have a minimum thickness of 40 mm and a classification of not less than Grade 15 to AS 3600 - SAA Concrete Structures.

Concrete cover slabs shall be placed over the cable firmly butted together in a continuous line throughout its length. The slabs shall overlap the cable by a minimum of 40 mm on each side of the cable and shall be placed not more than 75 mm above the cable.

Cover slabs of other than concrete may be used subject to specific approval by the DistCo for the purpose.

All cover slabs unless light orange in colour shall be further identified by the addition of orange marker tape installed in accordance with the Wiring Regulations.

(b) Cable Guards

Cable guards shall be of a type specifically approved for the purpose.

Sheet steel guards shall have a minimum thickness of 1.6 mm and be protected against the effects of corrosion by galvanising to AS 1397 for above ground use and to AS 1650 for below ground use; or other equivalent treatment.

5.4.3.5 Laying Below Ground

The bottom of the trench shall be free from all sharp projections and provide uniform support for the cable or its enclosure and the installation of the consumer's mains shall be carried out in accordance with the requirements of the Wiring Rules.

Note: Care should be taken to arrange underground enclosures to avoid moisture entering the building via the enclosure; particularly where a pit is installed at a higher level than the entry to the building.

(a) Minimum Depth

The MINIMUM depth of cover above the top of the mechanical protection for the cable (measured to the final finished ground level) shall be as shown in Table 5.1 or 5.2 for the particular case.

In areas subject to cultivation or camping, this minimum should be added to the depth of cultivation or tent pegs, etc, expected in the location of the cable. Attention is also directed to AS 3001 - Electrical Installations - Movable Premises (including caravans) and their Site Installations, regarding underground wiring where tent pegs are likely to be driven.

In locations where it is impracticable to maintain the minimum depth specified (for example, by obstruction from other underground installations or continuous rock), the Responsible Officer may approve a lesser depth of burial subject to the following -

- The cable enclosure shall be laid in a channel chased into the surface of the rock and covered with a layer of fine aggregate concrete not less than 50 mm thick; or
- The cable shall be enclosed in medium or heavy galvanised steel tube to AS 1074 and covered with approved cover slabs or provided with an equivalent degree of mechanical protection. Such a system shall be laid at a depth of not less than 0.3 m; or
- Served Mineral Insulated Metal Sheathed ("MIMS") cables suitable for use underground may be laid in a channel chased in rock and covered with fine aggregate concrete or enclosed in heavy-duty rigid conduit and laid directly below a paved area.

(b) Use of Common Trench

If required, a common trench may be used within private property to accommodate the electric cable and the service assets of other authorities (such as communication cables and

water service). In some cases, the cable may need to be enclosed in a wiring enclosure as required by the Wiring Rules (Section 3). Also refer to Tables 5.1 and 5.2 for further details. Unnecessary crossing of other services should be avoided where possible.

The requirements of other authorities for use of a common trench including clearances and minimum depth shall also be met.

Note: In general, the electrical system should be laid below other services and the trench partially backfilled prior to installing the other services.

(c) DistCo Pole on Property (Including Pole Type Substations)

Where the Underground Consumer's Mains are to be attached to a DistCo pole (whether timber, concrete or steel) and a rigid cable enclosure is used in the ground, the rigid cable enclosure shall be stopped between 0.5 and 1.0 m away from the pole and sufficient slack cable shall be left at the base of the pole to allow for pole replacement. (For "large" cables, the slack should be provided by forming a "drip loop" of cable at the base of the pole).

Conductors consisting of -

- multi-core cables of 20 mm or less outside diameter; or
- single-core insulated and sheathed cables of less than 95 mm^2 conductor cross-sectional area,

shall be enclosed in flexible or corrugated non-metallic conduit suitable for use in direct sunlight, from the end of the rigid cable enclosure to and up the pole adjacent to the point of termination

Single-core insulated and sheathed cables 95 mm^2 or greater in cross-sectional area may remain unenclosed from the end of the rigid cable enclosure provided they are lashed together in the ground during installation.

In all cases, the cable or flexible conduit between the end of the rigid cable enclosure and the DistCo's pole shall be protected by approved cover slabs and installed in accordance with the Wiring Regulations. Refer Figure 5.13.

5.4.3.6 Installation Above Ground

(a) Outdoor Locations

Where installed on the surface of a wall, pole or other structure, the cable shall be enclosed in medium or heavy galvanised steel tube to AS 1074 or **APPROVED** galvanised steel cable guards from not less than 0.3 m below the ground to 2.4 m above.

The enclosure shall be of such size as to readily accommodate the complete wiring system which it protects and shall be securely attached. Steel fittings and screws shall be galvanised or stainless.

Note: Electro-tinned or cadmium plated steel fittings and screws are not acceptable for exposure to the weather or below ground level.

Where flexible conduit is required, the flexible conduit shall be continued to the highest point of attachment of the cable and shall be so arranged as to prevent the ingress of moisture.

Cables shall be placed in such a position that they are least liable to mechanical damage and shall not obscure a DistCo pole identification mark or number.

(b) Indoor Locations - Underground Reticulated Distribution

Double insulation of Underground Consumer's Mains shall be maintained between the DistCo Underground Reticulated Distribution system and the first electrical protective device (fuse or circuit breaker) within the installation and further shall be provided with substantial mechanical protection where placed on or in a building. For example, in a brick veneer or timber wall cavity, insulated and sheathed, unarmoured, cables shall be enclosed in heavy duty non-metallic conduit to AS 2053. (Double brick wall cavity would be exempt).

See Clause 5.4.3.2 regarding the need under certain conditions, for cable installations within buildings to be visible at the time of inspection.

(c) DistCo Pole on Property (Including Pole Type Substations)

A minimum safe working clearance from any live apparatus of 2.0 m shall be maintained by all persons and apparatus in personal contact therewith. If this clearance cannot be maintained, the DISTCO SHALL be consulted before proceeding. See also Clause 5.4.1.1 which requires that certain substations be de-energised for safety and indicates certain poles which are unsafe to climb.

Drilling of concrete poles is **NOT PERMITTED** under any circumstances as ingress of moisture can lead to failure of the pole; hence, fixing of apparatus shall be effected by banding with suitable stainless steel bands. Multicore cables above 50 mm^2 shall be saddled to timber poles using approved type saddles, and fixed to concrete/steel poles with a stainless steel band, so arranged that the band will not directly compress on cable sheaths, but will securely attach cables to pole. In the case of a concrete pole carrying high voltage conductors, it may be necessary to provide additional insulation between the consumer's mains and the body of the pole or brackets attached thereto.

Where the maximum demand does not exceed 170 A per phase, the consumers mains shall be terminated by the REC on the DistCo pole 4.0 m above ground level (i.e. a FOLCB up to 100 A or a Fuse Switch Disconnector for supplies 100–170 A). The DistCo will provide and install the necessary cable, conduit, etc, for the connection from the DistCo's supply system to the Point of Supply.

Where the maximum demand exceeds 170 A per phase, the consumer's mains cable shall be of adequate length of conductor for connection to the service fuses or other appropriate apparatus of the DistCo's system as determined by the Responsible Officer.

The REC shall leave the cable, complete with its enclosure (if any), neatly attached to the pole not higher than 4.0 m above ground level. The cable ends shall be sealed to prevent ingress of moisture.

5.4.3.7 Customer's Pillars and Cubicles.

(a) General

A customer's pillar or cubicle is an enclosure installed on the customer's property for the purpose of housing the Consumer's Terminals for the connection of the DistCo's cable/s to the consumer's mains. These enclosures may also contain a switchboard and/or metering equipment. Pillars or cubicles are supplied, installed and maintained by the customer.

A customer's pillar is a free standing enclosure with access from the sides and top and which incorporates a lift-off cover to gain access to the apparatus within.

A customer's cubicle is an enclosure where access to the apparatus within is usually available from the front or rear through a door or removable cover.

Customer's pillars, cubicles and their contents shall comply with the relevant requirements of the Wiring Rules and the following:

- Where a pillar or cubicle is required to accommodate a service protection or disconnection device, such device may be designed to disconnect all phases of supply simultaneously when manually opened. Service protection devices and/or fuse links shall be of a type approved by the Responsible Officer. Refer to Clause 5.2 Service Protection Devices.
- Suitable connection devices (e.g. busbars or links) shall be provided for the termination of all active, neutral and earthing conductors of the Consumer's mains cables and the DistCo's Underground Service Cables.
  (The Responsible Officer shall be consulted regarding the size and type of service cable and method of termination).

- Pillars and cubicles shall be of robust construction. Doors and locking arrangements shall be designed to resist vandalism.
- Access to pillars containing service connection or protection devices only, may be effected by removal of a lift-off cover which shall have locking and securing facilities above ground level for attachment of a padlock supplied by the DistCo. Refer to Clause 5.2.2.
- Access to cubicles containing service connection or protection devices only, shall be by a removable panel or door provided with facilities for locking or sealing by the DistCo as approved by the Responsible Officer. Any removable panel not hinged shall be designed to prevent inadvertent contact with live parts when removing the panel.
- Any pillar or cubicle containing a customer's switchboard, fuses or a DistCo meter shall in addition to the access provided for above, be provided with a lockable hinged door fitted with a "Power Industry Lock" or other approved locking device. (Refer to Clause 1.11.) This door when opened shall not expose any live parts.
- The sealing and locking facilities of Clause 6.3 shall apply for pillars and cubicles.
- Pillars exposed to the sunlight shall be suitably protected against the effects of ultra-violet radiation.
- The electrical apparatus contained within the pillar or cubicle shall be capable of carrying the Calculated Maximum Demand and shall have a fault rating suitable for the magnitude of supply.
- All steel parts shall be galvanised to AS1650 or provided with other forms of protection to prevent corrosion. All welding shall conform to AS1554.1.
- **Where particular pillars and cubicles are intended to be marketed throughout Victoria their designs should be forwarded to the Convenor, Service and Installation Rules Working Group for approval (refer to Foreword for the mailing address).**

(b) Covers of Pillars:

Covers of customer's pillars shall comply with the following:

- The cover shall be totally removable from the base to allow full access to the contents.
- The cover shall be ventilated with a weather-proof air vent having a a minimum area of 1800 mm^2 and providing a degree of protection of IP33 to AS 1939.
- The top of the cover shall be clearly labelled to indicate it contains electrical apparatus, e.g. **ELECTRICITY** - 32 mm high letters. Refer to Clause 1.10 - Labelling.
- The cover shall be non-moisture absorbing and have a high impact resistance.
- The cover shall be constructed of fire-retardant material or be treated to prevent the spread of fire.
- Any live parts exposed when the cover is removed (e.g. bare studs) shall be protected by a shroud extending over the top and below such live parts. This shroud shall be designed to prevent inadvertent contact with live parts during removal of the cover.

(c) Space required inside Pillars and Cubicles for Terminations:

Adequate space shall be provided inside the pillar or cubicle for termination of the DistCo's Underground Service Cable and the consumer's mains. This space requirement will vary according to the size of the cables and the equipment to be installed inside the pillar or cubicle.

The minimum clear space required inside a **pillar** for termination of a DistCo's Underground Service Cable is shown in Fig 5.2.

The minimum clear space required inside a **cubicle** for termination of a DistCo's Underground Service Cable/s is shown in Fig 5.3 or 6.35.

This space is measured from where the cable enters the pillar or cubicle to the point where the Underground Service Cable/s attaches to the customer's termination device (service protection device, busbar, etc) and does not include the equipment itself.

(d) Access to Pillars and Cubicles:

Access to customer's pillars and cubicles shall comply with the following:

- Pillars and cubicles shall be located to provide ready access for maintenance of the equipment contained therein.
- For **pillars**, in general, a minimum clear space of 900 mm shall be maintained on three sides for access, but this may be reduced to 600 mm on any side which does not require access to operate or replace any equipment.
- For **cubicles**, in general, a clear space of 900 mm shall be maintained in front of any access door or panel. Refer to Section 6 of these Rules for space required for access to metering equipment (also refer to the Wiring Rules regarding space in front of switchboards).
- Consideration should be given to the construction of boundary fences and landscaping when locating the pillar or cubicle.
- Pillars and cubicles shall be protected by suitable barriers to prevent damage from vehicular traffic where necessary.

5.4.3.8 Cable Terminations, Joints and Sundry Materials

(a) General

All materials and methods used shall be to the satisfaction of the Responsible Officer.

Conductors shall be colour coded or otherwise marked to clearly and permanently identify each incoming active conductor and the neutral conductor. In the case of polyphase supplies, the active conductors shall be clearly and permanently identified to indicate each phase, i.e. red, white, blue. Any identification as required above shall be located at a position on the cable not likely to be removed when the cable is stripped for termination.

Where heat shrinkable tubing is to be applied to cable ends, the tubing shall be appropriately coloured to indicate the above.

Where the conductor core of a double insulated cable is to be changed in polarity, e.g. red coloured core to be used as a neutral, the cable shall be sleeved with heat shrinkable tubing of appropriate colour over the conductor core for a minimum length of 600 mm or to the entire stripped length whichever is the greater. This shall consist of a minimum layer of medium wall heat shrinkable tubing or two layers of thin wall heat shrinkable tubing.

Note: The Wiring Regulations require the neutral conductor to be coloured black.

(b) Termination at Building (or "Load") End

At the building (meter box) end of the cable, the cable cores or conductors shall be prepared in accordance with Section 6 and shall be separated and insulated as necessary to be ready for connection to the DistCo's apparatus.

Note: Where supplied from Underground Reticulated Distribution, and where a metallic enclosure is employed, particular attention to additional insulation and the earthing requirements of the Wiring Regulations is necessary to the length of consumer's mains between the Consumer's Terminals and the first electrical protective device (fuse or circuit breaker).

Refer to Figure 5.9 - Insulation Requirements for Cable Cores of Consumer's Mains used in URD at Building (or "Load") End.

(c) Pit at Property Boundary

Where the Determined Maximum Demand does not exceed 100 A per phase and the nominated Point of Supply is a pit at the property boundary, the REC shall install the consumer's mains cable complete with enclosure, into the pit. The cable end(s) shall be sealed to prevent the ingress of moisture and shall extend to a minimum of 1.0 m above the lid of the pit. The cables for each installation shall be tied together, identified with a permanent water resistant tag at ground level and left neatly coiled within the pit. The tag shall be permanently marked specifying the lot or street number and street name of the premises it supplies. The lid of the pit shall be replaced.

Cables greater in size than 50 mm^2 shall not enter the pit. Consumer's Mains within the pit shall be single-core insulated and sheathed stranded copper conductor or individual cores of multi-core cable, including neutral screened cable, suitably sheathed with insulating material as shown in Figures 5.10, 5.11 and 5.12.

In the event that no pit abuts the property boundary, the Responsible Officer **SHALL** be consulted. REC's are not permitted to open above ground DistCo pillars, cabinets, etc, unless specifically authorised to do so in a particular case.

(d) Other Arrangements

The termination of Underground Consumer's Mains within DistCo substations, or in circumstances other than specified above, shall be as detailed by and to the satisfaction of the Responsible Officer.

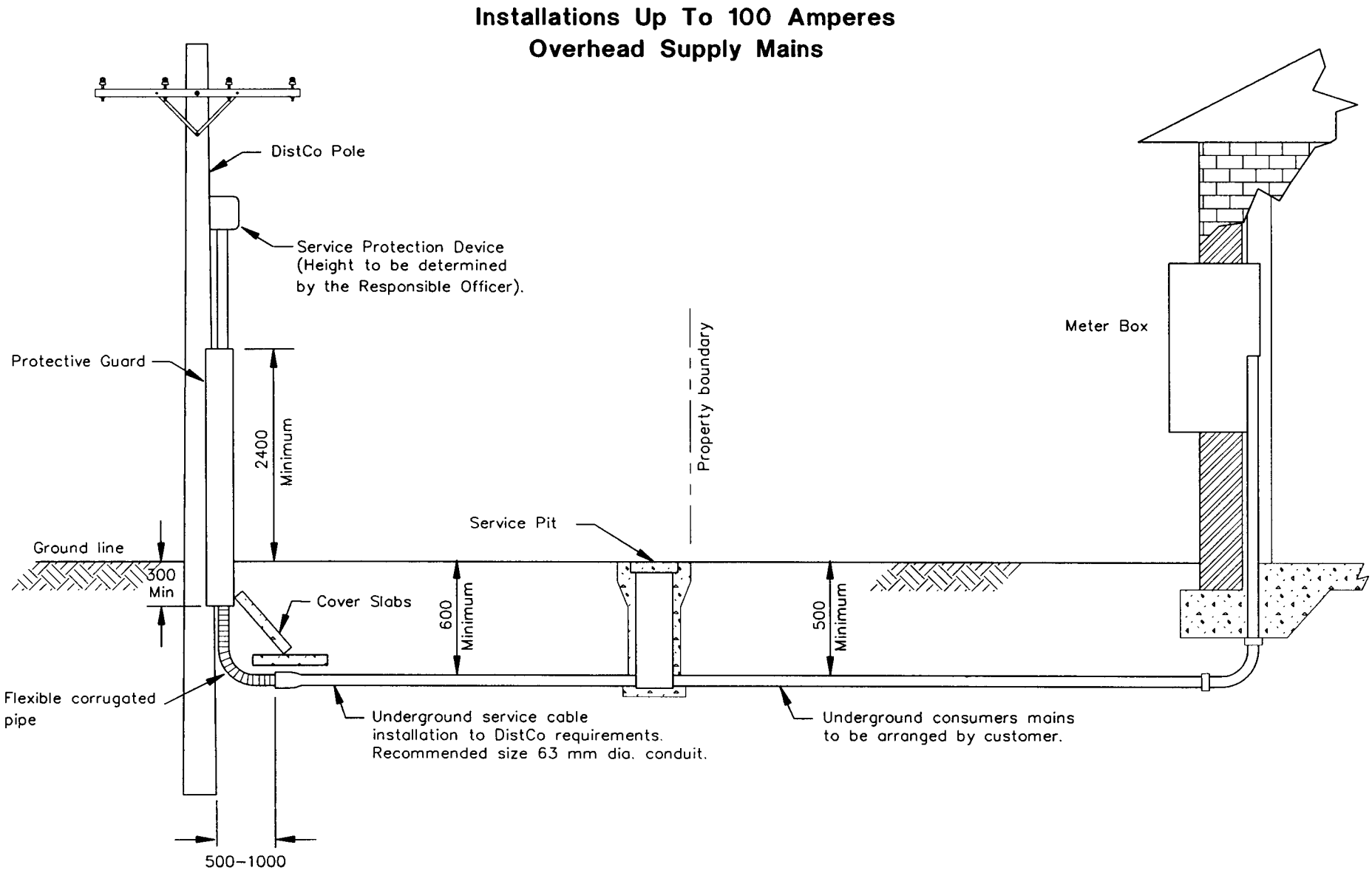
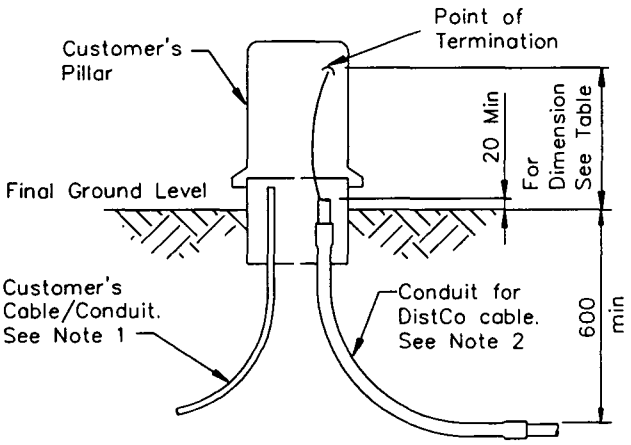
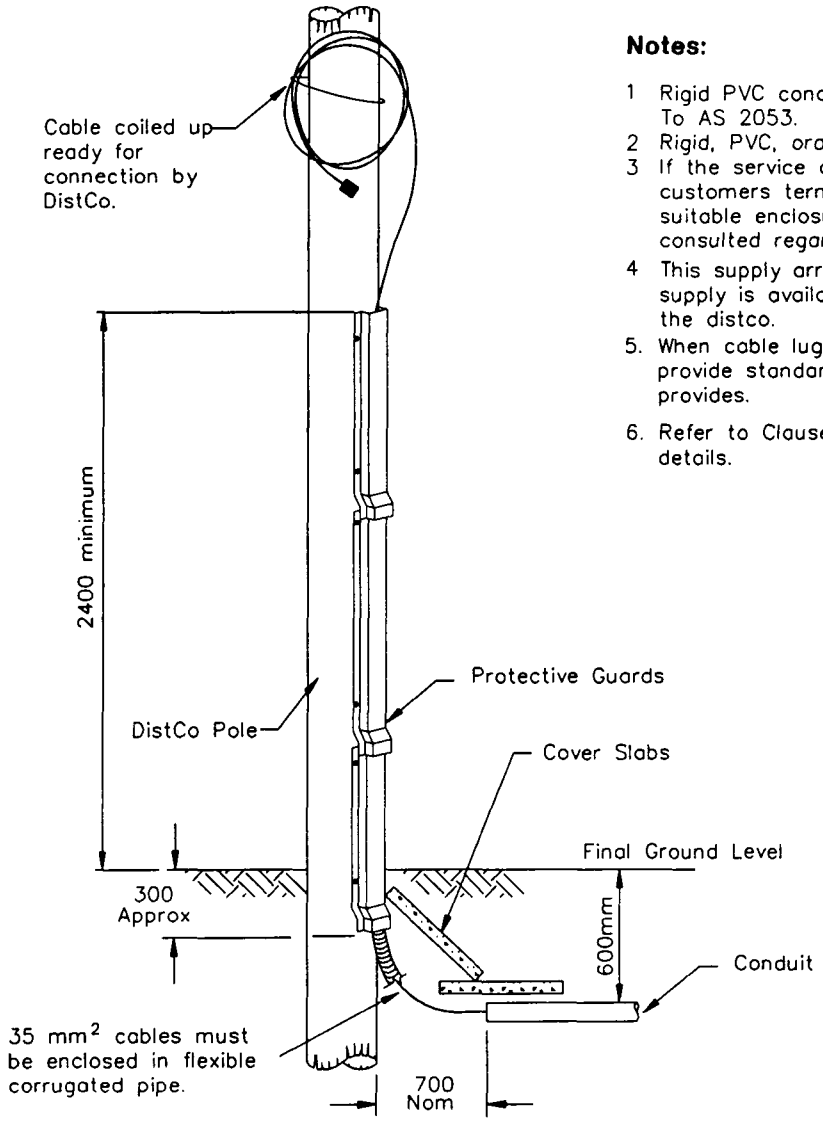


Figure 5.1 Underground Service Cable & Consumer's Mains – Typical Arrangement



Customer's Pillar Detail

DistCo Cable Size	Min. clear space between service cable entry and terminating device	Recommended conduit size for distco cable
35mm^2 CU XLPE	320mm	63mm
50mm^2 CU XLPE	320mm	80mm
185/240 mm^2 ALUM. 4 CORE	450mm	100/150mm

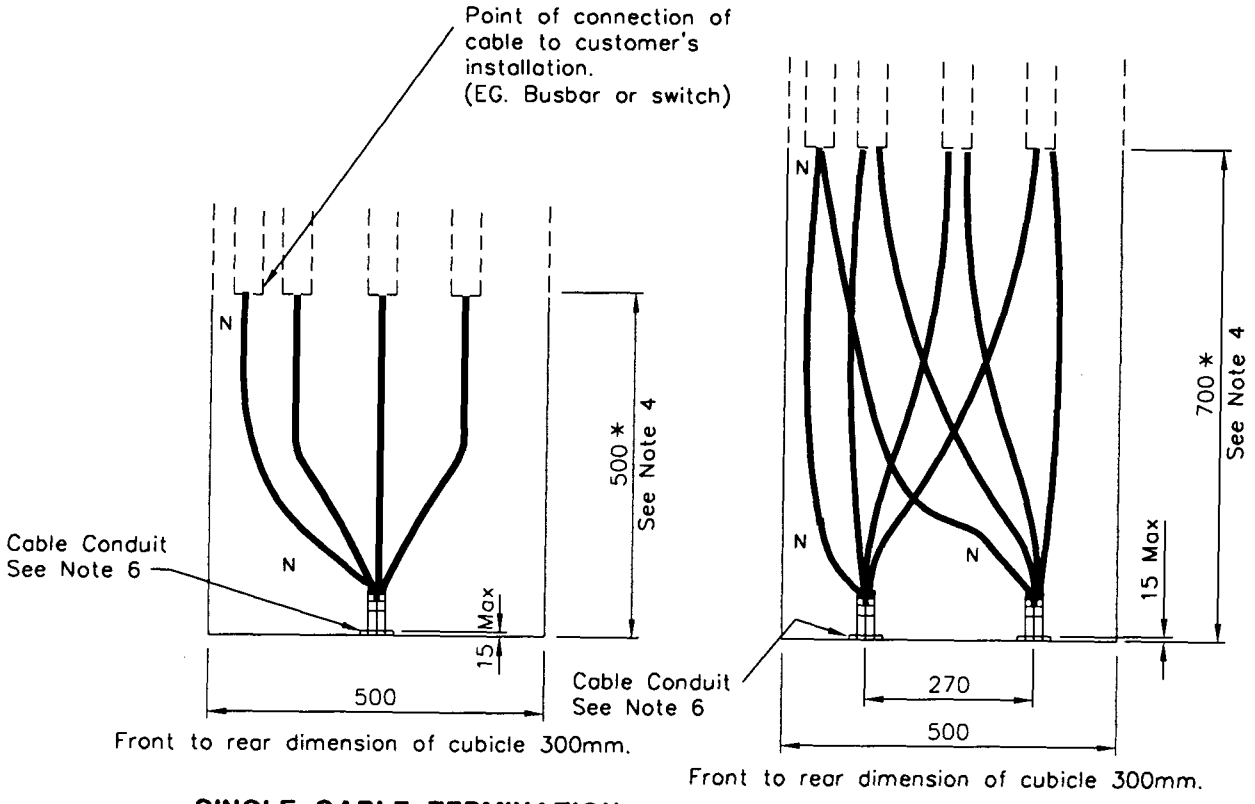


DistCo Pole Detail

Notes:

1 Rigid PVC conduit, underground, orange, heavy duty To AS 2053.
2 Rigid, PVC, orange, large sweep bend to AS 2053.
3 If the service cable is to be terminated at the customers terminals in a switchboard or other suitable enclosure, the Responsible Officer should be consulted regarding the method of termination.
4 This supply arrangement assumes that adequate supply is available and has been negotiated with the distco.
5. When cable lugs are required, the DistCo will normally provide standard cable lugs for the service cable it provides.
6. Refer to Clauses 5.4.3.7. and 5.4.3.8. for further details.

Figure 5.2 Typical U/G Service From O/H Distribution Supply Above 100 Amps - Pole and Pillar Detail

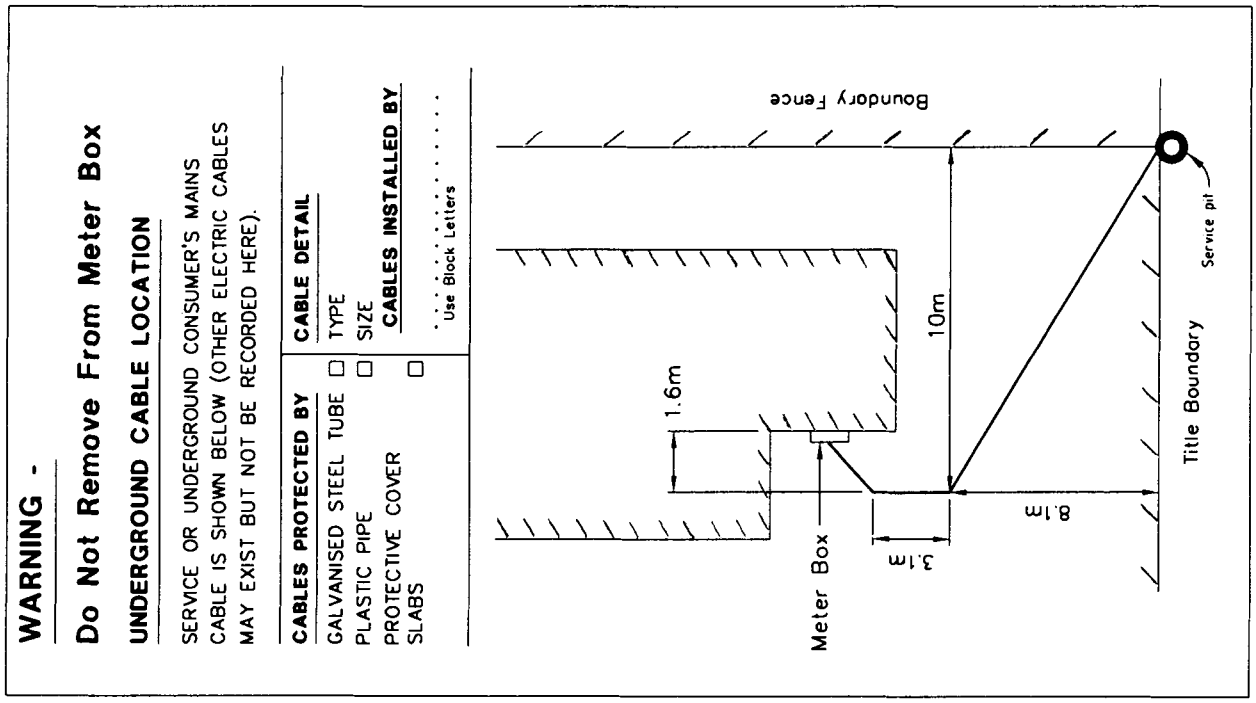


NOTES

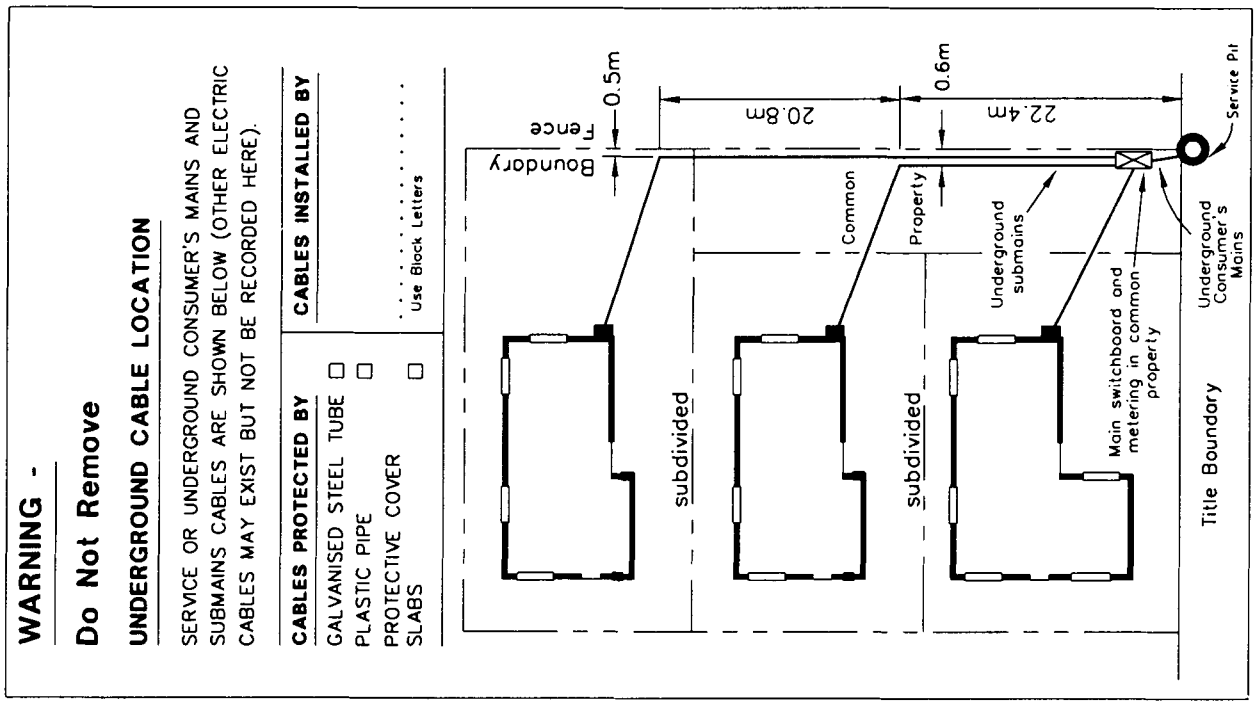
1. The dimensions shown are the minimum required for termination of the cable, and connection to the customer's busbar or switch.
2. Before construction of the switchboard or cubicle is commenced, the contractor/customer should check with the Distco regarding the size and number of cables to be installed to determine the minimum space required.
3. Dimensions shown are for multi core cables up to 240mm^2 4 core solid sector aluminimum conductors.
4. For DMDs up to 170 Amps per phase (50mm^2 cable or less) the dimension shown * may be reduced by 250mm.
5. The cable termination enclosure shall have provision for sealing against unauthorised access.
6. Where cables are installed in conduit, the conduit shall be H.D orange electrical to AS2053.
7. For DMDs up to 170 Amps per Phase the minimum conduit size shall be 80mm Dia. Bends shall be 90 degree large sweep type. For DMDs above 170 Amps Per Phase (185/240mm^2 cable), the minimum conduit size shall be 100mm Dia. Bends shall be large sweep (min radius 760mm).
8. When cable lugs are required, the DistCo will normally provide standard cable lugs for service cable it provides.

Figure 5.3 Dimensions for Cable Terminations in Customers' Cubicles or Switchboards for Terminating DistCo's Service Cables

SINGLE INSTALLATION

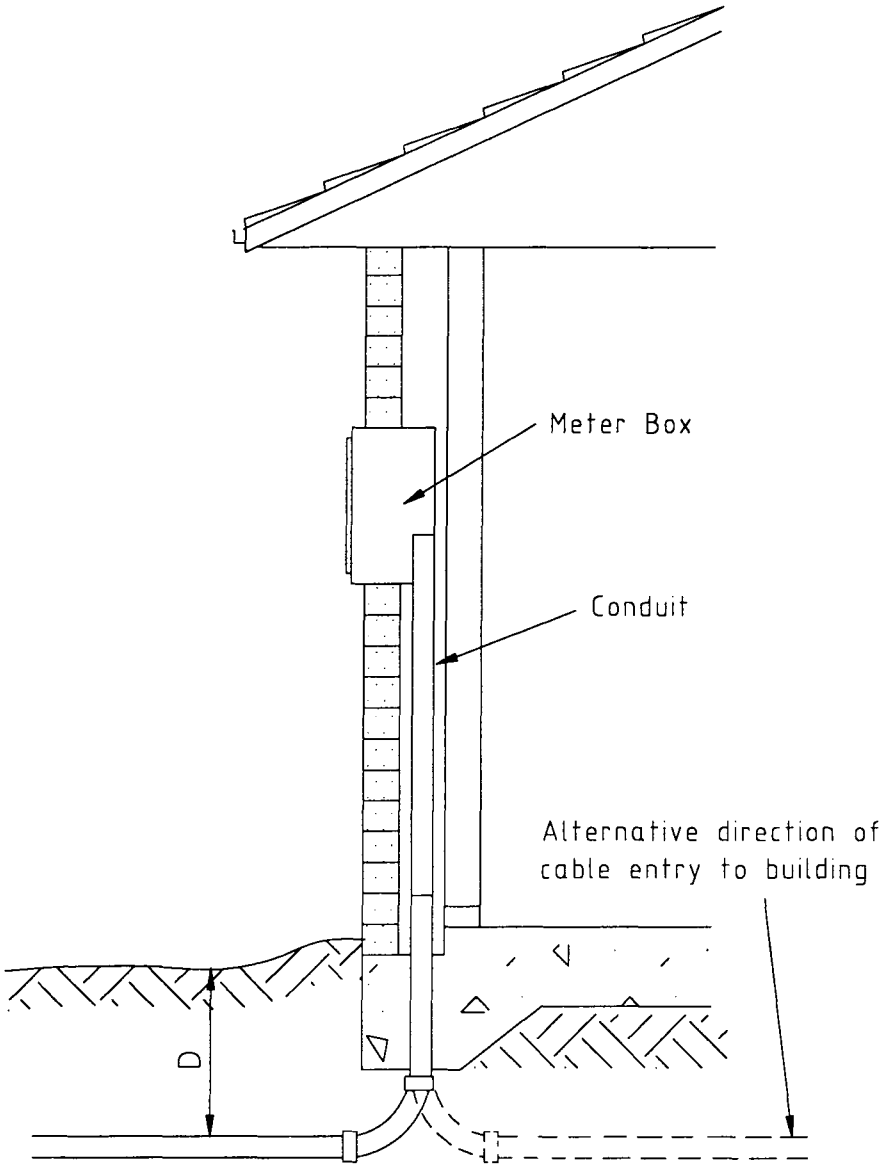


MULTIPLE INSTALLATION



NOTE: Refer to Clause 5.2.3.6(b) regarding recording of underground cables for large multiple installations.

Figure 5.4 Customer's Cable Location Record Cards

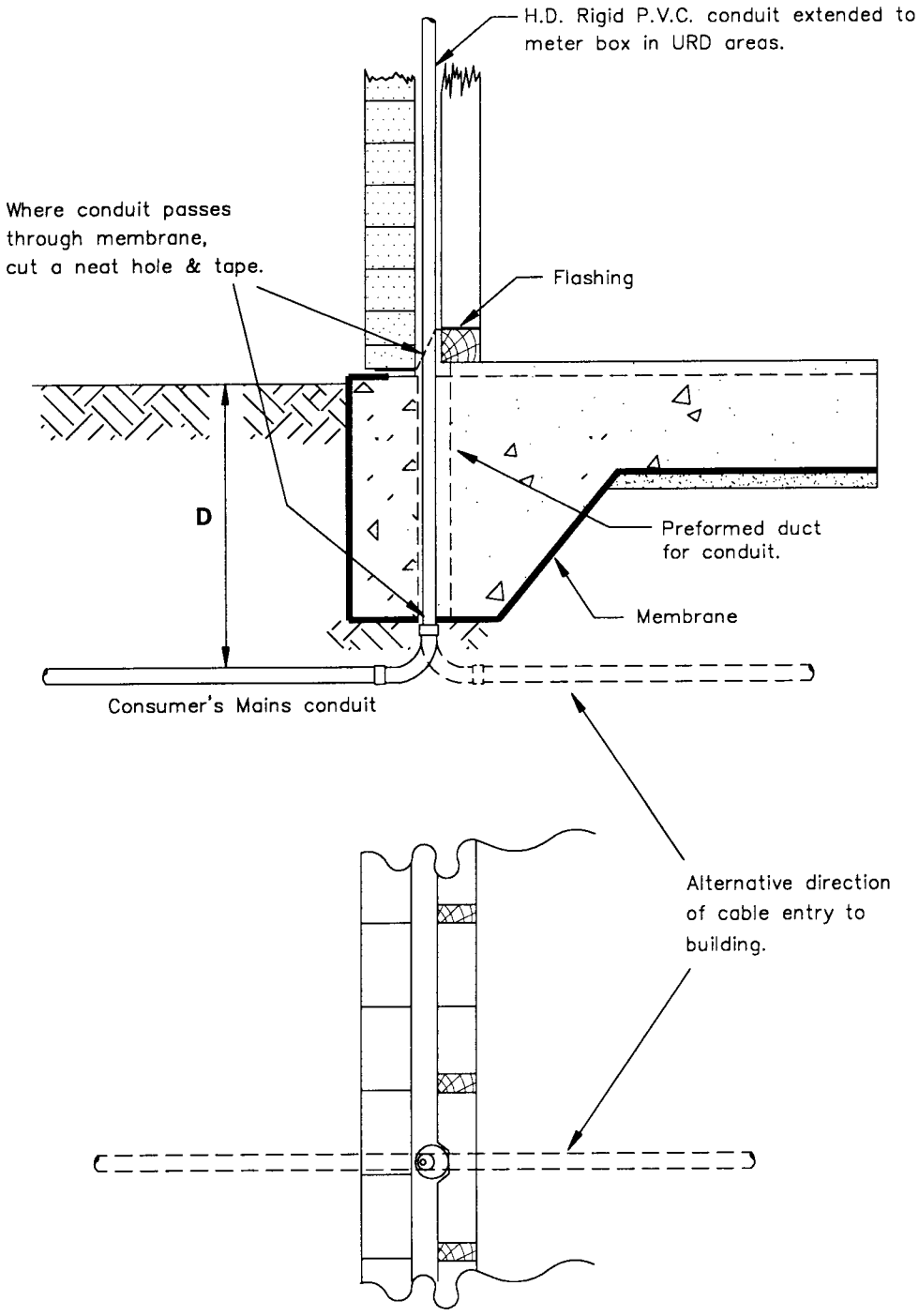


Notes

1. Dimension 'D' shall not be less than the minimum depth of cover specified for the particular wiring system employed. Refer Clause 5.4.3.5(a).
2. In U.R.D. Supply Areas:
   Increased mechanical protection from ground to meter box required in all cases – Refer Clause 5.4.3.6(b).

   Length of cable above ground level shall be the practicable minimum – Refer Clause 5.4.3.1(e).
3. Where no provision has been made for entry through footing, refer to Clause 5.4.3.1(d).
4. **Care must be taken to arrange underground cable enclosures in such a manner as to prevent moisture entering the building via the enclosure; particularly where a pit is installed at a higher level than the entry to the building.**

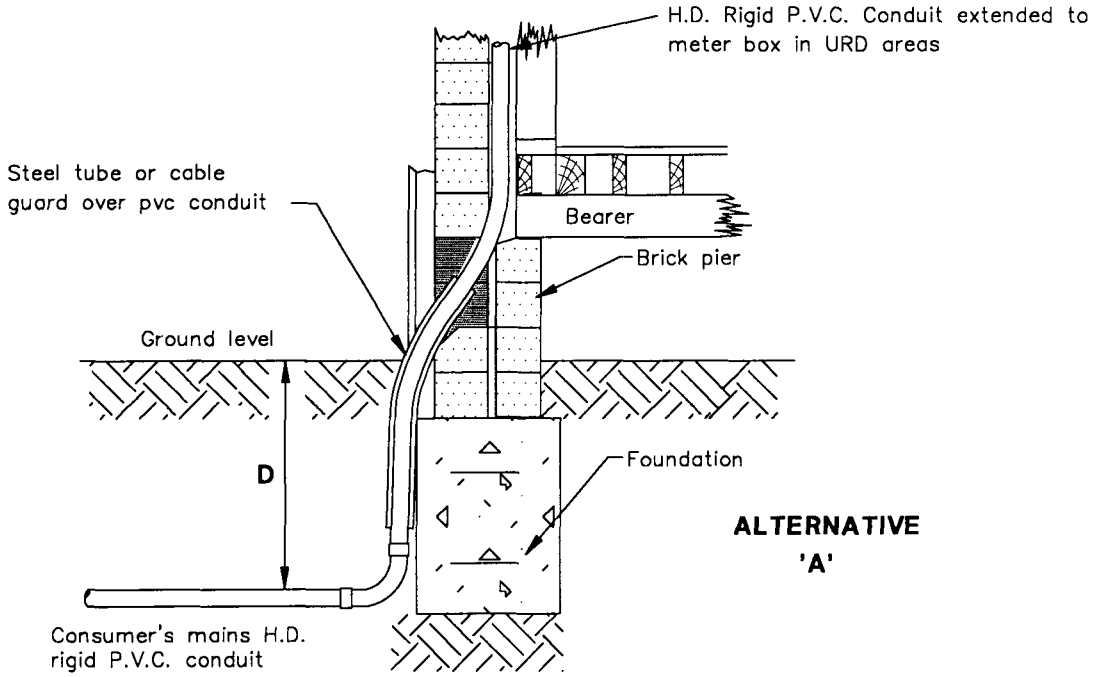
Figure 5.5 Cable Entry to Building



PLAN VIEW

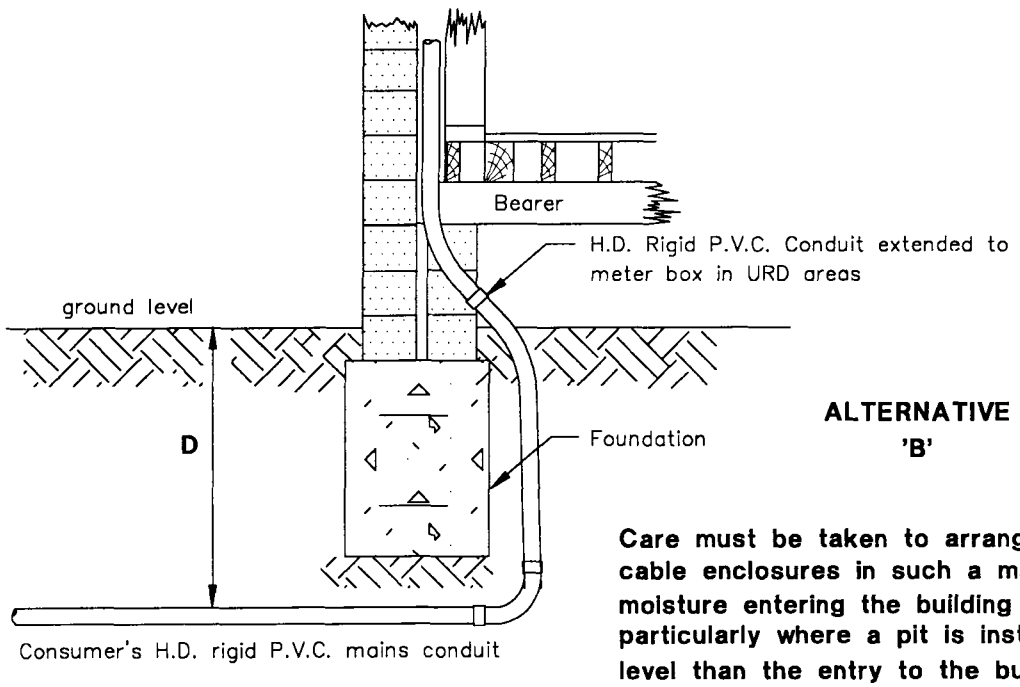
Care must be taken to arrange underground cable enclosures in such a manner as to prevent moisture entering the building via the enclosure; particularly where a pit is installed at a higher level than the entry to the building.

Figure 5.6 Cable Entry Details



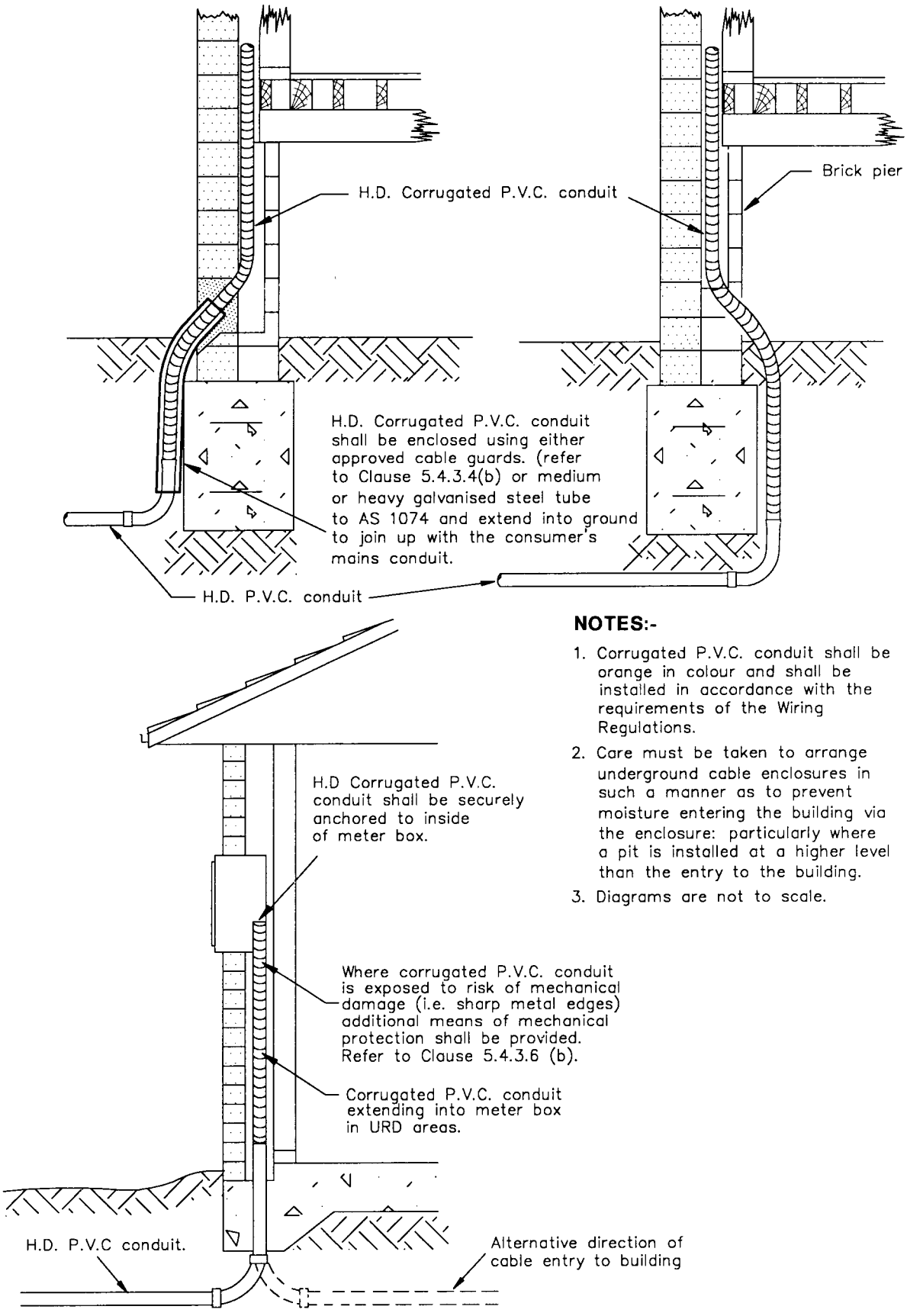
NOTE:

Dimension 'D' shall be not less than the minimum depth of cover specified for the particular wiring system. Refer Clause 5.4.3.5(a).



Care must be taken to arrange underground cable enclosures in such a manner as to prevent moisture entering the building via the enclosure; particularly where a pit is installed at a higher level than the entry to the building.

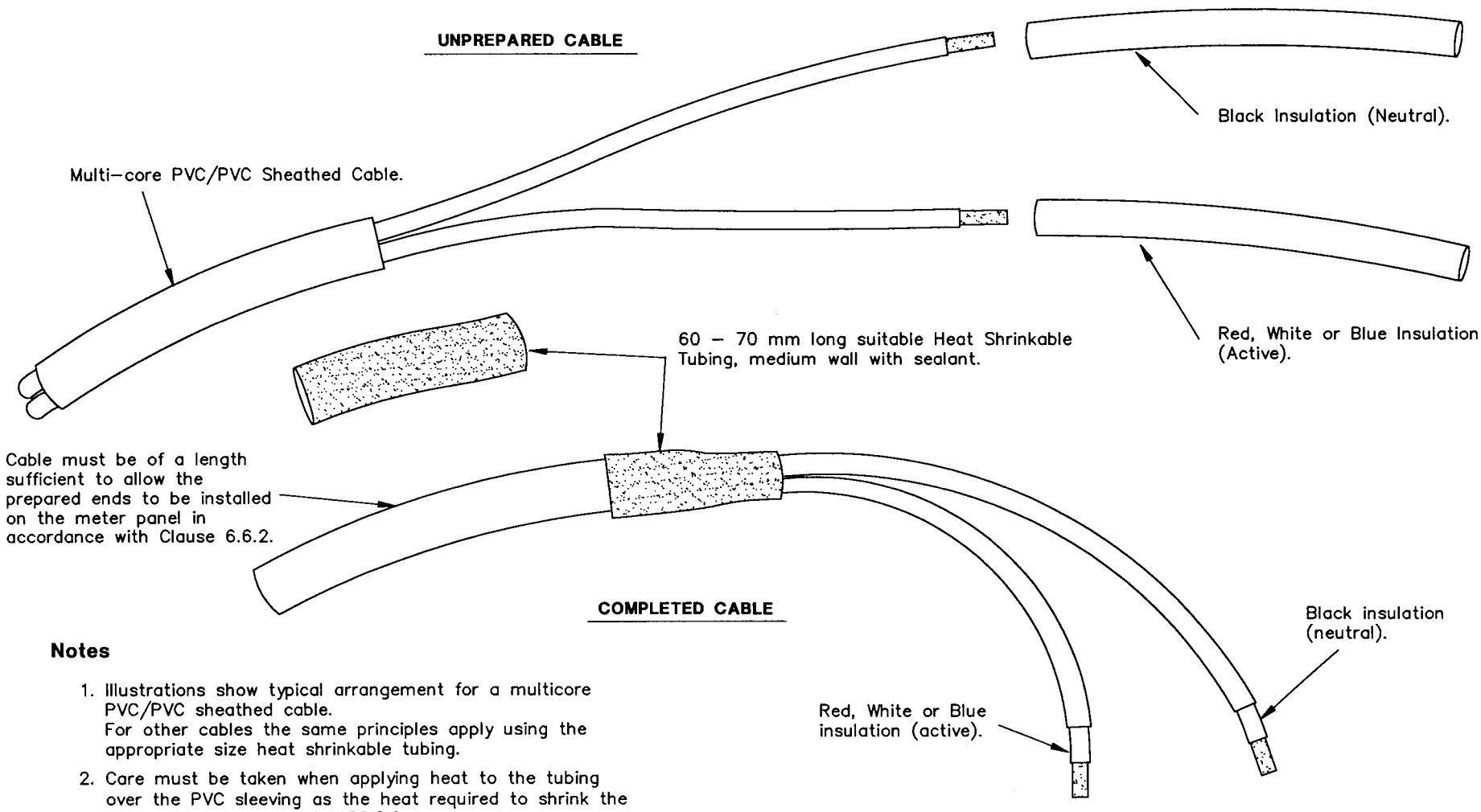
Figure 5.7 Alternative Cable Entries to Building



NOTES:-

1. Corrugated P.V.C. conduit shall be orange in colour and shall be installed in accordance with the requirements of the Wiring Regulations.
2. Care must be taken to arrange underground cable enclosures in such a manner as to prevent moisture entering the building via the enclosure: particularly where a pit is installed at a higher level than the entry to the building.
3. Diagrams are not to scale.

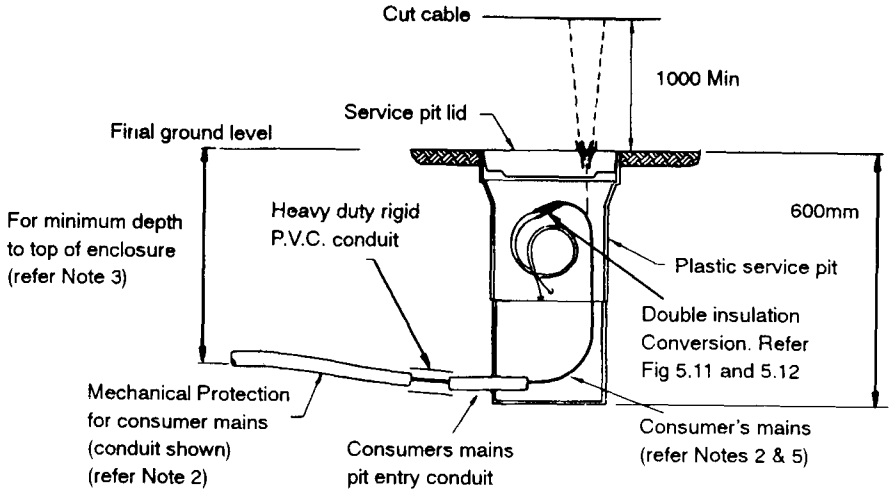
Figure 5.8 Alternative Cable Entries to Building Using Corrugated Conduit



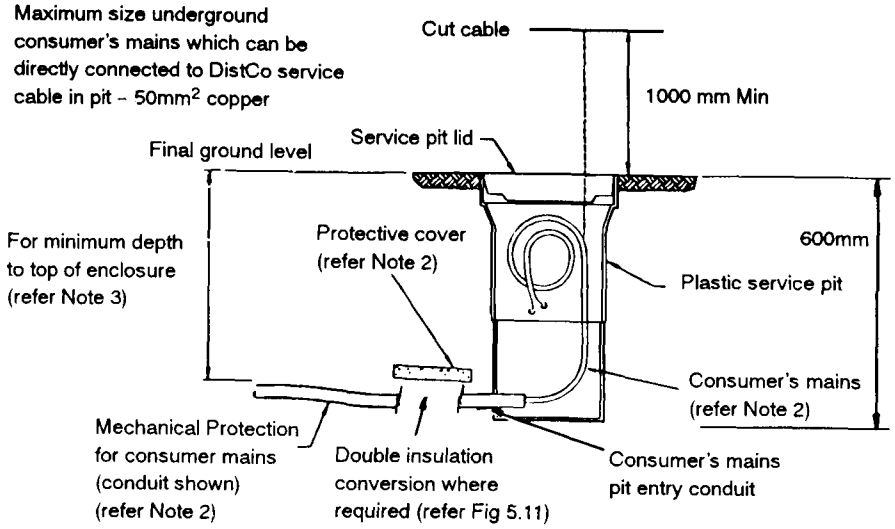
Notes

1. Illustrations show typical arrangement for a multicore PVC/PVC sheathed cable.
   For other cables the same principles apply using the appropriate size heat shrinkable tubing.
2. Care must be taken when applying heat to the tubing over the PVC sleeving as the heat required to shrink the heat shrinkable tubing is 120 ° C.
3. Double insulation of each core shall butt right up to the fuse and neutral link behind the Meter Panel.
   Refer to Note in Clause 5.4.3.8(b).

Figure 5.9 Insulation Requirements for Cable Cores of Consumer's Mains Used in URD Areas at Buildings (or "Load") End



Detail A Multi-core - (up to 16mm^2) Consumer's Mains

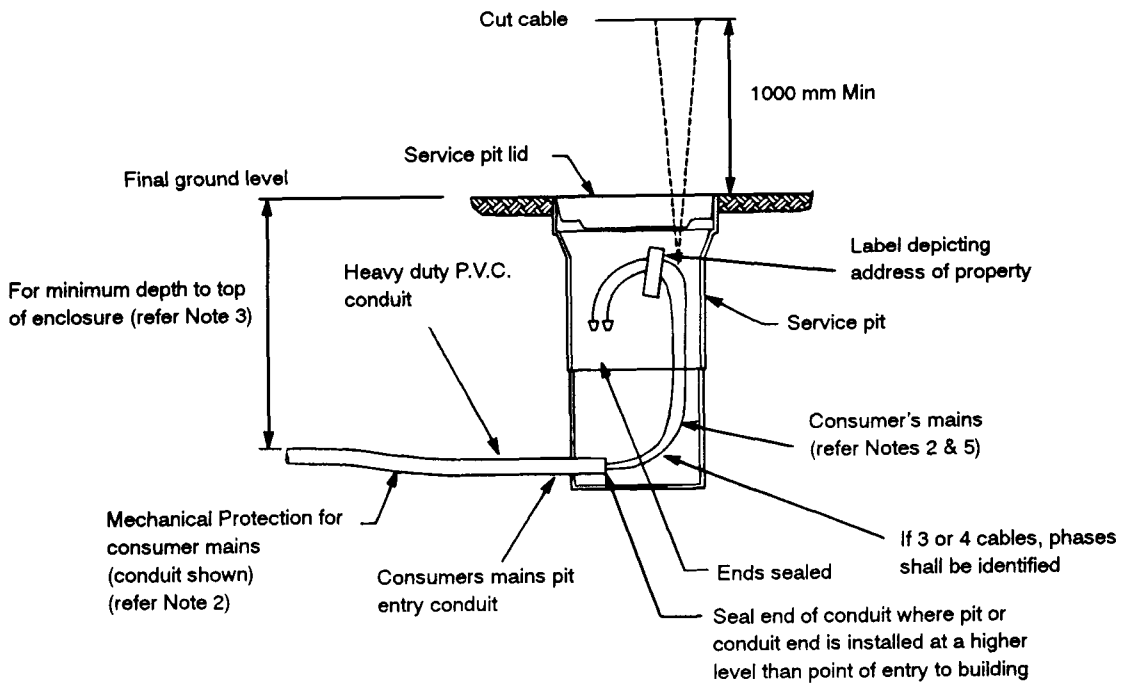


Detail B Multi-core - (above 16mm^2) Consumer's Mains

NOTES:

1. **WARNING - Cables in pit are live and Electrical Mechanics shall adopt safe working practices while carrying out any work in the pit.**
2. In these drawings particular approved items are shown, however the use of other materials may be permissible in accordance with Note 3 below.
3. Consumer's Mains (type of cable and installation requirements) shall be in accordance with Clause 5.3 and 5.4 of these Rules.
4. The DistCo service cable has been omitted from these drawings for clarity.
5. To provide the double insulated tails for multi-core (insulated and sheathed) Consumer's Mains up to 16mm^2 it is permissible to prepare the cable for connection in the pit at a point one metre from the end of the Consumer's Mains (refer Figure 5.12).
6. To provide the double insulated Consumer's tails for multi-core cable (greater than 16mm^2) the reconstruction of the Consumer's Mains shall be made at the base of the pit (refer Detail 'B' and Figure 5.11).
7. Heat shrinkable tubes applied to provide double insulated tails shall comprise one continuous length from conversion point to core ends.
8. **The maximum size of the double insulated tails which can be accommodated in the pit is 50mm^2.** Where Consumer's Mains need to be greater than this size (e.g. volt drop considerations), the cable must be reconstructed outside and adjacent to the pit to provide 50mm^2 or less double insulated tails in pit. Where customer's Determined Maximum Demand (DMD) is greater than 100 amps, consumer's mains cable shall be terminated in a pillar or cubicle supplied by the customer or on customer's switchboard unless otherwise approved by the DistCo's Responsible Officer (refer Clause 5.4.1.3.)
9. Electrical Mechanics shall -
   - A Lift service pit lid;
   - B Push Consumer's Mains through pit entry conduit into pit (Electrical Mechanic shall not pull Consumer's Mains or draw wire through the service pit);
   - C Cut Consumer's Mains a minimum of 1000mm above final ground level, convert if necessary and seal end to exclude moisture (refer Note 5);
   - D Coil Consumer's Mains in pit, and
   - E Replace service pit lid.
10. Details for preparation of neutral screened and multi-core cables in service pit (refer Figure 5.12).

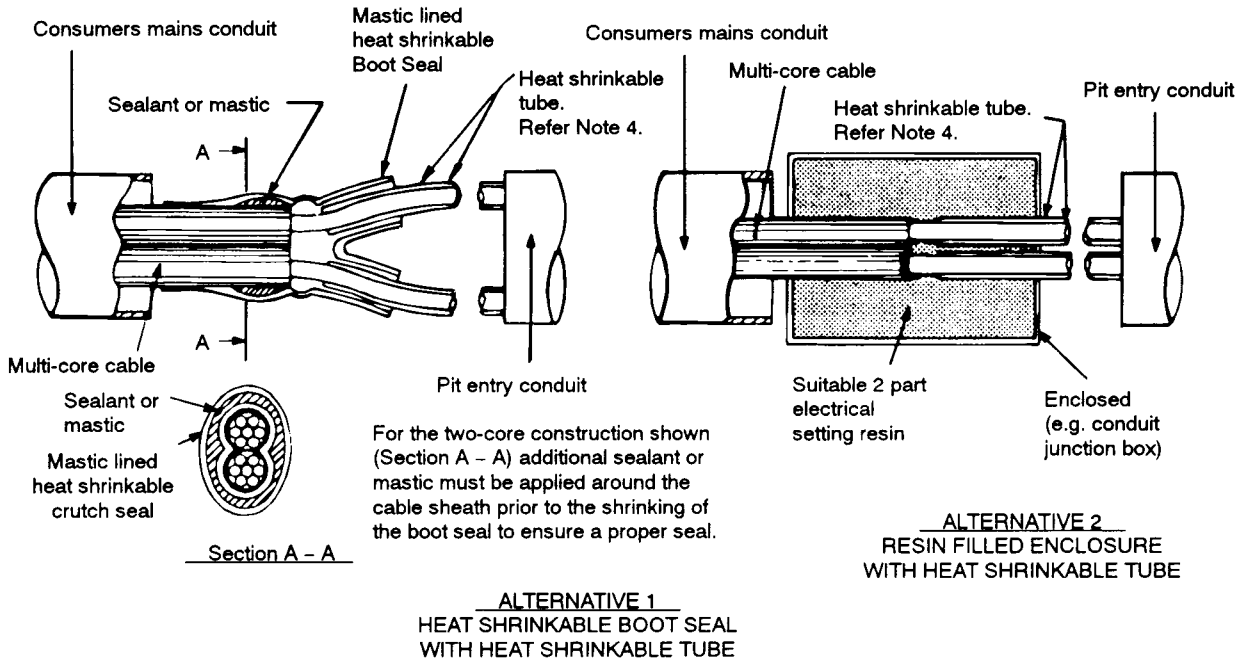
Figure 5.10 Service Pit - General Arrangement



Detail C

(no need for heat shrink at either end)

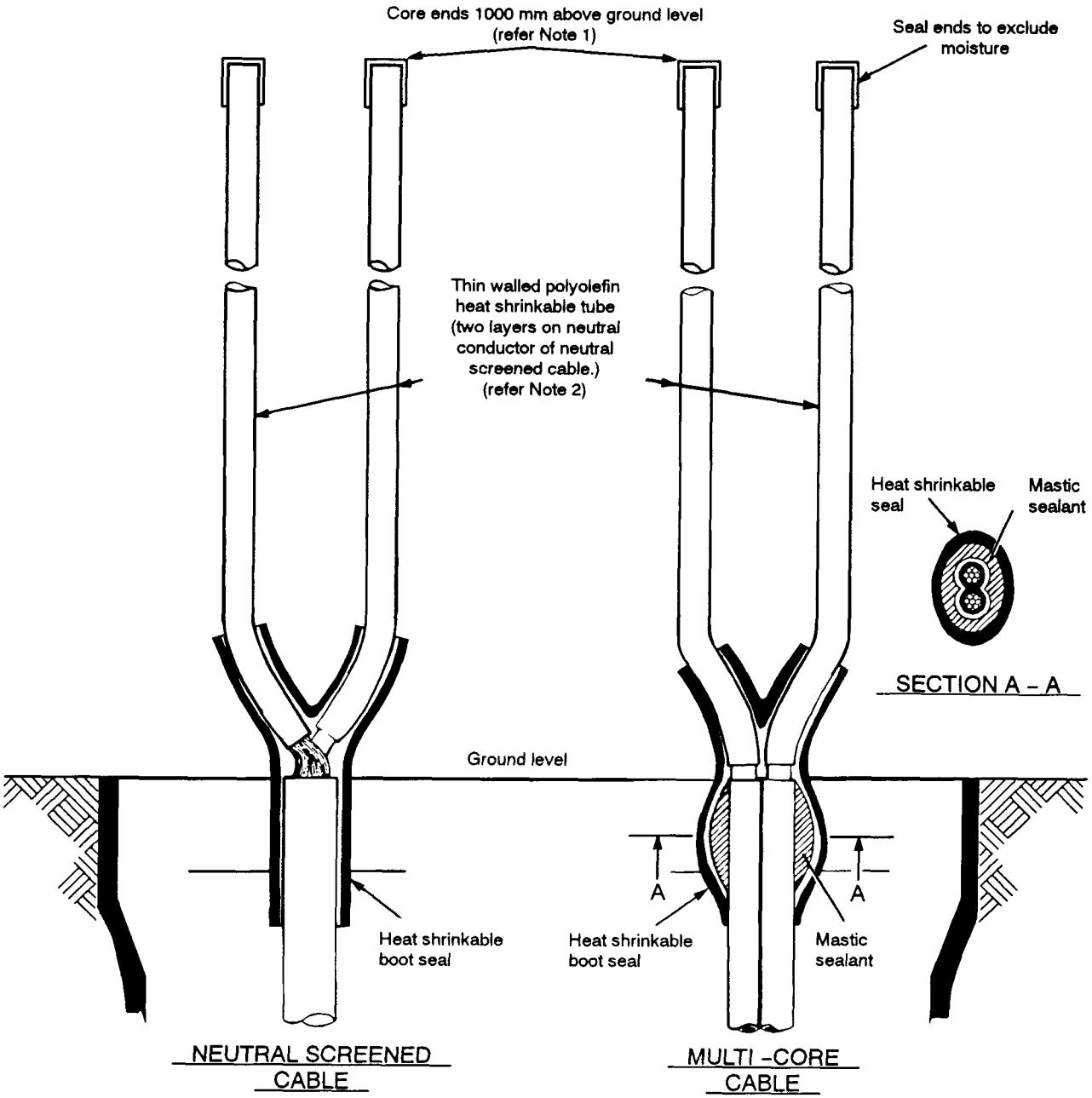
Figure 5.10/1 Service Pit – Single Double Insulated Consumer's Mains up to 50 mm^2



NOTES:

1. Alternatives 1 & 2 are two methods approved by the DistCo. Other methods may be accepted, however, prior approval from the DistCo shall be obtained.
2. The methods represented above show the reconstruction of the consumer's mains outside the pit. For up to 16mm^2 multi-core cable, this can be applied inside the pit (refer to Figure 5.10) however, only the heatshrink method would be acceptable at this point.
3. The discontinuity in the conduits shown above will require further mechanical protection, e.g. concrete cover slabs.
4. Heat shrinkable tube to extend for full length of cable in the pit. Refer to Clause 5.4.3.8(a) for colour coding of multi-phase supplies.
5. Heat shrink tubings shall be flame retardant polyolefin with minimum recoverable wall thickness to DistCo requirements.

Figure 5.11 "Double" Insulation of Consumer's Mains at Pit



NOTES:

1. All Consumer's Mains cores shall have a minimum length of 1000 mm above ground level.

   For Builder's Supply Consumer's Mains, the core ends may extend to a maximum of 2000 mm above ground level.

2. Heat shrink tubings shall be flame retardant polyolefin with minimum recoverable wall thickness to DistCo requirements.

3. Refer to Figure 5.10 for Consumer's Mains greater in size than 16 mm^2.

4. Heat shrinkable tube to extend for the full length of stripped cable in the pit. Refer to Clause 5.4.3.8(a) for colour coding of conductors.

Figure 5.12 Preparation of Underground Consumer's Mains up to 16 mm^2 in Service Pit

Installations Up To 100 Amperes Overhead Supply
DistCo Pole or Substation on Customer's Property

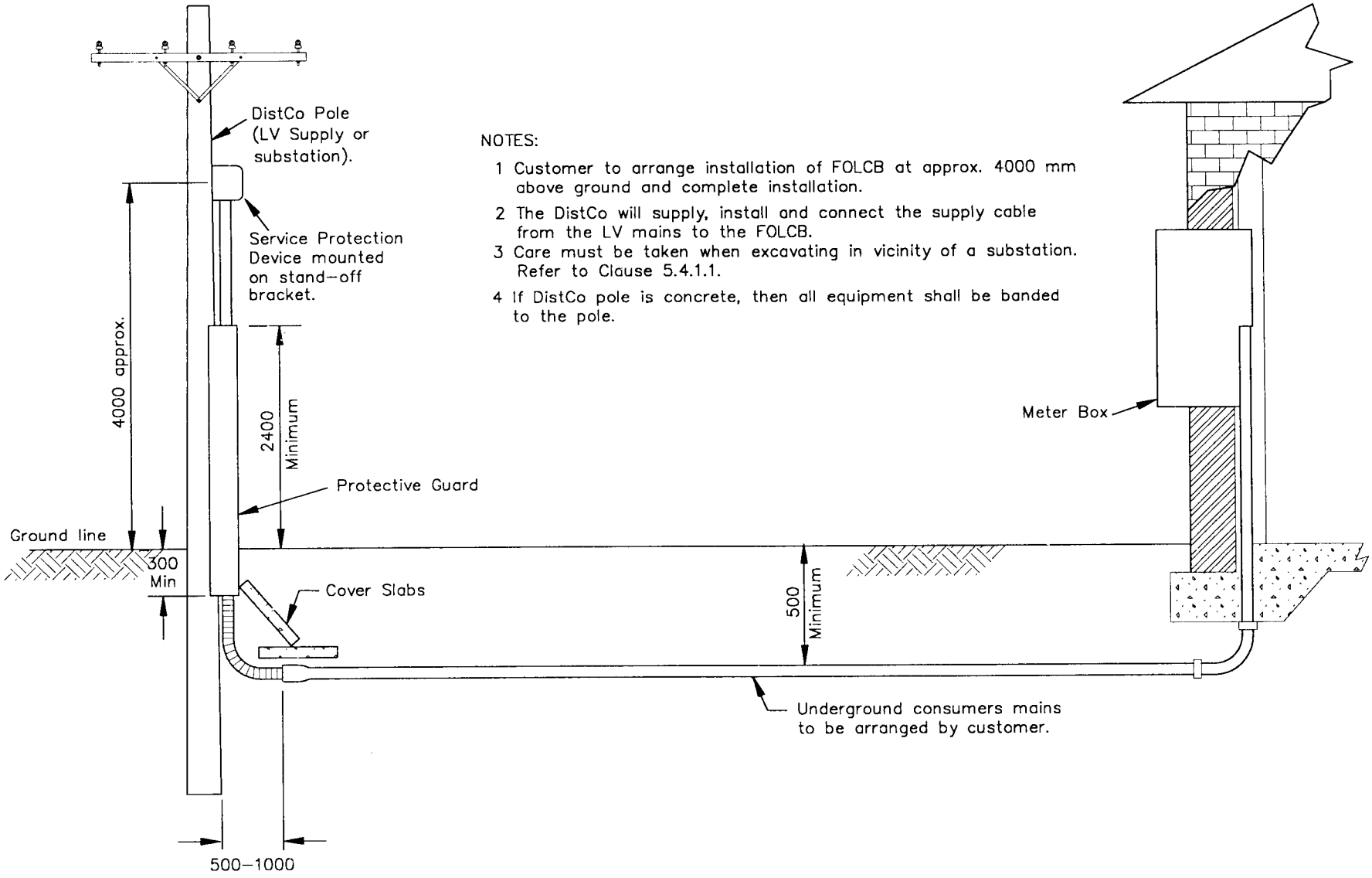


Figure 5.13 Underground Consumer's Mains Cable, Typical Arrangement

5.5 Overhead Supplies

5.5.1 Aerial Service Cables

5.5.1.1 General

Where, in accordance with Clauses 5.1.1 & 5.1.2, an aerial service cable is permitted, the DistCo will supply one span of aerial service cable which shall terminate within the customer's property at a point of attachment located up to 20 m from the property boundary and not further than 45 m from the DistCo pole outside the property provided **all** clearances detailed in Fig. 5.14 can be maintained. The Responsible Officer will determine the route of the service cable and approve the position of the point of attachment to the building, pole or structure.

Note: Maximum size Aerial Service Cable is 95 mm^2. For supplies above 170 A see Clause 5.4.2.2.

5.5.1.2 Point of Attachment (POA)

The POA of an aerial service cable to a customer's installation shall be selected with regard to the details provided in Figures 5.14 and 5.15 and the notes therein. If any of the requirements for locating a POA as described in Figure 5.15 (items 1 to 7)) cannot be met, then the consumer's mains shall be installed underground. The REC must negotiate servicing arrangements with the DistCo.

Notes:

- In the case of a substantial electrical load or an installation on a corner allotment having alternative Points of Attachment from separate streets, the Responsible Officer shall be consulted.
- Services from urban pole type substations should be avoided wherever practicable.
- The possibility of the pole being relocated in the future should also be given some consideration in determining the POA.

5.5.1.3 Fixing for Aerial Service Cable at POA

The customer shall provide and install a suitable service bracket having adequate fixing at the POA for an aerial service cable. Bolts extending through timber fascia or brick walls, into suitable fixings, shall be used where necessary. Any service bracket provided shall be of an approved type, and shall, in general, have an installed safe working load capacity of 2 kN. However, a service raiser bracket having an installed safe working load capacity of 1 kN is acceptable where the attached span of aerial service cable does not exceed 45 m in route length and does not comprise more than two conductors.

Any non-approved service brackets shall -

- have their design certified by a qualified structural Engineer and the computations shall be provided to the DistCo as appropriate. Commercially manufactured brackets shall have their design and computations submitted for approval to the appropriate Nominated Officer as detailed in Clause 1.5.

  Note: The computations shall allow for a maximum working load of 2 kN for all service brackets except for service raiser brackets suitable for 2 conductor service cable where the maximum working load shall be 1 kN. These computations shall allow for the maximum working load being applied to the side of the bracket for all angles up to 60° from the centreline of the bracket.

- be hot dipped galvanised after fabrication to AS 1650.

A range of suitable commercially available brackets and fixing arrangements are shown in Figures 5.16, 5.17 and 5.18.

5.5.1.4 Clearances of Aerial Service Cables

The clearances of aerial service cables above ground and to other structures, etc, shall be as detailed in Figures 5.14 and 5.15. **Minimum clearances shall not be reduced by subsequent building alterations carried out on the premises. Refer Clause 5.4.2.2.**

5.5.1.5 Tree Clearances from Aerial Service Cables

The customer is responsible for ensuring that any tree or other vegetation on the customer's property is kept pruned to maintain not less than the minimum clearance from any aerial service cable supplying the customer's premises as specified in the appropriate Table of the Code of Practice for Tree Clearing.

Note: For clearances of less than 1.0 m from an INSULATED service cable reference should be made to the Code of Practice for Tree Clearing.

5.5.1.6 Failure to Maintain Prescribed Clearances

If the customer should fail to maintain the clearances prescribed in Clause 5.5.1.5 above, the DistCo may at any time, and at the customer's expense, remove any tree or limb on the customer's premises which may endanger the safety or effectiveness of the aerial service cable.

5.5.2 Aerial Consumer's Mains (including Private Overhead Electric Lines)

In general, the Chief Electrical Inspector and the DistCos require that all private electric lines (i.e. consumer's mains, submains or final subcircuits) proposed to be constructed or to be substantially reconstructed **shall be placed underground** except that overhead lines may be constructed and/or maintained in any of the following circumstances -

(a) Where a private electric line is located in an urban area not considered a bush or grass fire hazard (Category 1 Area). (The local DistCo office will advise of areas so considered.)

(b) Where an existing private overhead electric line involving one or more private poles is located in an area considered to be a bush or grass fire hazard (Category 2 Area), but required maintenance DOES NOT involve substantial reconstruction. (Substantial reconstruction includes re-conductoring and/or replacement of more than 30% of poles in a line).

(c) Where substantial economic difference or construction and technical problems can be substantiated, the Chief Executive Officer (CEO)/Managing Director (MD) for the area concerned will consider a written application for approval of construction or maintenance of an overhead private electric line, other than (a) or (b) above. Such application must be submitted at least **TEN WORKING DAYS BEFORE** the proposed date of commencement of work.

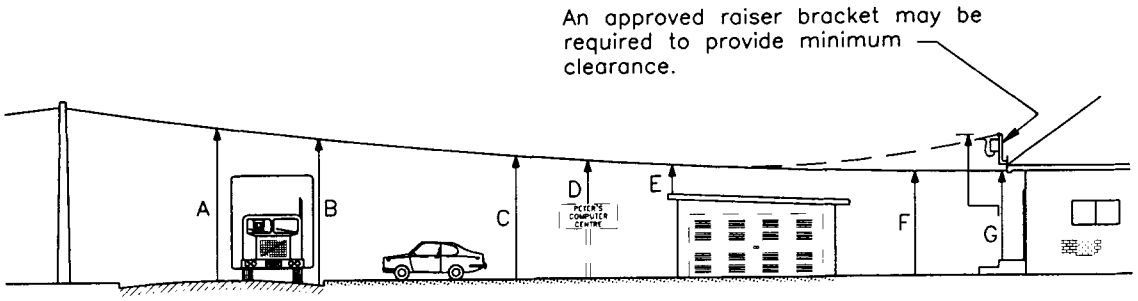
Private Overhead Electric Lines, where permitted, shall be installed and maintained to the requirements of Appendix B of these Rules and the Wiring Regulations.

Notes:

- Where a defect notice is issued, and before proceeding with repairs or modifications to existing aerial consumer's mains or private poles, the customer's REC must ascertain from the DistCo whether the line must be placed underground and whether the method of supply to the property is to be altered in any way.
- In rural areas of Victoria aerial cables are liable to attack by birds, particularly the parrot family. In these areas, advice should be sought from the local DistCo office if the use of an aerial cable is being considered.
- Appendix C is a guide to assist the LEM with polarity testing following repairs to Aerial Consumer's Mains or other circuits.
- Any timber pole marked with an "X" cut into or marked on the surface has a limited life and must therefore be considered unsafe to climb or support a ladder.

CLEARANCES FOR THE TERMINATING SPAN

For an aerial service in a span terminating at the Point of Attachment, the following clearances shall be maintained under the worst operating conditions of temperature, wind and electrical loading.



A.	Above a public roadway – Centre of roadway	5.5m
B.	Above a public roadway – At the kerbline of:– (Refer Melway street directory, for definitions)	
	• Primary arterial roads, main highways, over dimensional routes.	5.5m
	• Secondary arterial roads, collector roads	4.9m
	• Other roads,	4.6m
	• Freeway crossings are not normally permitted.	
C.	Above customer's property – Over driveway	3.9m
D.	Structure or part of building on which a person cannot stand eg. sign, mast, blank wall.	0.6m
E.	Where the service cable passes over but is not attached to any part of a building or structure not normally accessible but on which a person may stand eg. car–port, pergola. Refer Note 2.	2.7m
F.	Above customer's property – Elsewhere	3.0m
G.	At Point of Attachment	3.0m

Notes

1. Wherever practicable services should be located to avoid crossing driveways and structures.

2. Where the Point of Attachment is directly above a verandah, the vertical clearance may be reduced to 0.6m.

3. A conductor drip loop of not more than 250mm is permissible below Point of Attachment.

4. Special consideration should be given to areas within customer's property where large vehicles or machinery may be used eg farms. In general, a minimum clearance above these areas of 5.5m should be maintained.

5. If the above requirements cannot be met, the Responsible Officer must be consulted regarding the method and conditions of supply.

Figure 5.14 Insulated Service Cable Clearances for Terminating Span

REQUIREMENTS:

1 The POA shall not be located in dotted area.

2 The maximum POA height should not exceed 6 metres and shall permit work to be performed conveniently with access provided by ladder.

3 Access to "stick – operated" service fuse/s shall be available to allow ready operation from ground level with a fuse operating stick.

4 The POA shall not be within areas accessible from the boundary of balconies measured 0.9m radially from such boundaries up to a height of 3.0m above the surface normally accessible for pedestrian traffic or resort.

5 For opening windows & doorways: –

(a) Top of window/door less than 2.7m above floor level: –

POA shall not be within an area 0.9m from bottom and sides of window/door and extending to 3.0m above floor level.

(b) Top of window/door greater than 2.7m above floor level: –

Under 3.0m from floor level, POA shall not be within 0.9m from sides and bottom of window/door.

Above 3.0m from floor level, POA shall not be within 0.3m from sides and top of window/door.

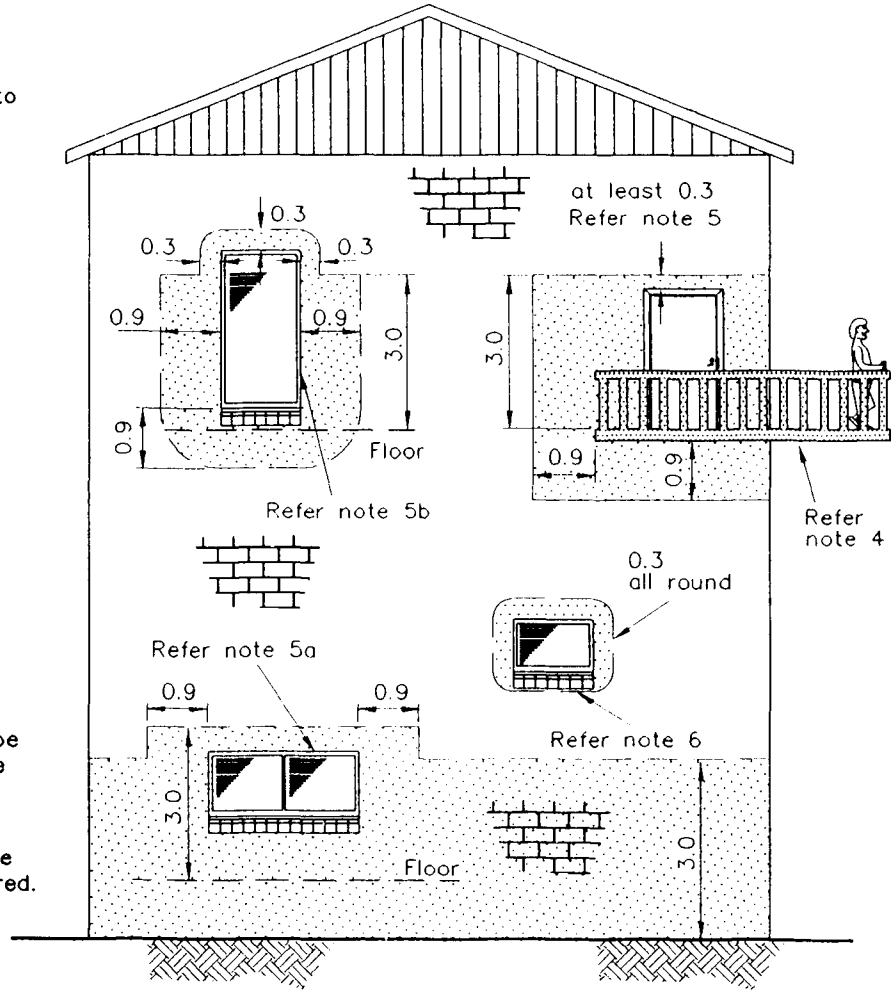
6 For non–opening windows, POA shall not be within 0.3m from the window.

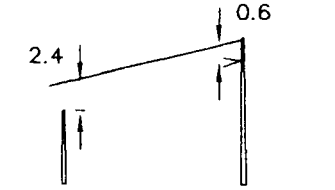
7 Unless a more practical location is available which will satisfy all other conditions, the POA shall be located on the foremost portion of the structure facing the LV supply mains.

8 If any of the above requirements cannot be met the consumer's mains shall be installed underground. The REC must negotiate servicing arrangements with the DistCo.

9 The POA where practical, should be located to avoid the crossing of adjacent properties, roofs and verandahs, etc. Where this cannot be readily achieved, the Responsible Officer must be consulted as an underground supply may be required.

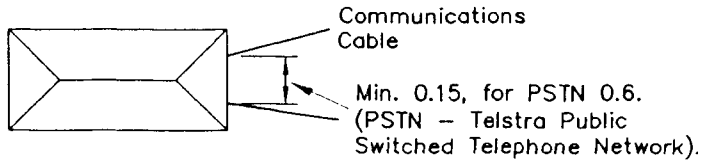
10 All dimensions in metres.





Over street traction wires and conductors or approach to communications poles where unattached.

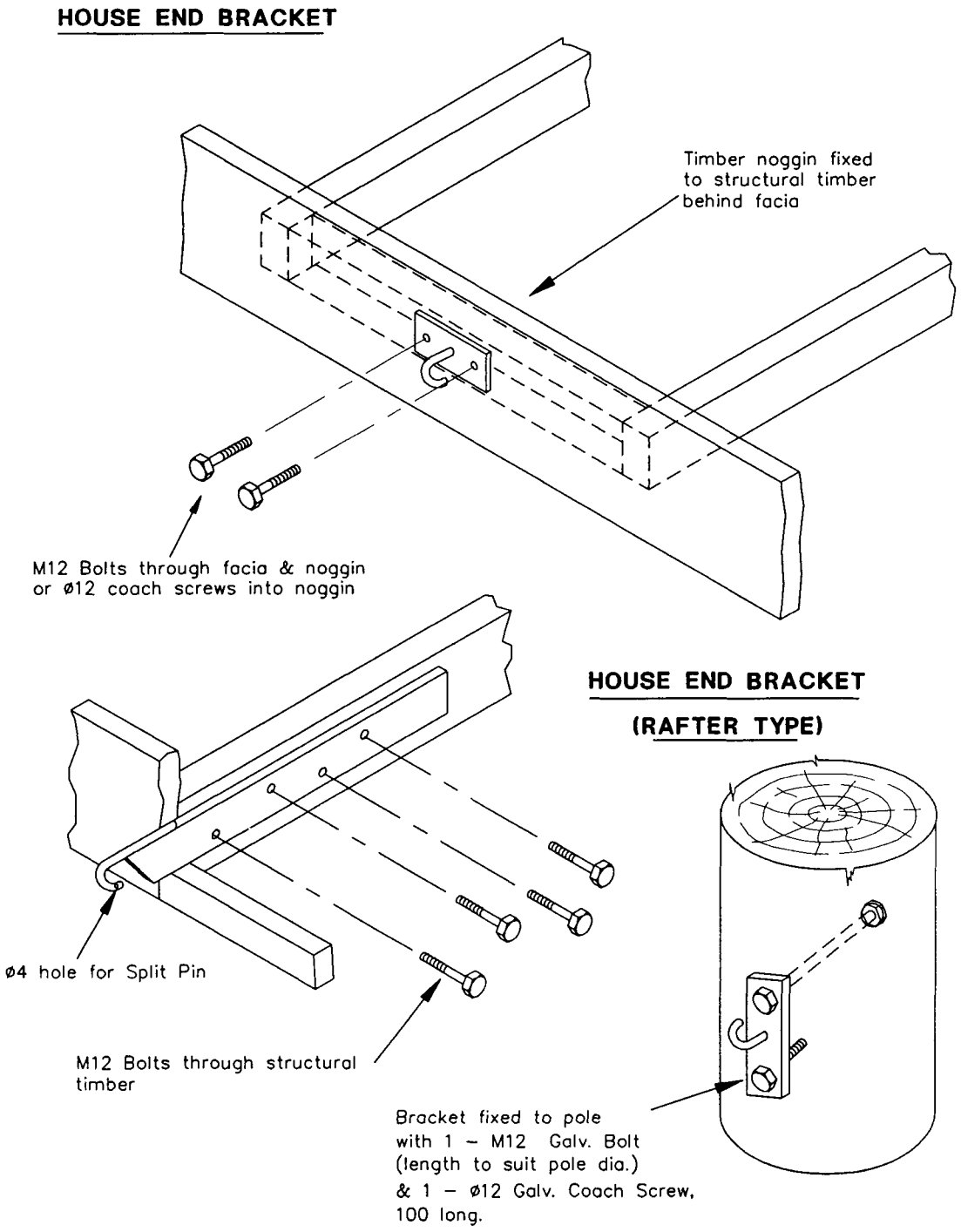
At the point of attachment or at any point along the length of service



CLEARANCES FROM COMMUNICATIONS CABLES OR STREET TRACTION CONSTRUCTION

(Refer to Code of Engineering Practice for Shared Use of Poles).

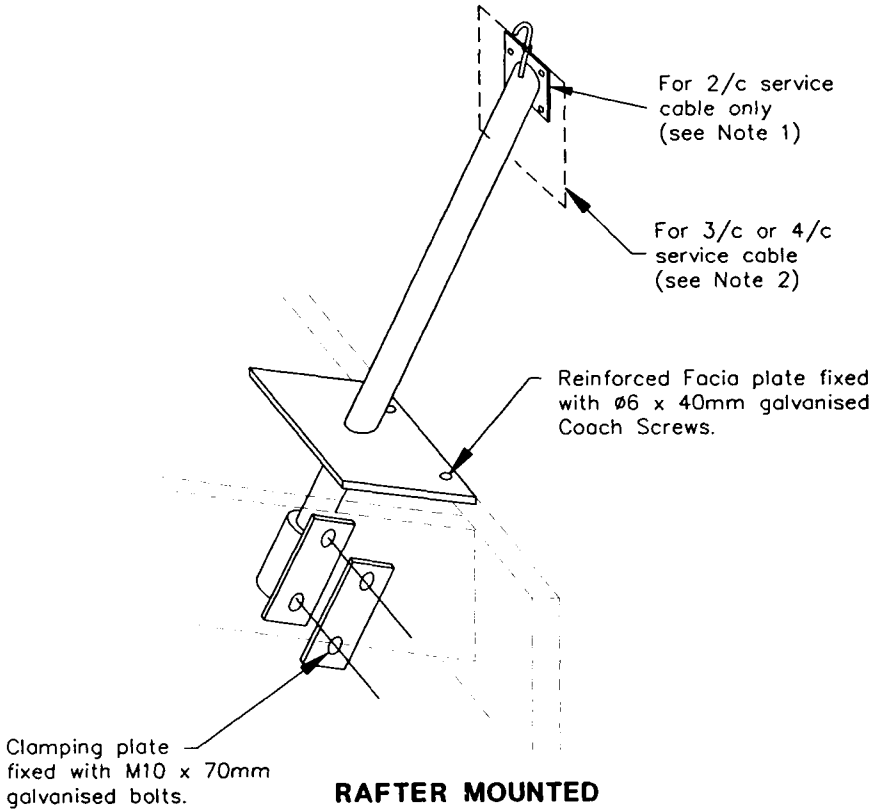
Figure 5.15 Requirements for Location of Point of Attachment (POA)



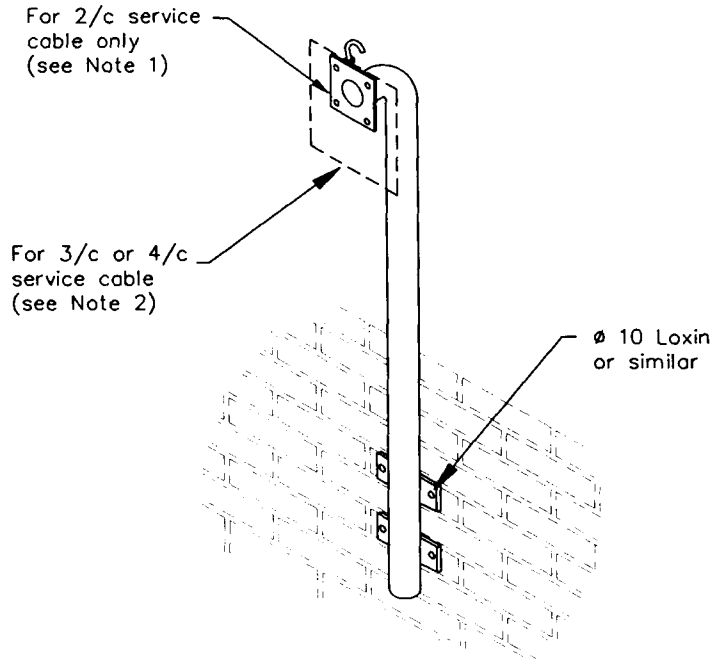
NOTES:-

1. Hook down for uplift in service cable.
2. Hook up for service falling away from POA.
3. All bolts and screws to be galvanised.

Figure 5.16 Service Bracket - Typical Installations



RAFTER MOUNTED

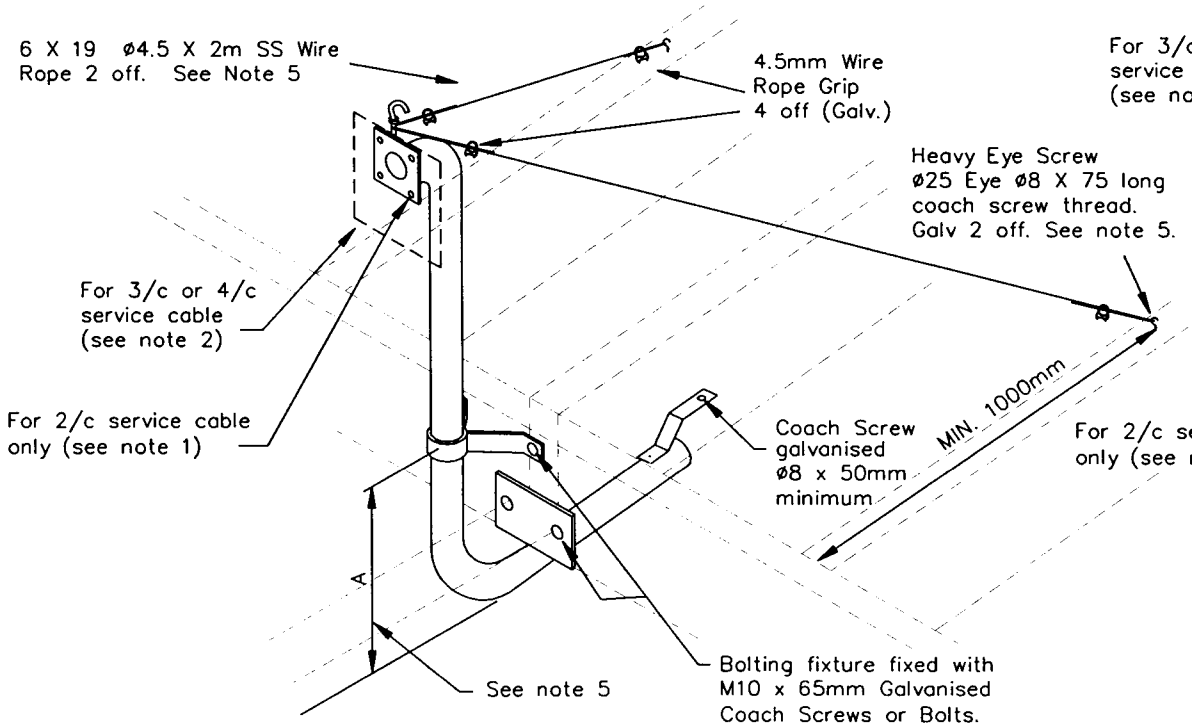


SURFACE MOUNTED

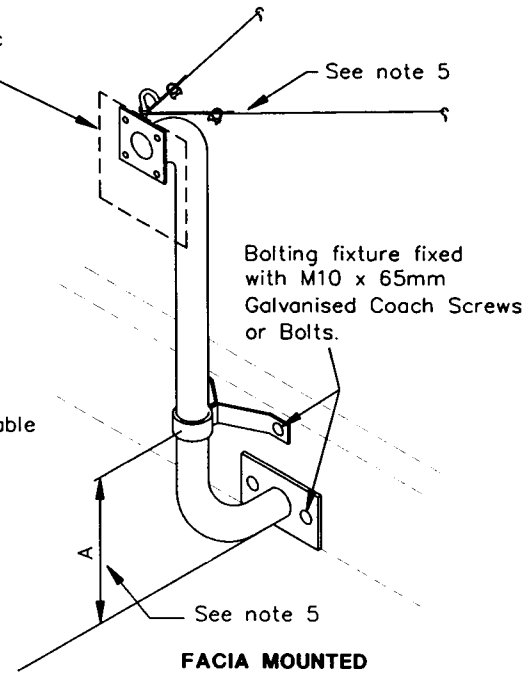
NOTES

1. 2/c Raiser Brackets :–
   - Have a small FOLCB mounted mounting plate (75x100mm approx) with "1kN" stamped on the back.
   - Only suitable for 2/c service cable.
2. 3 or 4/c Raiser Brackets :–
   - Have a large FOLCB mounting plate (230x230mm approx) with "2kN" stamped on the back.
   - Suitable for 3 or 4/c service cable
3. Only approved raiser brackets shall be used.
4. The customer is responsible for the installation of raiser brackets.
5. 2/c denotes 2 Conductor, 3/c denotes 3 Conductor, etc.

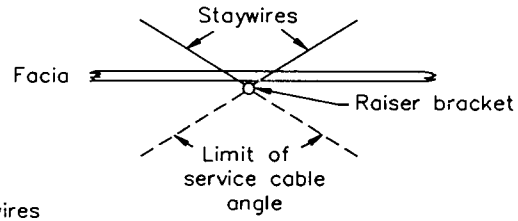
Figure 5.17 Typical Service Raiser Brackets



UNDER EAVES MOUNTED



FACIA MOUNTED



PLAN VIEW OF RAISER BRACKET

Notes

1. 2/c Raiser Brackets :–
   - Have a small Fused Mains Connection Box mounting plate (75x100mm approx) with "1kN" stamped on the back.
   - Only suitable for 2/c service cabe.
2. 3 or 4/c Raiser Brackets :–
   - Have a large FOLCB mounting plate (230x230mm approx) with "2kN" stamped on the back.
   - Suitable for 3 or 4/c service cable
3. Only approved raiser brackets shall be used.
4. The customer is responsible for the installation of raiser brackets.
6. 2/c denotes 2 conductor, 3/c denotes 3 conductor, etc.

5. Stay Wires
   - Stay wires to be used when the dimension 'A' is less than 150mm.
   - Service cable angle limit with staywires fitted is shown.
   - Eye Screw to be fitted through a ø10 hole drilled through the roofing material. Once positioned the remaining gap around the eye screw is to be sealed with a suitable sealant.
   - Stay wires to be installed at angles that provide support against the pull of the aerial service cable.
   - Additional structural support or noggins (not shown) may be required to prevent twisting of rafters or joists.

Figure 5.18 Typical Service Raiser Brackets

Metering

6

Section 6 Contents

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PLEASE NOTE
The major variation from previous practices introduced in this edition is that the customer shall provide and install a hinged meter panel as detailed in Clause 6.6. In addition, for other than Current Transformer Metering, the meter panel shall be fully wired, complete with service protection device/s and neutral link where required, ready for meter installation.

6.1 General

The customer shall provide and maintain adequate mounting and installation facilities for the DistCo metering equipment in the position/s approved or selected by the Responsible Officer. Equipment supplied and installed by the DistCo shall, unless otherwise agreed in writing, remain the property of the DistCo.

The customer shall ensure that access is not subsequently restricted or the location otherwise rendered unsuitable. Should this occur, the customer shall restore suitable access or arrange for the relocation of the metering equipment at the customer's expense.

Note: The Customer shall provide a hinged meter panel as detailed in the following clauses three months from the date of publication of these Rules.

The DistCo may, however, supply and install a meter board or panel for mounting of the metering equipment under exceptional circumstances or as a replacement of an existing panel in an existing installation as determined by the Responsible Officer.

However, in either case, equipment installed on the meter panel which is directly associated with DistCo metering of the supply shall be considered as metering equipment for the purpose of the Wiring Regulations.

For information regarding High Voltage Metering refer to Clause 8.6.

6.2 Location and Accessibility of Metering Equipment

6.2.1 General

Meters shall be located in a position readily accessible for fixing, reading, testing, adjustment and removal, without difficulty or hazard. The position should be such that DistCo personnel can gain access without having to obtain a key.

However, objection will not be raised to positions within business premises normally open between the hours of 9.00 am and 5.00 pm Monday to Friday. Refer Clause 6.2.3 or 6.2.4 for details.

Adequate working space, not less than 1.2 metre wide - or the width of a group of meter panels, whichever is the greater - by 1.0 metre deep shall be provided and maintained in front of each metering panel and shall extend to a height of 2.0 metres above the floor, platform or level ground. This space is required to enable DistCo personnel to read meters, place and use test equipment and work safely. Any opening providing access to this space shall be not less than 2.0 metres in height and 0.6 metres in width.

Mounting height of meter panels shall be in accordance with Clause 6.6.1 for Direct Metering and Clause 6.7.2 for L.V. Current Transformer Metering.

Any gas meter, fittings, fixtures, enclosures or other obstructions installed below the metering panel shall not project further than 300 mm from the face of the wall on or in which the metering panel is mounted. In addition, a gas regulator shall be not less than 500 mm radially from any electrical metering equipment. Refer to Figure 6.2 and AS2430.

Any elevated floor or platform used to provide access shall be fitted with a railing where considered necessary by the Responsible Officer and shall be both substantial and permanent. Access to such elevated positions shall be provided by an approved fixed stairway or ramp equipped with a handrail. Access by means of a ladder is not acceptable.

Where metering equipment is installed in a room or area set aside for the purpose, such room or area shall be provided with adequate illumination for meter reading. Access thereto shall be kept clear, clean and free of rubbish. The room shall not be used for any other purpose such as storage of furniture, cleaning materials or equipment.

Locking of access to metering equipment, including a meter box or other enclosure, is only acceptable by means of a "Power Industry Lock" and by arrangement with the DistCo (See Clause 6.4.4). Such locks shall be used only on doors or gates which provide access to the property and/or to an enclosure or room housing DistCo metering equipment.

For installations on properties exceeding 0.4 Ha in area the Responsible Officer shall be consulted regarding a suitable meter location.

6.2.1.1 Unsuitable Metering Locations

DistCo metering equipment shall not be erected behind a security door or gate which is capable of being locked unless, subject to the approval of the Responsible Officer, the door or gate is fitted with a "Power Industry Lock" (See Clause 6.4.4).

In addition, the following locations are not acceptable for metering equipment:

- Areas to which access is normally restricted - for security, health or other reasons. (This would include areas in which animals may be kept for security reasons).
- A carport associated with a single occupancy unless access to the main entrance of that occupancy is gained only through the carport, or after consultation with the Responsible Officer, there is no other available location.
- On a single occupancy building, over an external elevated area which is greater than 2.0 m above finished ground level at the point at which access is obtained. (Refer Figure 6.1)
- On a single occupancy building, greater than 2.0 m below finished ground level at the point at which access to the structure is obtained.
- Above a gas meter, except where shown in Figure 6.2.
- Where the use of a ladder would be necessary.
- Over stairways, landings, ramps, in narrow passageways or in other confined spaces.
- Vehicle docks, car parks, driveways and factory passageways where the metering equipment or a person working thereon would not be effectively protected.
- Positions in close proximity to or over machinery or open type switchgear.
- Locations liable to be affected by fumes, dampness, dust, noise, vibration or other external factors of such nature as may cause deterioration of equipment or unsatisfactory working conditions.
- Hazardous areas as defined in the Wiring Rules.
- Where the ambient temperature is maintained in excess of 30°C.
- Where there is insufficient light.
- In fire isolated stairways, passageways or corridors.
- Where access is restricted by vegetation

6.2.2 Single Domestic Premises

In single domestic premises, the metering equipment shall normally be fixed in a location which is accessible without having to enter rooms, enclosed verandahs or yards which may be locked. Suitable locations are shown in Figure 6.3

Therefore, in general, the meters on a residence shall be located on the face of the residence toward a street or along the adjacent side wall within 1.5 m of that face or an associated corner window of the residence to which ready pedestrian access exists and will be maintained.

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

In addition, the meters shall, in general, be located outside any fence or any area to which access is capable of being restricted by simply fitting a door or gate.

Where a perimeter fence which restricts access is erected between the building and the access street, the metering equipment shall be installed in a suitable vandal resistant lockable enclosure installed in an external accessible part of the fence, which does not protrude outside the building line. Alternatively, and subject to the approval of the Responsible Officer, where an access door or gate is fitted, a "Power Industry Lock" shall be installed (refer to Clause 6.4.4). This lock shall be accessible from outside the door or gate.

As a further alternative and subject to availability and agreement between the customer and the DistCo, an alternative metering system may be installed by the DistCo at the customer's expense.

As metering equipment may produce a degree of noise, installation on a bedroom wall is not recommended - but is acceptable.

6.2.3 Single Business Premises

Unless otherwise approved by the Responsible Officer, in single business premises, metering equipment shall be fixed in a position as close as practicable to the entrance to the premises and which is readily accessible without having to enter rooms or areas not normally open to visitors or the public.

In addition, metering equipment shall 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.

Metering for single business premises within a multiple occupancy shall normally be grouped together with the associated distribution switchboard as detailed in Clause 6.2.4.

6.2.4 Multiple Occupancy Premises

These requirements apply equally to domestic and non-domestic installations.

WARNING: 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.

Where a property is subdivided the foregoing is mandatory.

Where one service cable supplies a number of occupancies, the metering equipment shall, except as provided below, be grouped at the main switchboard for the installation and located to comply with Clause 6.2.1 and in a position such that all occupants have common right of access thereto.

The metering may, alternatively, be grouped at a number of distribution switchboard locations as determined by engineering considerations of supply. These conditions include voltage drop as, for example, in the case of multi-storey buildings etc. Such locations may be in a room, cupboard or alcove set aside for the purpose which complies with Clause 6.2.1.

The doors of rooms and enclosures for housing metering equipment shall be labelled "Electricity Meters".

Notwithstanding the above, in exceptional circumstances the Responsible Officer may approve metering at individual locations on separate structures. Conditions of such approval shall include written assurance of ongoing unrestricted access to each meter location.

Where metering on separate structures has been approved, the common vehicular driveway serving the separate structures shall be deemed to be the "street" for the purpose of determining an acceptable metering location on each structure.

Note: Attention is directed to Section 7 of these Rules regarding additional requirements for multiple occupancy premises.

6.2.5 Public Thoroughfares

Where metering equipment is required to be installed for an electrical installation on Crown land (or road reserves), the customer shall supply a suitable enclosure and mounting facilities for this equipment within or on the customer's installation remote from the DistCo pole (minimum 2.0 metres). The metering equipment shall be installed in a location readily accessible to DistCo personnel for reading, replacement or maintenance. Suitable locking arrangements using a "Power Industry Lock" shall be fitted to prevent vandalism (refer to Clauses 6.4.3 and 6.4.4).

However, in special circumstances, and by negotiation, supply may be provided to an enclosure on a DistCo pole. In such cases the use of the pole will comply with the "Code of Engineering Practice for Shared Use of Poles" as appropriate. The customer is responsible for the supply and mounting of a suitable enclosure in a position nominated by the Responsible Officer, generally located on the "footpath" side of the pole. The minimum mounting height shall be 2.7 m to the bottom of the enclosure. The top of the enclosure should generally not exceed 3.5 m above ground level.

The customer shall provide any service protective device required and all necessary materials for connection by the DistCo.

Drilling of concrete poles is NOT PERMITTED under any circumstances as ingress of moisture can lead to failure of the pole; hence fixing of apparatus shall be effected by suitable brackets and/or stainless steel bands. In the case of a concrete pole carrying high voltage conductors, the Responsible Officer may require additional insulation between consumers' mains or apparatus and the body of the pole or brackets attached thereto.

Notes:

- A minimum safe working distance of 2.0 m from any exposed live apparatus shall be maintained by all persons and any material in direct personal contact therewith. If this clearance cannot be maintained, the DistCo MUST be consulted before proceeding.
- Electrical wiring, installed in a public thoroughfare – including that for any public or other lighting scheme – which is to be maintained by a customer, is an electrical installation and hence shall comply with the Wiring Regulations.

6.3 Sealing of Equipment

To prevent diversion or interference to the supply, the customer shall make provision for the DistCo to affix seals to prevent unauthorised access to all unmetered equipment. In general, seals will be of wire and seal type approved for the use or alternatively by an approved DistCo locking device.

All switches in unmetered circuits shall have provision for sealing in the closed (on) position and locking in the open (off) position using a padlock having a shackle of not less than 5.5 mm diameter.

Terminals of metered and unmetered equipment shall be kept segregated from each other by barriers or other suitable means.

6.4 Protection of DistCo Metering Equipment (including Current Transformers)

6.4.1 General

Any enclosure used to house metering equipment and installed after the date of operation of these Rules shall be constructed in a manner to prevent the spread of fire in accordance with the requirements of the Wiring Rules for construction of switchboard cases and surrounds.

A suitable mechanical protective barrier shall be supplied and installed by the customer where the metering equipment is located within a storage area or in a position capable of being struck by vehicles. The barrier shall allow for the minimum working space required by Clause 6.2.1.

6.4.2 Within or on Normally Occupied Premises

The customer shall provide adequate protection for the metering equipment where, in the opinion of the Responsible Officer, the equipment would otherwise be exposed to mechanical damage, effects of the weather, sea air, corrosion, etc.

Where such protection is required it shall take the form of a weatherproof box, providing a minimum degree of protection IP23 to AS1939, with a hinged door or lid fitted with a suitable catch. This box shall be constructed from galvanized steel or other materials affording equivalent protection and shall be such that the metering equipment is completely enclosed yet remains accessible.

In general, the box within which the meters are installed may not be locked. Where locking is considered desirable, the customer shall make arrangements for the use of the "Power Industry Lock" to the satisfaction of the Responsible Officer. (Refer to Clause 6.4.4).

6.4.3 Installed Externally in Isolated and Unattended Locations

Where DistCo meters are installed in boxes externally on buildings or poles in isolated and unattended locations, the boxes shall be constructed using galvanized steel or equivalent material of sufficient strength to afford protection against vandalism, weather or other external factors and shall have an IP rating suitable for the environment. Such boxes must be kept locked at all times, using the "Power Industry Lock", or otherwise be installed to the satisfaction of the Responsible Officer. (Refer to Clause 6.4.4).

6.4.4 Locking of Metering Equipment Enclosures

Where locking of enclosures, gates or doors which provide access to metering equipment other than Current Transformers is considered necessary, the customer should arrange for the lock/s involved to be keyed to the "Power Industry Lock".

"Power Industry Lock" cylinders and padlocks which are keyed to the DistCo master key system are available through retail hardware merchants throughout Victoria. Refer to Clause 1.11.

6.5 Meter Installation

6.5.1 General

Metering and control equipment considered necessary by the DistCo to record and control electricity consumption shall be supplied and maintained by the DistCo, and shall remain the property of the DistCo.

The customer shall provide facilities including a meter panel which complies with AS 1795 Part 1 as a Type X or Type Z material and, where required, plug-in meter sockets, together with any surrounds or enclosures, securely fixed to a wall or rigid supporting structure, for the mounting and connection of the DistCo's metering equipment.

For details and requirements of suitable meter panels, metering enclosures, surrounds, links and fuses, a specification is available from the local DistCo.

A commercially manufactured frame or enclosure is an acceptable alternative to any of the arrangements described herein provided that type acceptance has been obtained **following the submission of designs to the Convenor, Service and Installation Rules Working Group (refer to Foreword for mailing address).**

The fastening of a metering panel to an enclosure or frame shall be effected by means of hinges attached to the vertical edge of the panel and shall allow for the panel to be readily opened to an angle of not less than 80 degrees from the closed position with all metering equipment installed. (This may require a double hinged section). Refer to Figures 6.4 and 6.5 for details. Care must be taken when erecting multiple panels adjacent to each other to allow the panels to be opened, without obstruction, after the metering equipment has been installed.

Every hinged panel shall be installed in accordance with the requirements of the Wiring Rules for hinged switchboard panels and in addition with the requirements of these rules. Such panels shall be capable of being sealed in the closed position with a DistCo seal.

Where the determined maximum demand of any separately metered portion of an installation exceeds 100 Amperes per active conductor, the Responsible Officer may require that the meter be of a type operated by current transformers. In such cases the customer shall provide a hinged metering panel together with adequate space, housing and wiring facilities for the DistCo's current transformers and metering equipment. The DistCo will normally provide and install the wiring for the meter panel for such installations. Refer to Clause 6.7 for details.

6.5.2 Common Enclosure Housing Metering and Switchboard Equipment

Where a common enclosure is intended to accommodate equipment other than DistCo Current Transformer and/or metering equipment, adequate space shall be provided to accommodate such equipment independently of the DistCo equipment. Dimensions quoted in these Rules do not allow for any other equipment.

Wiring not intended for connection to the metering panel/s shall not be located in the wiring space directly behind the meter panel/s unless contained within a physically separate duct or conduit located in a rear corner of the enclosure such that it does not obstruct the meter wiring space. Similarly, wiring not associated with metering shall not be installed within a Current Transformer enclosure.

In general, wiring behind the meter panel/s and switchboard wiring should be physically separated from each other with suitable provision for the passage of the necessary conductors between the two sections. The only exception is a builders supply meter box and switchboard mounted on a builders supply pole.

6.5.3 Switching Service

In some circumstances a switching service may be available to control customers (off peak) loads. For details please contact the DistCo. Refer to Clause 3.3.2 and Figure 3.1.

6.6 LV Installation up to 100 A per Active Conductor

DIRECT CONNECTED METERING

6.6.1 General

Direct metered installations shall be so arranged that any meter panel is installed at a height above the floor or ground not more than 2.0 m to the top edge. The lower edge of the panel, above the floor or ground, shall be not less than 1.0 m in the case of a single occupancy and

0.6 m in the case of multiple occupancies, unless the Responsible Officer approves of a lesser height in a particular instance.

Note: Refer to Clause 6.4 regarding protection of metering equipment.

Where the panel is enclosed, a **minimum** clearance of 5 mm shall be provided from the front face of the metering equipment to the inner face of the door or any internal projection thereof.

Note: Direct metering equipment may be up to 175 mm deep.

The customer shall arrange for the supply, installation and wiring of the meter panel. Both the metered and unmetered conductors shall be installed, prepared and connected, as necessary, ready for the DistCo to install the metering equipment.

The customer shall also arrange for the supply, installation and wiring of service protective devices and metering neutral links as specified in Figures 6.6 to 6.30 and which must be capable of accepting DistCo seals.

Service protective devices shall be 100 Amp, 500 Volt hand operated fuse carriers and bases, backwired to accommodate Size 2A Fuse Links to AS2005 (57 mm x ∅ 22.2 mm).

The metering neutral link shall have a rating of 100 Amp, 500 Volt with a removable insulating cover.

Where plug-in meter sockets are required, the customer shall arrange for their supply, installation and wiring ready for the insertion of a meter. Refer to Clause 6.6.2.2.

The 'standard' meter panel arrangements will accommodate either Plug-in meter sockets or bottom connected meters. There is a variation in the numbers of each type accommodated on certain panel sizes for multiple installations (Refer to Clauses 6.6.2.1 and 6.6.5).

All cables to be terminated on the meter panel shall be permanently labelled to indicate their function. Refer to Clause 4.8.2, Clause 5.4.3.8(a) & (b) and Figures 6.6 to 6.30. For example: (line/load, hot water, light /power, etc). In addition, for multiple installations, meter panels shall be clearly and permanently labelled to indicate occupancy identification, in accordance with Clause 7.1.3, for all equipment to be mounted on the panel.

6.6.2 Metering Equipment Wiring

The customer shall provide sufficient length of cable attached to the metering panel and brought through suitable holes in the correct positions ready for connection by the DistCo. A cable length of between 100 mm and 150 mm shall protrude through the meter panel with 20 mm of insulation removed from the cable ends. (Refer to Figures 6.6 to 6.30.)

Conductors shall be multi-stranded soft drawn copper of a size to suit the maximum demand of that portion of the installation being metered and in any case having a cross sectional area of not less than 4 mm^2 or not greater than 35 mm^2. Metering neutral conductors which do not form part of the consumer's mains (i.e. do not carry load current) shall be 4 mm^2.

Where solid, compressed, compacted, hard drawn or aluminium conductors are employed for the customer's circuit/s, such conductors shall be converted to multi-stranded annealed copper conductors of equivalent current carrying capacity for connection to the meter terminals. 25 mm^2 and 35 mm^2 conductors shall comprise not less than 19 strands. Any other form of conductor is **NOT ACCEPTABLE** for connection to metering equipment without specific approval of the Responsible Officer.

The wiring of each metering panel shall conform with that shown in the wiring diagram for the relevant installation type or shall otherwise be installed to the satisfaction of the Responsible Officer. All meter panel wiring shall be neatly loomed vertically up the hinged side of the panel and horizontally to the appropriate conductor terminations to allow the panel to be readily opened with all apparatus installed. The loom shall be secured to the meter panel.

Neutral conductors for each meter and time switch shall originate from a terminal of a neutral link. Looping between neutral terminals of apparatus is **NOT ACCEPTABLE** however

active conductors may be looped at line terminals of apparatus. The incoming neutral conductor to the neutral link shall be clearly identified.

In accordance with Clause 3.3, the DistCo will provide switching for the customers qualifying off peak load up to a maximum of 30 A single phase.

For loads exceeding 30 A single phase the DistCo will provide switching for the coil/s of suitable contactor/s or relay/s installed on the customers switchboard which will be arranged to control ALL the off peak load. For the purposes of this clause, space heating and water heating shall be considered separately.

6.6.2.1 Isolation of Metering Equipment

Supply to equipment on all metering panels shall be capable of being isolated. For installations comprising not more than one meter panel or combined maximum demand less than 100 A per phase, isolation may be achieved by the removal of service fuses on the meter panel for underground supplies or the removal of the service fuses at the POA for overhead supplies.

For installations comprising more than one meter panel or combined maximum demand exceeding 100 A per phase a single switch operating in all active conductors and capable of being 'locked off' and 'sealed on' shall be provided on the supply side of each meter panel.

Note: Where these switches are enclosed and access is restricted by a DistCo lock, the locking off and sealing on facilities as described above may not be required.

6.6.2.2 Plug-in Meters

Not all Victorian DistCo's use plug-in meters, hence any request for their use should be directed to the Responsible Officer at an early date to avoid delays and determine additional charges, if any, which may apply. Refer to Clauses 6.6.3 and 6.6.5

Where plug-in meters are used, the associated sockets form part of the customer's installation.

6.6.3 Single Installation Metering (Up to 16 mm^2 conductors)

For single installation metering having conductors not exceeding 16 mm^2 (at the meter position) the customer shall arrange for the provision and installation of a fully wired metering panel and, where exposed to the weather, an enclosure, suitable for the DistCo to supply and install the metering equipment.

Where Plug-in meters are to be installed for single phase metering the customer shall arrange for the provision, installation and wiring of the necessary sockets ready for the insertion of the meter by the DistCo.

Unless otherwise approved by the Responsible Officer as, for example, the use of a single Plug-in meter, the size of the metering panel shall be not less than 400 mm wide x 380 mm high (Refer to relevant wiring and layout diagrams at the end of this Section).

Notes:

- The 400 mm wide x 380 mm high panel will not accommodate a multi-phase 'WINNER' or a single phase installation with two off-peak loads in domestic situations - for such an installation refer to Clause 6.6.4.
- The maximum size of any one conductor which may be terminated on this metering panel is 16 mm^2.
- Where larger conductors are required due to voltage drop, they shall be reduced to comply with the above prior to termination on the meter panel.
- Where larger conductors are required due to maximum demand, a larger panel must be used.

Where exposed to the weather, the metering panel shall be mounted:-

- in a standard commercially manufactured meter box which is marked to indicate that it has been submitted and accepted in accordance with Clause 6.5.1; or
- in a meter box constructed in accordance with the specification available from the DistCo. Refer to Figure 6.4.

Where suitably protected from the weather, the metering panel shall be mounted:-

- as described above; or
- hinged and mounted on a suitable surround having a clear space of not less than 75mm between the rear of the panel and the surface on which the surround is mounted as for a hinged switchboard panel in accordance with the Wiring Rules and Figure 6.5.

6.6.4 Single Installation Metering (up to 35 mm^2 conductors and 100 A M.D.)

For single installation metering having conductors of 25 mm^2 or 35 mm^2 in cross section and a calculated Maximum Demand of not greater than 100 A per active (at the meter position) the customer shall provide and install a fully wired meter panel and, where exposed to the weather, an enclosure, suitable for the DistCo to supply and install the metering equipment.

The meter panel shall be not less than 400 mm x 590 mm (Refer to relevant wiring and layout diagrams at end of this Section).

This meter panel is also acceptable for use in those situations where smaller conductors are used as described in Clause 6.6.3.

Notes:

- This panel **will** accommodate a multi-phase **'WINNER'** or a single phase installation with two off-peak loads in domestic situations - for details consult the DistCo. - Refer to Figures 6.22 and 6.23 for wiring details.
- The maximum size of any one conductor which may be terminated on this metering panel is 35 mm^2.
- Where larger conductors are required due to voltage drop, they shall be reduced to comply with the above prior to termination on the meter panel.

Where exposed to the weather, the metering panel shall be mounted:-

- in a standard commercially manufactured meter box which is marked to indicate that it has been submitted and accepted in accordance with Clause 6.5.1 for the purpose; or
- in a meter box constructed in accordance with the specification available from the DistCo. Refer to Figure 6.4.

Where suitably protected from the weather, the metering panel shall be mounted:-

- as described above; or
- hinged and mounted on a suitable surround having a clear space between the rear of the panel and the surface on which the surround is mounted as for a hinged switchboard panel in accordance with the Wiring Rules and Figure 6.5.

6.6.5 Multiple Occupancy Metering

Where a number of meters for different occupancies are to be installed at the one location (eg. adjacent to the main or a distribution switchboard), the customer shall arrange for the provision and installation of a fully wired meter panel or panels and, where exposed to the weather, an enclosure, suitable for the DistCo to supply and install the metering equipment.

Where Plug-In meters are to be installed for single phase metering, the customer shall provide, install and wire the necessary sockets ready for the insertion of the meters by the DistCo.

Each plug in meter socket shall be provided with a separate disconnection device eg. fuse link or switch. Where switches are used they shall be arranged so that they are accessible to DistCo personnel only. The switches shall be located in a separate compartment which shall be capable of being locked with a padlock supplied by the DistCo, having a shackle of not less than 5.5 mm diameter unless otherwise approved by the Responsible Officer.

IMPORTANT NOTE

The following arrangements are based on customers conductors not exceeding 35 mm^2 in cross section (on the meter panel). In the event that larger conductors are to be employed, the Responsible Officer shall be consulted regarding meter space requirements.

The metering panel/s shall be not less than the sizes given in Table 6.1 for the relevant size of conductors and the number and type of metering installations. For mixed arrangements the Responsible Officer **MUST** be consulted.

Where exposed to the weather, each metering panel shall be mounted:-

- in a standard commercially manufactured meter box which is marked to indicate that it has been submitted and accepted in accordance with Clause 6.5.1 for the purpose; or
- in a meter box constructed in accordance with the specification available from the DistCo.

Where suitably protected from the weather, each metering panel shall be mounted:-

- as described above; or
- hinged and mounted on a suitable surround having a clear space between the rear of the panel and the surface on which the surround is mounted as for a hinged switchboard panel in accordance with the Wiring Rules. Refer to Figure 6.5.

Where a greater number of metering installations are required, this shall be achieved by grouping a suitable number of panels in a modular fashion. In a specific case the Responsible Officer may approve the use of a 600 mm x 900 mm panel.

Warnings:

- Care must be taken that the opening arrangements described in Clause 6.6.1 can be attained when all metering equipment is installed. This may require the use of cable ways or blank fillers between the vertical edges of adjoining panels.
- **Not all Victorian DistCo's use plug-in meters, hence any request for their use should be directed to the Responsible Officer at an early date to avoid delays and determine additional charges, if any, which may apply.**

Notes:

- Attention is directed to Clause 6.6.2 regarding wiring arrangements.
- Where larger conductors are required due to voltage drop, they shall be reduced to comply with the above prior to termination on the meter panel.

Table 6.1 Maximum Number of Metering Installations Per Panel

Maximum 16 mm² Conductors	NUMBER OF SEPARATE OCCUPANCIES			
Metering Panel Dimensions (mm) Width x Height	1 Phase 2 Wire All Tariffs, One Off-Peak Load up to 30 Amps	Multi - Phase Single Rate	Multi - Phase 2 Rate	Multi - Phase Winner, and Single or Multi-Phase with two Off-Peak Loads
400 x 380	2	1	1	Not Suitable
400 x 590	4*	2	2	1
590 x 400	3	2	1	1
600 x 600	6*	3	3	Refer to DistCo

Maximum 35 mm² Conductors #	NUMBER OF SEPARATE OCCUPANCIES			
Metering Panel Dimensions (mm) Width x Height	1 Phase 2 Wire All Tariffs, One Off-Peak Load up to 30 Amps	Multi - Phase Single Rate	Multi - Phase 2 Rate	Multi - Phase Winner, and Single or Multi-Phase with two Off-Peak Loads
400 x 380	Not Suitable			
400 x 590	4*	1	1	1
590 x 400	3	2	1	1
600 x 600	6*	3	3	Refer to DistCo

* A greater number of Plug-in type meters may be accommodated on a commercially manufactured and approved panel / enclosure.

\# Note that the Wiring Rules require additional space behind panels having 25 mm² or 35 mm² conductors attached thereto.

6.7 LV Installation in excess of 100 A per Active Conductor

L.V. CURRENT TRANSFORMER METERING

6.7.1 General

Where the determined maximum demand of any separately metered portion of an installation exceeds 100 Amperes per active conductor, the Responsible Officer may require that the meter be of a type operated by current transformers (CT's).

The customer shall provide adequate space, housing and wiring facilities for the DistCo's current transformers and metering equipment including the meter panel as detailed below and should give as much notice as practicable of the proposed installation loading details.

In general, the customer shall arrange with the DistCo for delivery/collection of the meter panel to allow the DistCo to wire the panel at the DistCo's premises.

6.7.2 CT Meter Location

The metering equipment shall be located at a position approved by the Responsible Officer.

In any case metering equipment should be located within a maximum distance of 10 m route length of wiring from the CT's as detailed in Clause 6.7.5

Access to metering equipment shall be direct (ground floor) or by stairs or lift. Ladder access is not acceptable.

A clear, level, paved and illuminated space as specified in Clause 6.2.1 shall be provided in front of the metering position to allow access for meter reading and to accommodate test personnel and their equipment.

The lower edge of the meter panel shall be located between 1.0 m and 1.2 m above the floor or ground level.

Unless enclosed in an independent enclosure having no projections, open, live or bulky apparatus is not permitted below or in front of the meter panel. Any controls, push buttons etc. should be enclosed. The DistCo will not accept responsibility for inadvertent operation of any apparatus located below or in front of the meter panel which is not protected

The meter panel is not permitted in a location subject to varying high intensity magnetic fields. Heavy current carrying conductors shall not be installed behind or near the meter panel, unless effectively shielded by an earthed metallic screen.

Unless effectively shielded as described above, the following clearances shall be maintained between conductors and meter panel:-

RATING OF CONDUCTOR (Amps)	DISTANCE BETWEEN METER PANEL AND THE NEAREST CONDUCTOR (mm)	
500	200	Interpolate for intermediate values
1000	400	
2000	600	
3000	800	

6.7.3 Meter Space Requirements

Meter space for CT metering should be confirmed with the local DistCo before a commitment to proceed is made.

The 'standard' meter panel size is 900 mm H x 600 mm W for a single CT metering installation. This size allows space for installing equipment for energy pulsing or remote reading.

Where the meter panel is to be erected independent of the customer's switchboard on a surround or in an enclosure direct to a wall where there are no obstructions the DistCo may accept a meter panel size of 600 mm x 600 mm.

Space required for Current Transformers is separate and distinct from meter panel space. Refer to Clause 6.7.4.3.

The meter panel shall be hinged utilising lift off hinges to enable the DistCo to remove and replace panels.

Where installed within an enclosure the hinging of the panel shall be so arranged that the panel may be fully opened clear of the enclosure with all metering equipment mounted thereon. Refer to Clause 6.5.1.

The panel shall be so arranged that a wiring space of not less than 50 mm is maintained behind the panel and a clear space of not less than 240 mm is provided in front of the face of the panel to accommodate the metering equipment.

Any door fitted to a metering enclosure shall have lift-off hinges. The door shall be labelled **"Electricity Meters".**

6.7.4 Current Transformers

6.7.4.1 General

Metering current transformers shall be mounted in a suitable enclosure segregated from meters and switchboard equipment. The space requirements for metering current transformers are separate and distinct from those for the meter panel as detailed in Clause 6.7.3.

In general, current transformers are supplied by the DistCo. The sizes of metering current transformers used vary from DistCo to DistCo. Advice should be obtained from the Responsible Officer regarding the type to be used in any specific project. Those used are:

ESAA Type S	200/5 A Single Ratio
ESAA Type B	400-800-1200/5 A
ESAA Type C	1000-2000-3000/5 A
ESAA Type T	800/5 A Single Ratio
Type W	1500/5 A Single Ratio

Note: ESAA means Electricity Supply Association of Australia Limited.

Typical dimensions are given in Fig. 6.34.

Metering current transformers (CT's) should, where practicable, be located on the supply side of the individual customer's main isolating switch and be so arranged as to allow independent isolation of supply to the CT's.

CT's shall be fixed with **P1 (polarity) side facing the incoming supply**. In most cases CT's will have a label attached - "This side to Incoming Supply".

6.7.4.2 CT Mounting Details

These details are to be read in conjunction with Fig. 6.34 and 6.35.

The customer shall provide the necessary primary conductors and install the CT's.

Provision shall be made to enable the DistCo to readily change any CT.

Unless otherwise approved by the Responsible Officer the minimum mounting height from the floor or platform for the lowest C.T. shall be 500 mm.

For primary circuits rated at 200 A or less, the conductor passing through the CT window shall be either busbar as described below or, alternatively the Responsible Officer may approve the passing of a cable through the CT window. To facilitate a CT change, attention must be given to the diameter of the conductor termination relative to the CT window diameter.

The primary conductor threaded through the CT's shall not have a metal sheath, screen or armouring.

For primary circuits exceeding 200 A per phase, the conductor passing through the CT window shall be in the form of a removable section of busbar not less than 300 mm in length, or provided that the cable termination is within the CT chamber a cable of up to 240 mm^2 may pass through the CT and attach to a bolted connection as shown in Fig. 6.35.

For circuits carrying up to 1200 A, the spacing between centres of busbars shall not be less than 125 mm, and above 1200 A, not less than 150 mm.

Two methods of mounting current transformers are acceptable. These are "in - line" (i.e. the bodies of each CT are in the one line) or "trefoil" where the centre phase CT is offset from the other two. Refer to Figure 6.34 for details.

Friction clamping of CT's to busbars is not acceptable.

The secondary terminals of the CT's shall face outwards, or in the case of overhead horizontal duct, they shall face downwards.

Attention must be paid to additional space requirements to terminate large conductors, provision for CT removal, access to CT secondary terminals for tap changing and sealing of terminal covers in a safe manner.

6.7.4.3 CT Enclosure Details

The minimum space inside the CT enclosure shall not be less than :

- For in-line mounting arrangement - 620 mm W x 400 mm H x 300 mm Deep.
- For trefoil mounting arrangement - 500 mm W x 600 mm H x 300 mm Deep.

(Refer to Figure 6.34 for details)

This space does not include any allowance for cable terminations or entry of cables. The minimum space required for terminating DistCo service cables shall not be less than as shown in Fig 6.35

The CT compartment shall be closed with a hinged door or hinged panel which must have provision for sealing in accordance with Clause 6.3. Unless installed in an overhead duct, the door or panel shall normally be hinged on a vertical side. Hinging at the top is permitted if the door is capable of being lifted off or secured in the open position at 170 degrees.

A clearly visible durable label - **"Electricity Metering Transformers"** - shall be affixed to the door or panel allowing access to the CT's.

The clear opening through which access to the CT's is obtained shall not be less than:

- In-line mounting arrangement - 560 mm x 340 mm.
- Trefoil mounting arrangement - 440 mm x 540 mm.

The cubicle or duct shall not be less than 300 mm deep with ready access to the CT's at all times. The secondary terminals of the CT's shall be as close as reasonably practical to the face of the enclosure (door or panel) and in any case not more than 300 mm behind the closed door.

Outdoor CT cubicles shall be lockable with a padlock having a shackle of not less than 5.5 mm diameter unless otherwise approved by the Responsible Officer.

No M.E.N. connection or equipment other than that required for metering purposes shall be located within a CT enclosure.

6.7.5 CT Meter Voltage and Current Wiring

The customer shall provide three 32 A fuse units, HRC, 440 V, complete with 32 A staggered offset tag cartridge fuse links to AS 2005, suitable for the connection and protection of 2.5 mm^2 or 4 mm^2 stranded copper conductors forming the active metering voltage supply circuit. These fuse units shall be installed within the CT enclosure and be connected to the primary active conductors. Fuses should preferably be mounted in the top of the CT enclosure, in the left hand front corner, they may, however be bar mounted provided they face outward and are easily accessible from the opening of the enclosure so arranged that they are withdrawn directly toward the operator.

Cables used to connect the fuse units to the primary conductors shall be minimum 32 Amps rated and be so arranged as to minimise the likelihood of a short circuit developing over the life of the installation. (e.g. not in contact with busbar of opposite phase). Single insulated conductors are acceptable only if arranged in this manner, otherwise insulated and sheathed cables must be used.

The customer shall also provide a terminal connected to the primary neutral conductor - suitable for connecting the 2.5 mm^2 or 4 mm^2 copper meter voltage neutral conductor - within the CT enclosure. Where the primary neutral conductor does not pass through the CT enclosure, the neutral conductor connecting this terminal shall be teed off the primary neutral with the connection thereto being effected by means of soldering, brazing or equivalent. This conductor shall be suitably identified as "metering neutral".

DistCo metering conductors will not be connected directly to aluminium conductors. Where aluminium primary conductors are employed, the customer shall provide all necessary conversions to allow for connection of copper conductors.

Provision for wiring between CT's and meters shall be provided in the form of channels, holes or knockouts within a switchboard or conduit elsewhere. In general 32 mm diameter conduit openings are acceptable. 32 mm PVC conduit is a suitable enclosure for secondary circuit wiring. Where rigid conduit is used elbows are not acceptable; bends shall be used to negotiate corners and their number should be kept to a minimum. A draw wire should be provided where the length of the run or a number of bends may affect the ease of installing a seven core cable and the bends should not be glued to the conduit until the cable is installed. Alternatively, the DistCo may provide the cable for installation by the customer.

A maximum route length of 10 m for 2.5 mm^2 copper secondary circuit conductors between CT's and meter/s is acceptable. Where a longer route is required, the circumstances shall be referred to the Responsible Officer to enable the calculation of burdens and selection of appropriate conductor size.

Where conductors greater than 2.5 mm^2 are necessary the customer will be required to meet the costs involved and/or may be required to provide and install conductors, complete with appropriate identification, to the satisfaction of the Responsible Officer.

Earthing of metal metering enclosures shall conform with the requirements of AS3000, including size of earthing conductor. Where earthing of a separate metering enclosure is required, the earthing conductor may be installed within the conduit containing the CT secondary wiring. (Note: 2.5 mm^2 secondary wiring requires a 2.5 mm^2 earthing conductor - where no primary conductor is installed within the metering enclosure).

6.7.6 Supplies to Separate Circuits

Where supply to separately metered circuits is taken from within or adjacent to a CT enclosure, such circuits shall be controlled and protected in accordance with the Wiring Rules for either switchboard wiring or sub-mains as appropriate in the circumstances. (Whilst not recommended, looping from line side terminals to supply adjacent direct connected metering may be appropriate in certain cases).

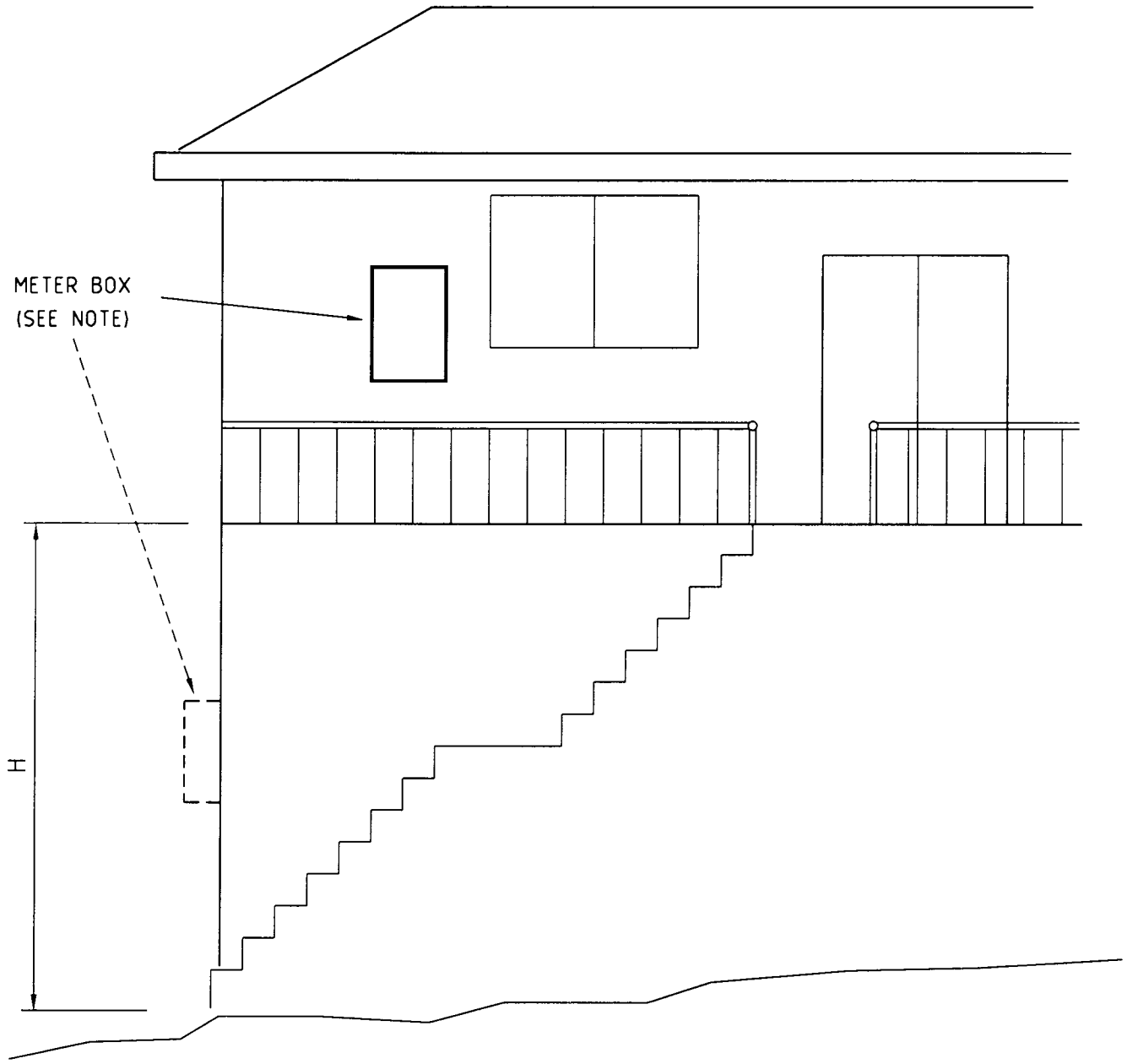
6.8 Customer Owned Metering

Meters installed by the customer for monitoring performance and energy usage shall not be located on the same panel as DistCo metering equipment unless specifically approved by the DistCo in a particular instance. All such meters installed in the same area as the DistCo metering shall be clearly and permanently marked "**CUSTOMER OWNED METERING**".

6.9 Alterations and Additions to Existing Installations

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

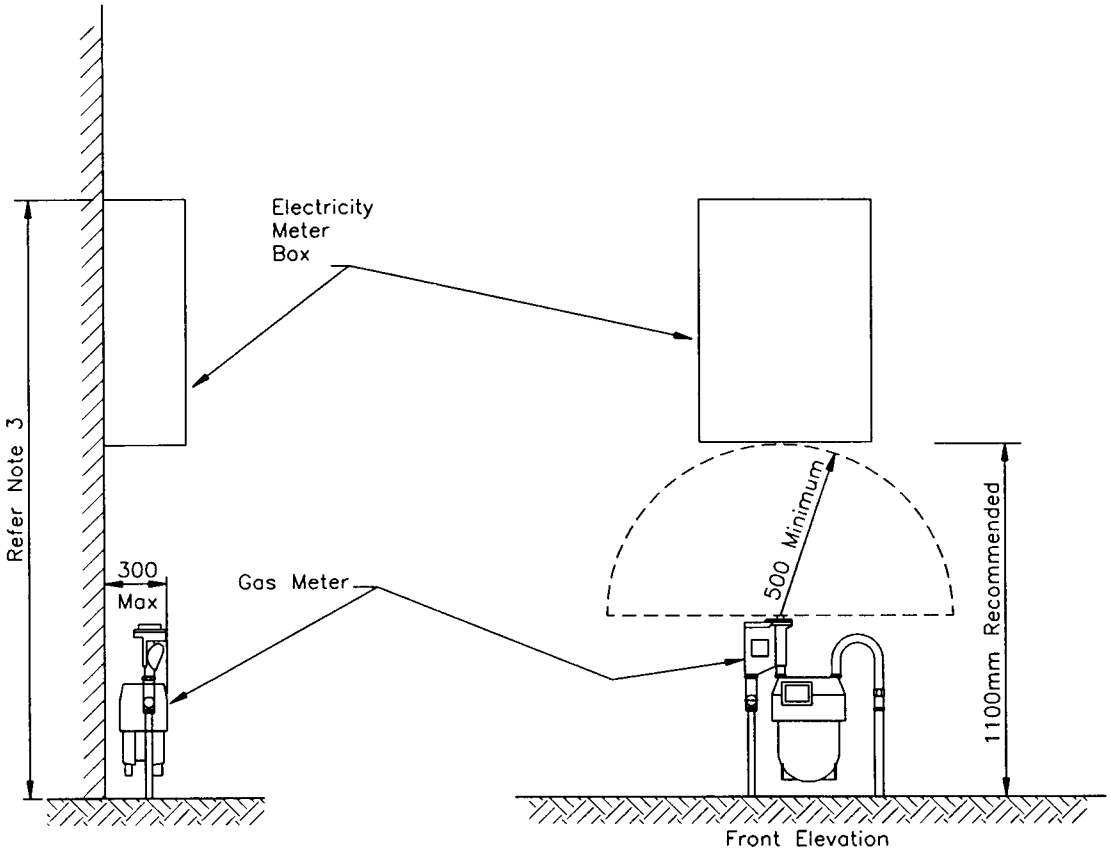
However, where the existing metering installation is suitable and can readily accommodate an addition to, or change of metering equipment, the Responsible Officer may agree to utilise the existing arrangement.



Notes

If dimension 'H' exceeds 2.0m, metering equipment shall be installed on lower portion of structure.

Figure 6.1 Acceptable Meter Locations for Elevated Premises



Notes:

1. The minimum clearance between any part of the electrical equipment and the gas meter regulator shall be 500mm.
2. Refer to AS2430.3 "Classification of Hazardous Areas– Specific Occupancies." where the diameter of the gas meter regulator relief opening exceeds 50mm then the 500mm distance may need to be increased.
3. The top edge of the meter panel shall be not more than 2000mm above finished ground level.
4. Gas meters which protrude more than 300 mm from the wall shall not be installed below the electricity meter box.
5. Where 500mm minimum clearance can not be maintained, Australian Standards referring to hazardous locations may allow for alternative arrangements.

Figure 6.2 Meter Boxes Near Gas Meters

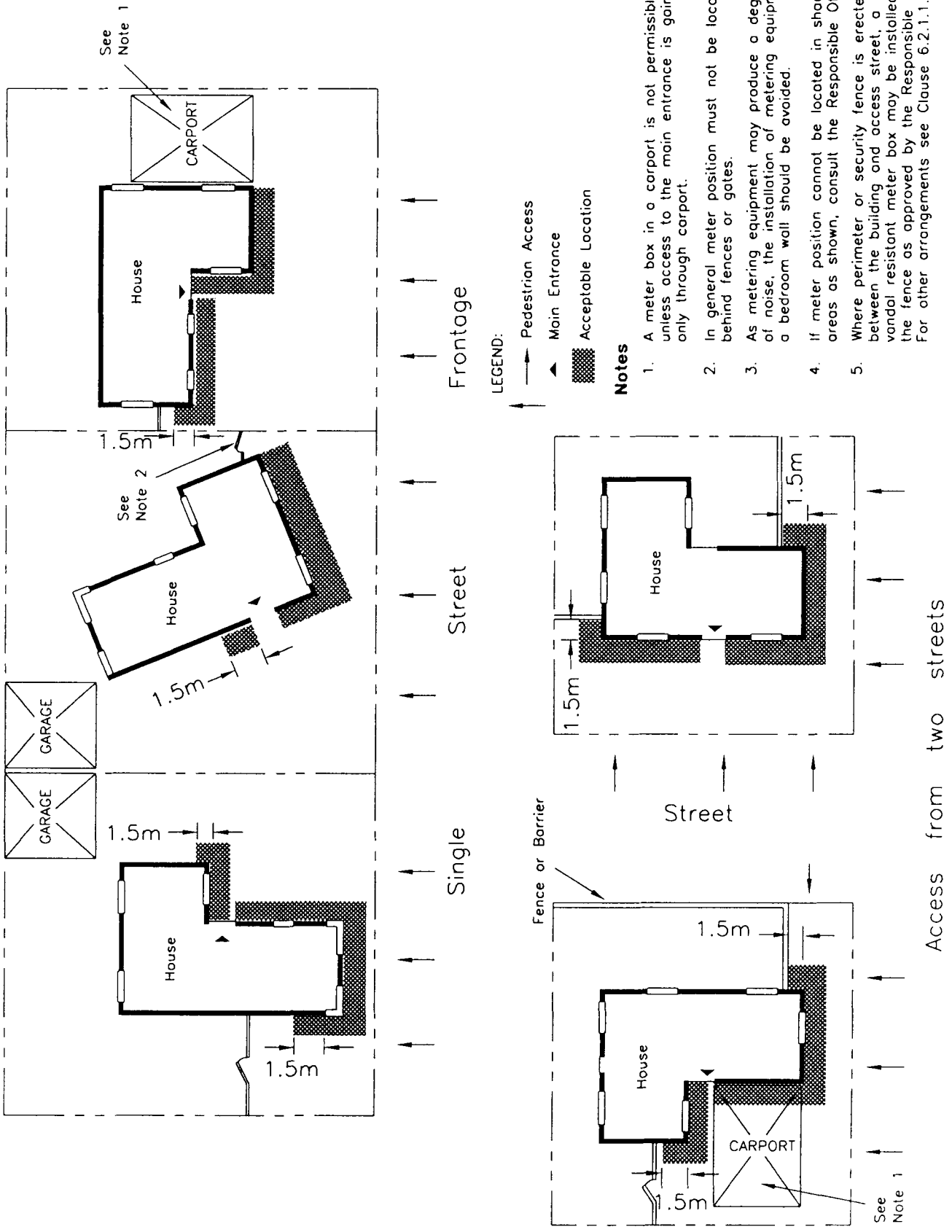


Figure 6.3 Individual Installations – Acceptable Meter Locations

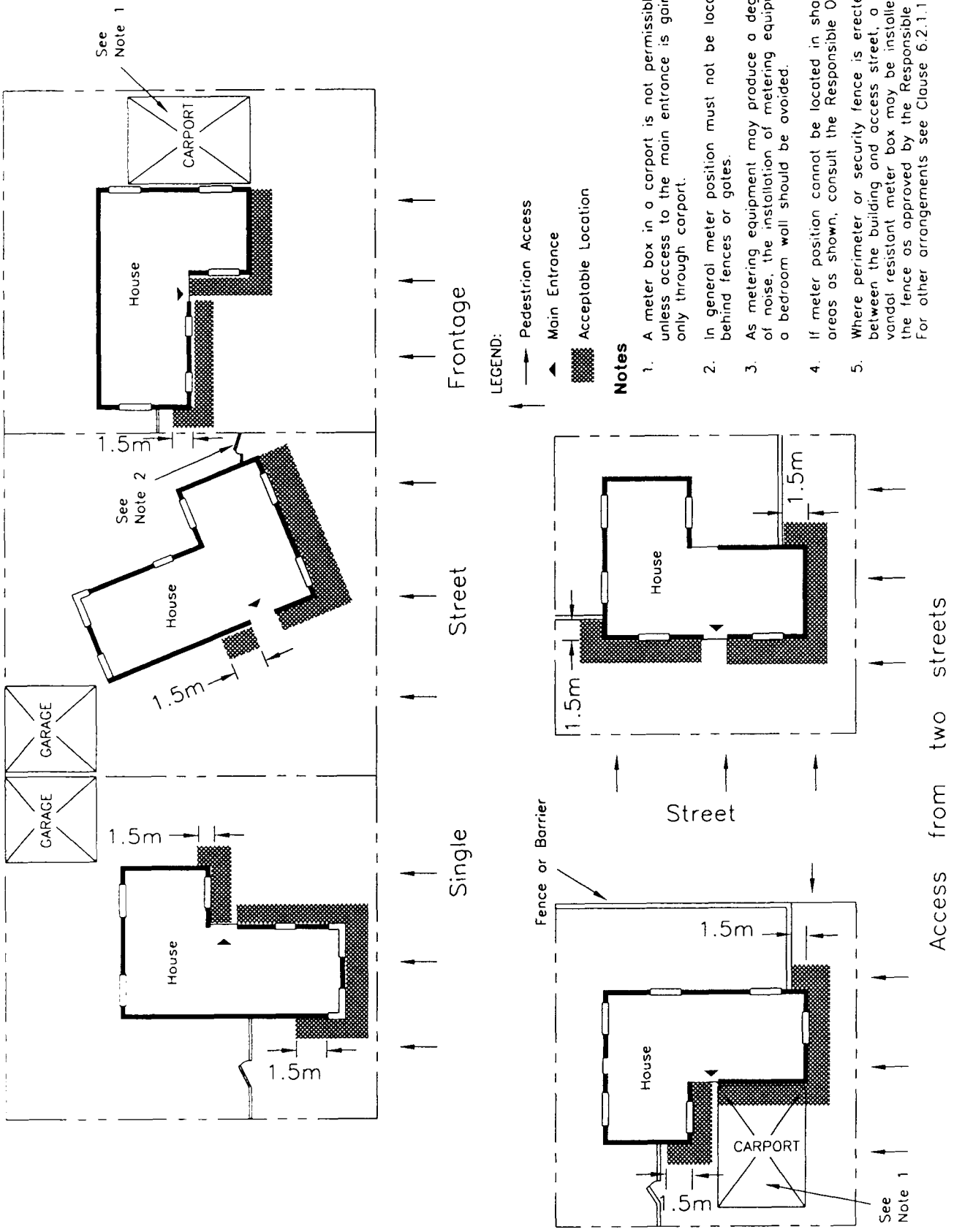
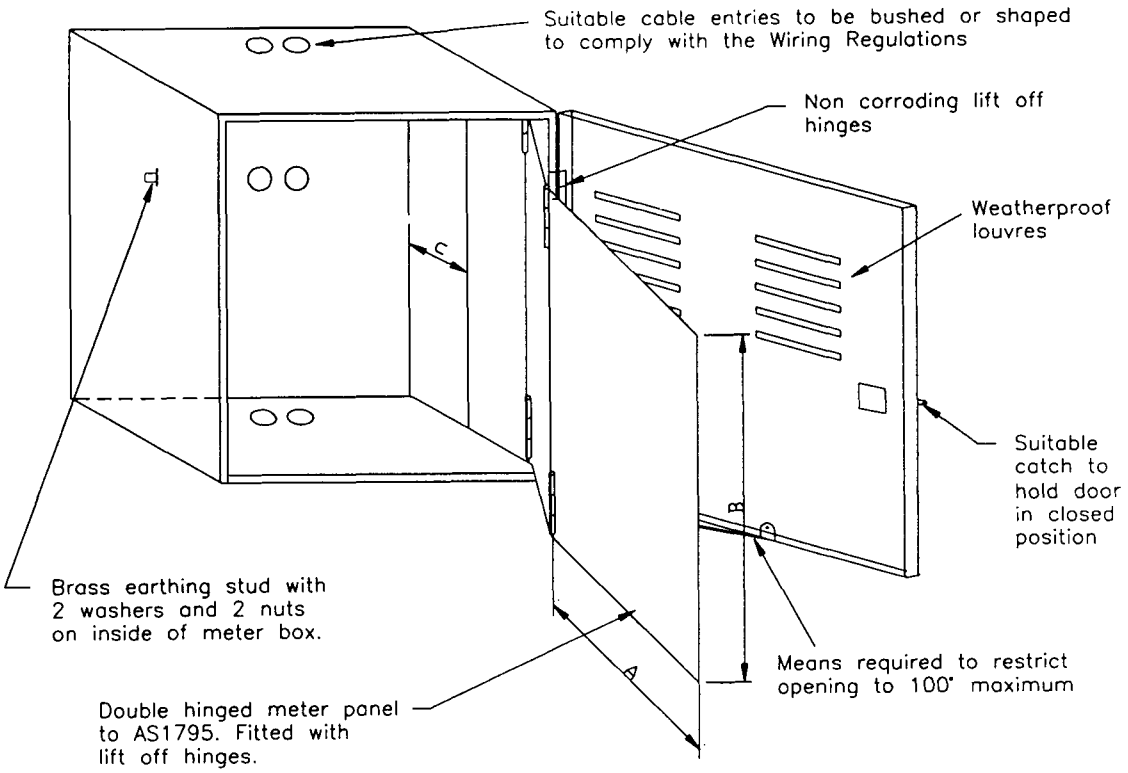


Figure 6.3 Individual Installations - Acceptable Meter Locations



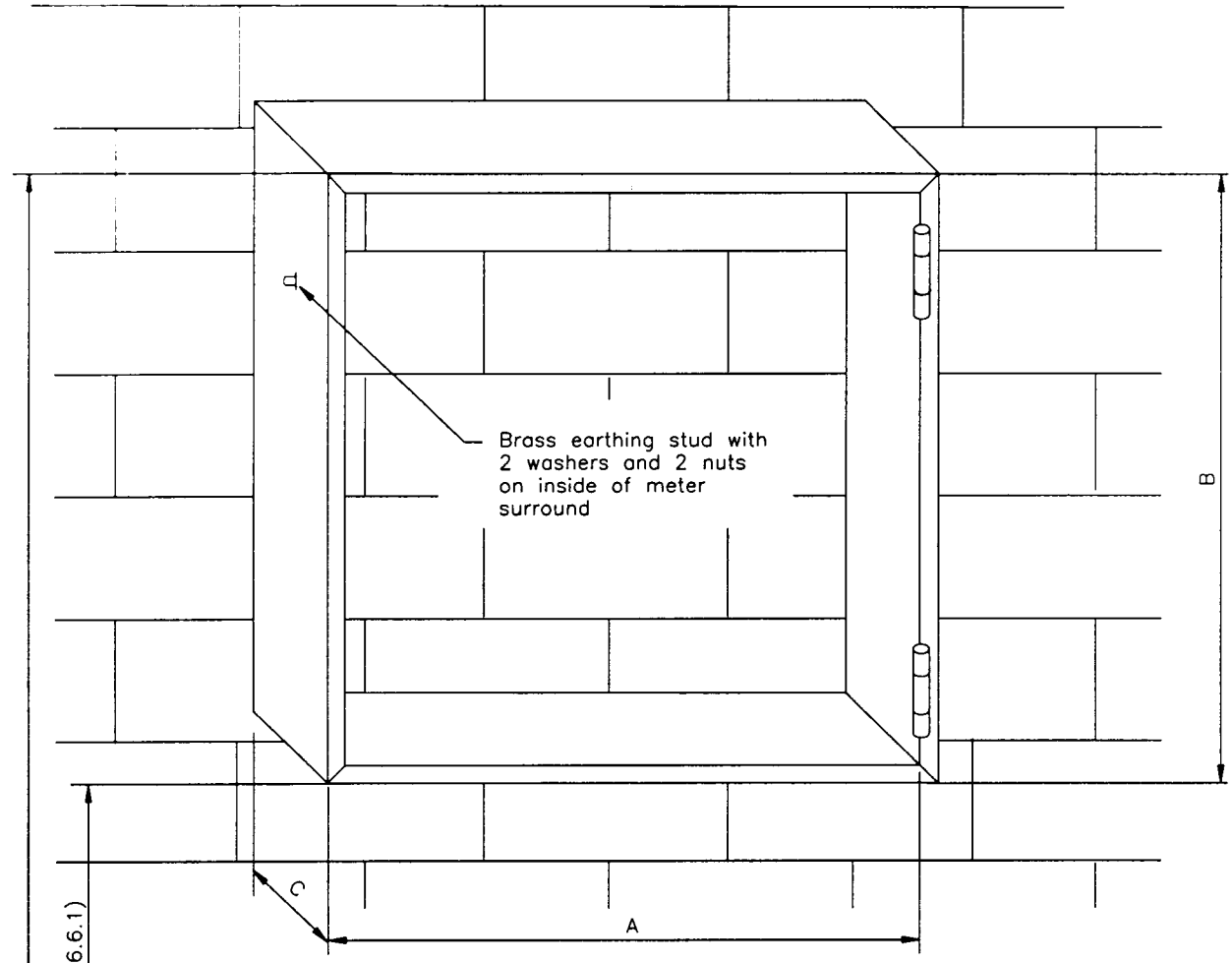
METER PANEL SIZE		INTERNAL DIMENSIONS	
'A'	'B'	Min. space in front of Meter Panel	Space Behind Meter Panel 'C'
400	380	180	In accordance with AS 3000 for hinged switchboard panels.
400	590	180	
590	400	180	
600	600	180	
600	900	180	
CT Metering Only			
600	900 *	240	

* Refer Clause 6.7.3

NOTES:

1. Suitable flashing may be required to prevent entry of moisture into box if the box is to be exposed to the weather. Particular attention should be paid to sealing around the door. The degree of protection shall be IP23 as defined in AS 1939. Adequate drain holes shall be provided in the bottom of the box.
2. Meter Box:– Constructed of galvanised sheet not less than 1.2mm thickness (or other acceptable metal sheet).
3. Refer to Clause 6.5.2 regarding provision for wiring not intended for connection to metering equipment.
4. The design and construction of a non–commercially manufactured meter box and panel shall be approved by the Responsible Officer.
5. Provision for sealing is required when panel is in the closed position.
6. Refer Clause 6.5.1, 6.6.3, 6.6.4 and 6.6.5 for further details regarding meter box and panel requirements.

Figure 6.4 Meter Box - Metal



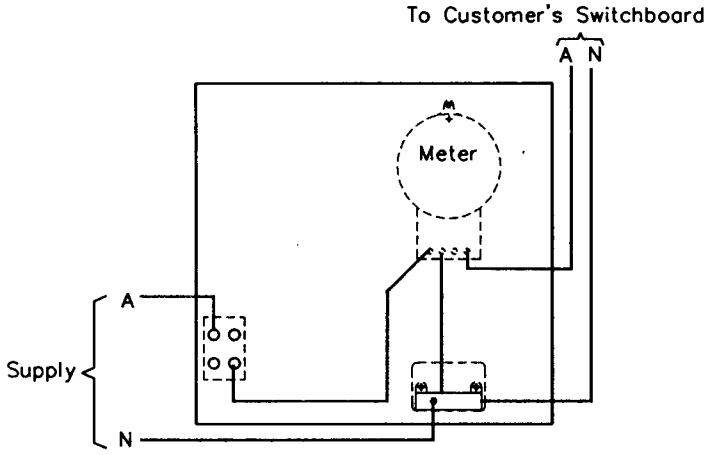
METER PANEL SIZE		SPACE BEHIND METER PANEL (INTERNAL DIMENSION)
"A"	"B"	"C"
400	380	In accordance with AS 3000 for hinged switchboard panels.
400	590	
590	400	
600	600	
600	900	
CT Metering Only		
600	900 *	

* Refer Clause 6.7.3

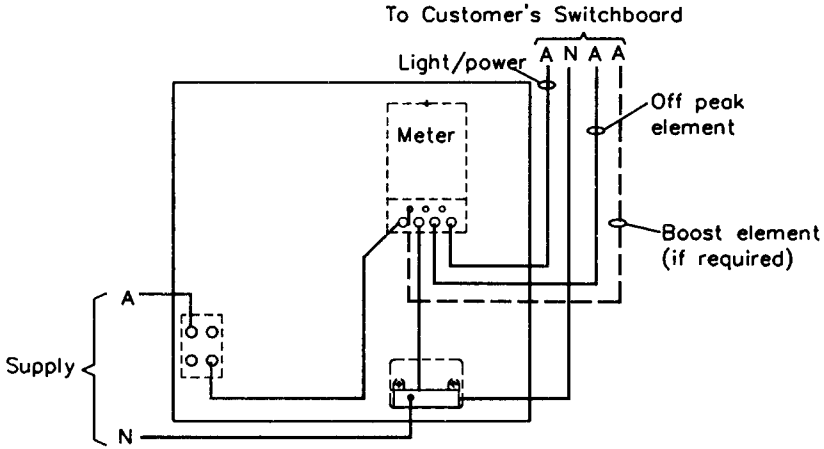
Notes:

1. Where installed on a conductive wall, insulating backing is required. In other cases backing is optional.
2. Where installed on a wall of combustible material, fire resistant lining shall be provided on the wall.
3. The customer shall supply and install the meter panel and mounting surround. The meter panel shall be fire resistant, hinged and capable of being lifted off. Refer to Clauses 6.5.1, 6.6.3, 6.6.4 and 6.6.5 for further details regarding meter surround and panel requirements.
4. Mounting surround constructed of galvanised sheet not less than 1.2mm thickness (or other acceptable metal sheet).

Figure 6.5 Meter Panel, Mounting Surround - Metal



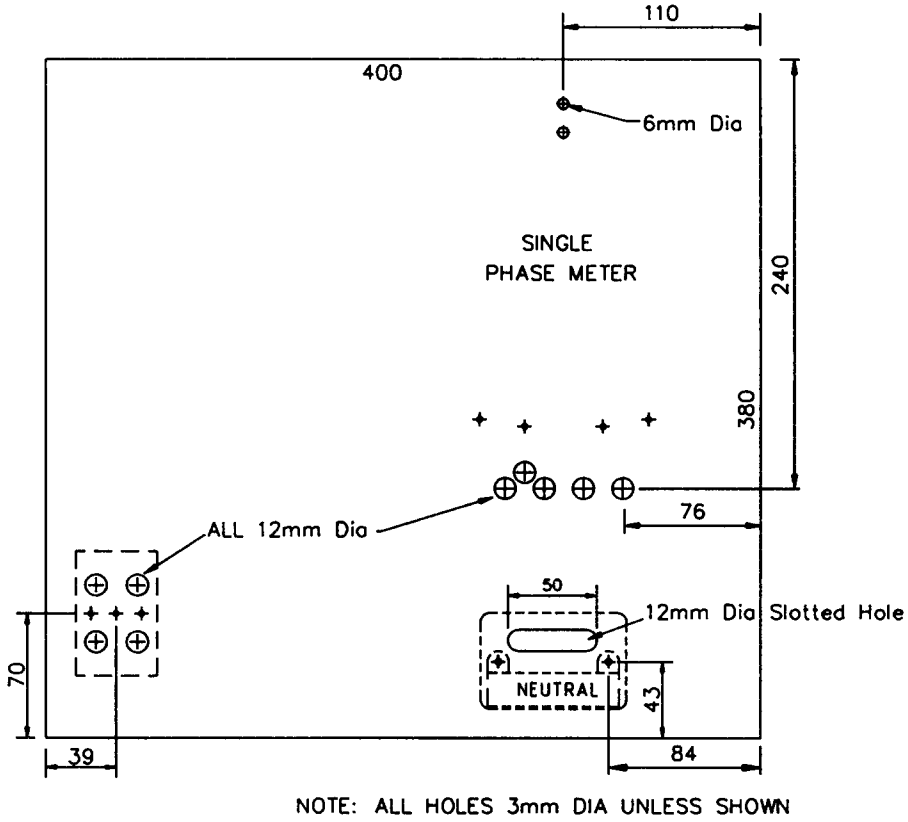
WIRING DIAGRAM
WITHOUT OFF PEAK LOAD



WIRING DIAGRAM
WITH OFF PEAK LOAD
ELECTRONIC METER

Notes

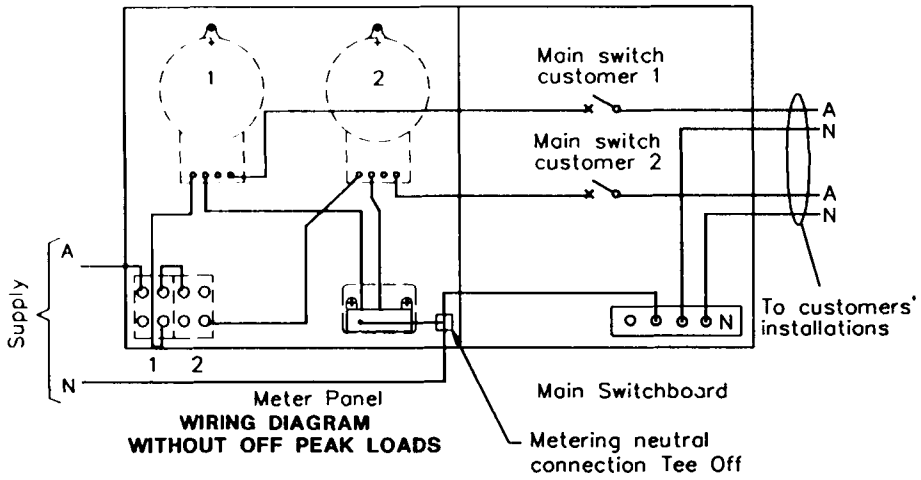
1. Meter panel fuse is not required for an overhead supply.
2. All metering neutrals minimum 4mm.²
3. Refer to fig 6.31 for meter template



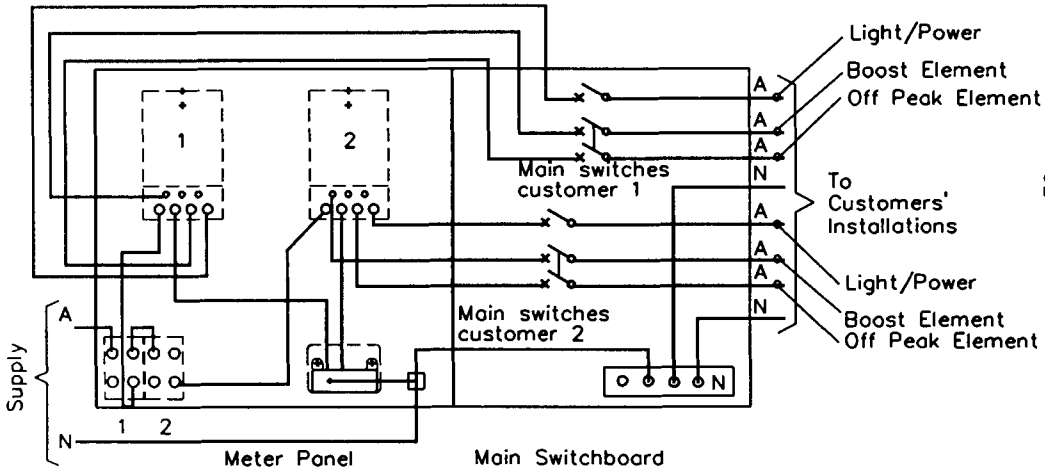
METER PANEL LAYOUT

TYPICAL METERING DETAILS FOR ONE CUSTOMER
SINGLE PHASE WITH OR WITHOUT
OFF PEAK LOAD
MAXIMUM 16mm² CONDUCTORS
PANEL SIZE 400mm W x 380mm H

Figure 6.6



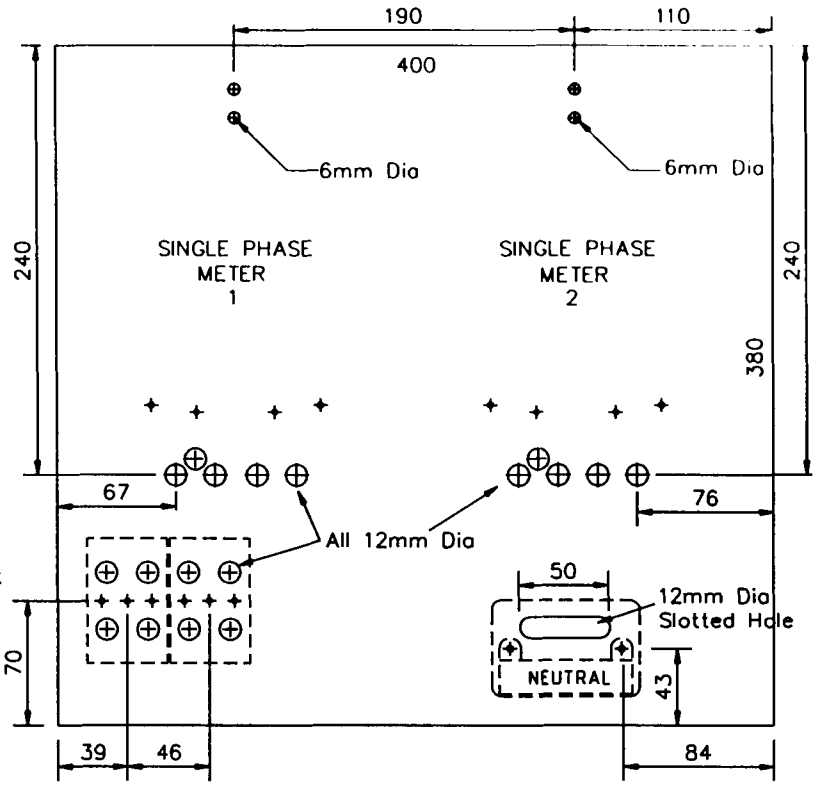
WIRING DIAGRAM WITHOUT OFF PEAK LOADS



WIRING DIAGRAM 2x240V METERS WITH OFF PEAK LOADS ELECTRONIC METERS

Notes

1. Meter panel fuse is required for each customer in overhead or underground supply areas.
2. All metering neutrals minimum 4mm²
3. Refer to Fig. 6.31 for meter template.

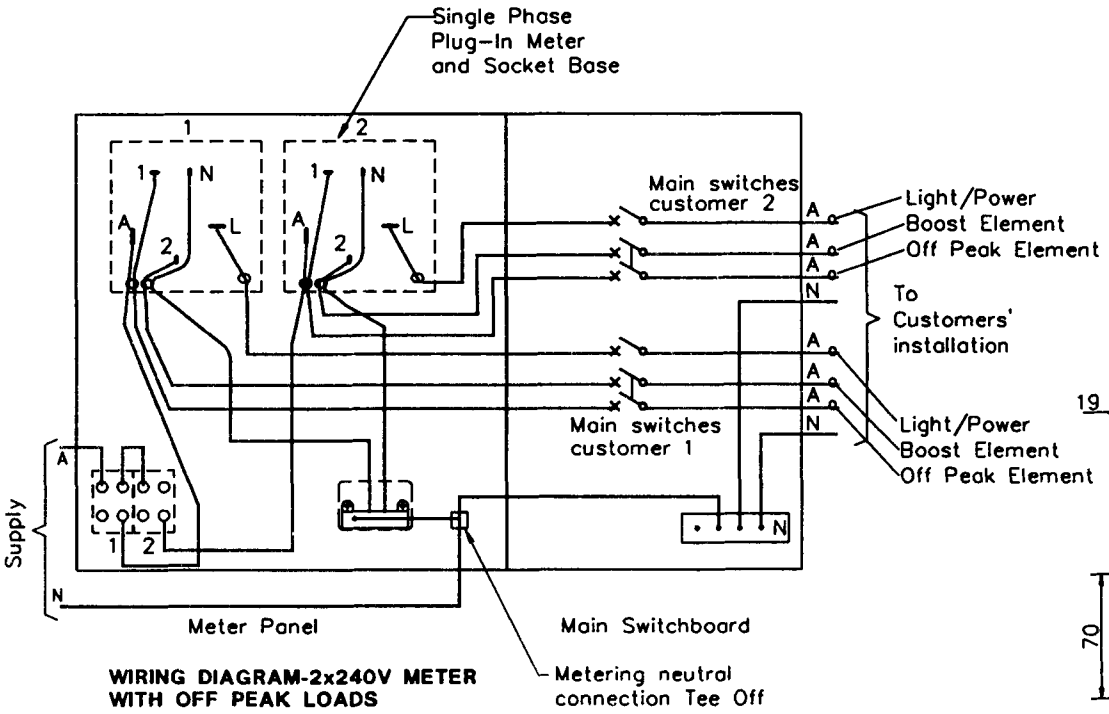


NOTE: ALL HOLES 3mm DIA UNLESS SHOWN

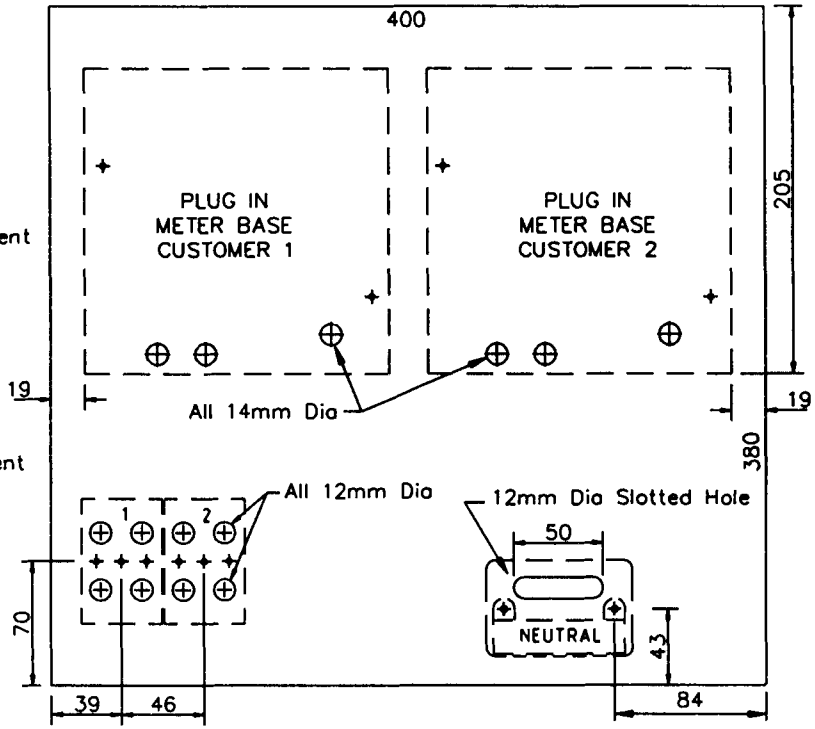
METER PANEL LAYOUT

TYPICAL METERING DETAILS FOR TWO CUSTOMERS SINGLE PHASE WITH OR WITHOUT OFF PEAK LOADS. MAXIMUM 16mm² CONDUCTORS PANEL SIZE 400mm W x 380mm H

Figure 6.7



WIRING DIAGRAM-2x240V METER WITH OFF PEAK LOADS



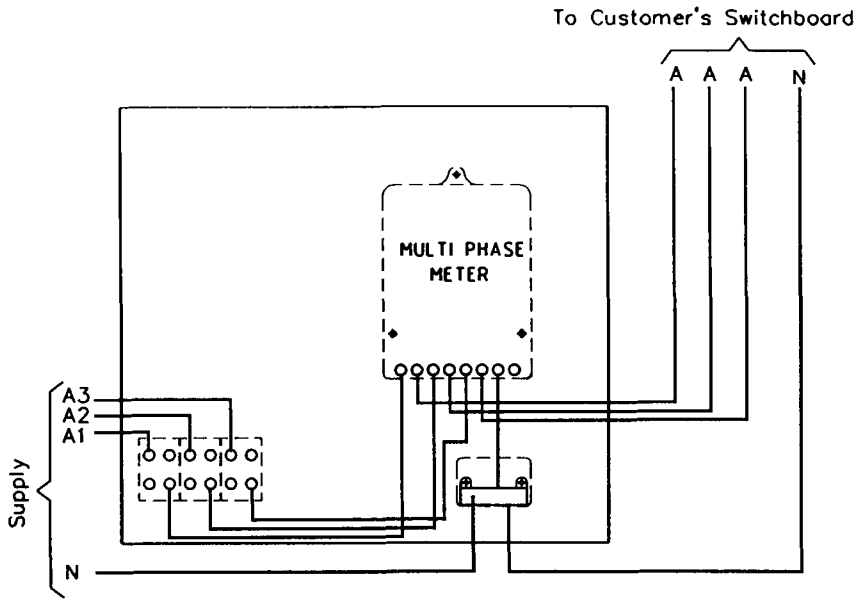
NOTE: ALL HOLES 3mm DIA UNLESS SHOWN

METER PANEL LAYOUT

Notes
1. For single customer installation delete one meter and one fuse.
2. Meter panel fuse not required for single customer with overhead supply.
3. Meter panel fuse is required for each customer in overhead or underground supply areas.
4. All metering neutrals minimum 4mm^2

TYPICAL METERING DETAILS FOR TWO CUSTOMERS SINGLE PHASE WITH PLUG-IN METERS. MAXIMUM 16mm^2 CONDUCTORS PANEL SIZE 400mm W x 380mm H

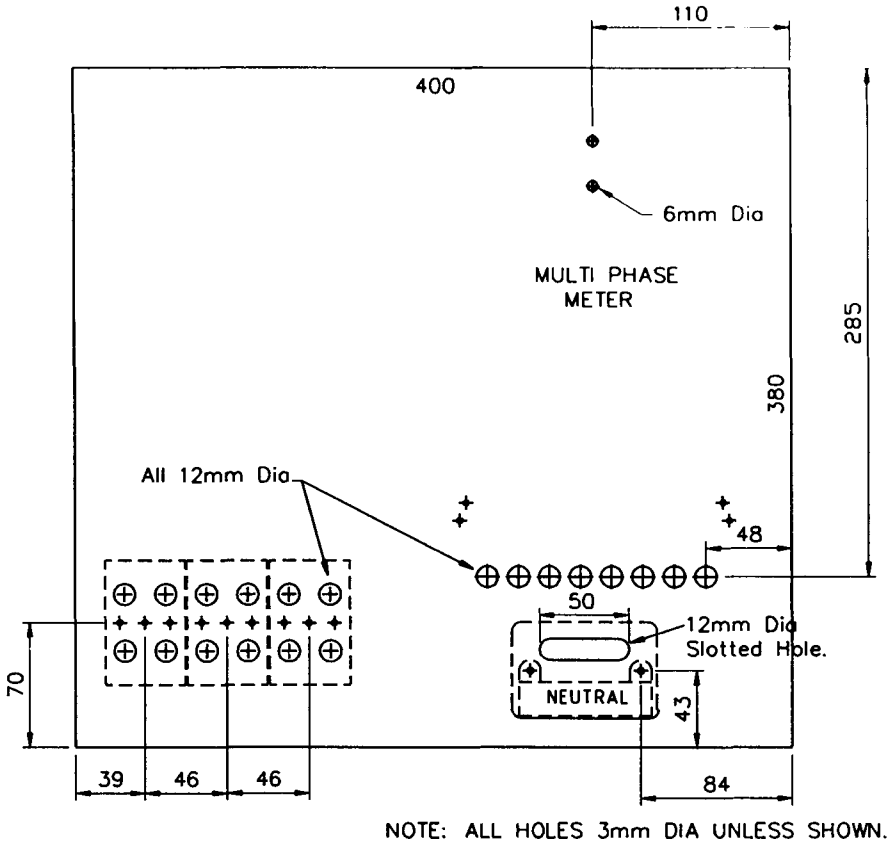
Figure 6.8



WIRING DIAGRAM

Notes

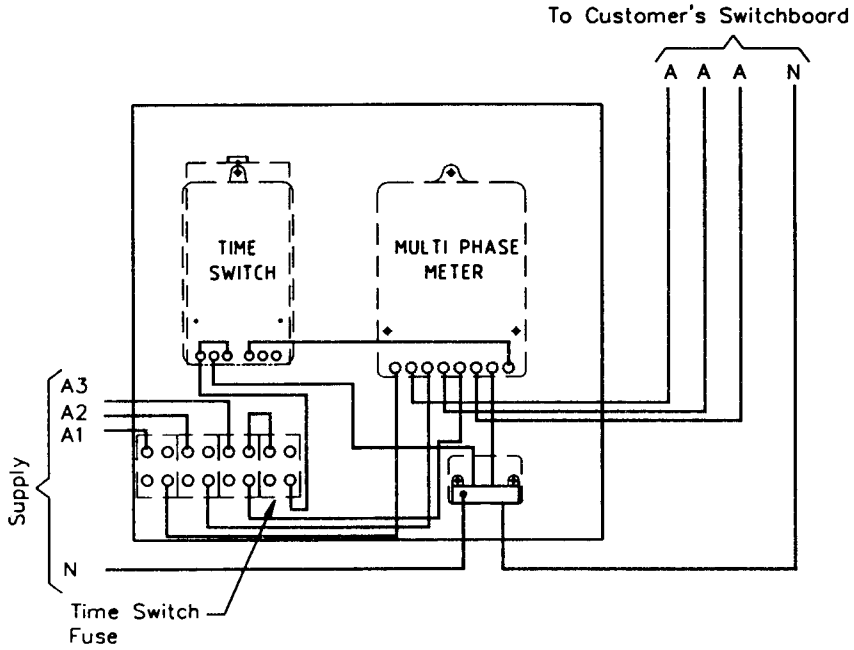
1. Meter panel fuses are not required for an overhead supply.
2. All metering neutrals minimum 4mm²
3. Refer to Fig 6.32 for meter template.



METER PANEL LAYOUT

TYPICAL METERING DETAILS FOR ONE CUSTOMER
MULTIPHASE ONE RATE
MAXIMUM 16mm² CONDUCTORS
PANEL SIZE 400mm W x 380mm H

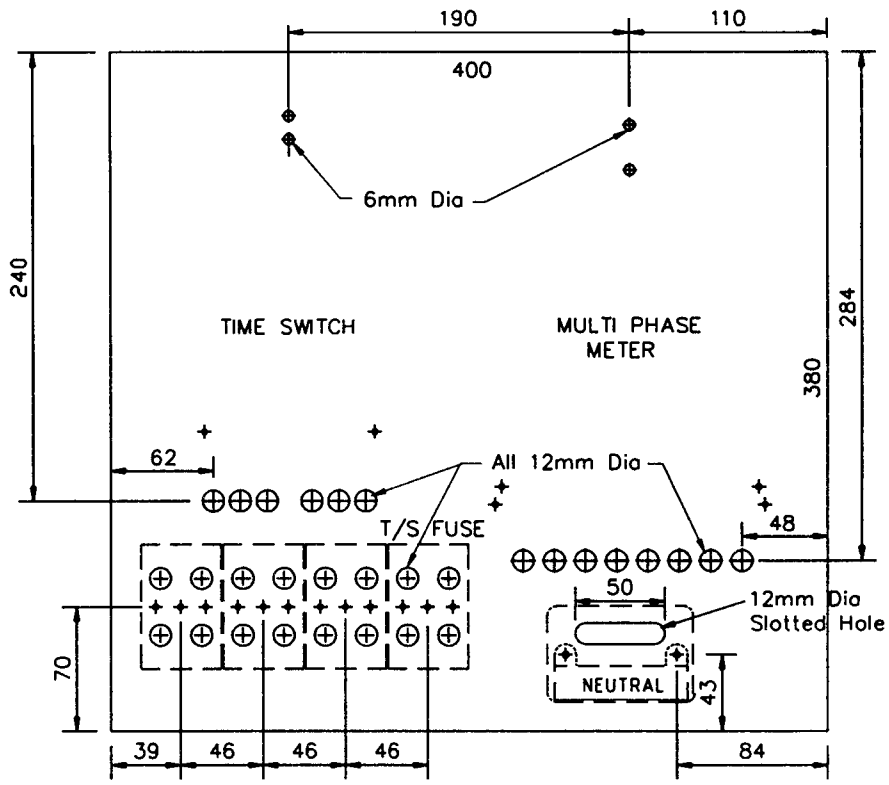
Figure 6.9



WIRING DIAGRAM

Notes

1. Meter panel fuses are not required for an overhead supply.
2. All time switch wiring and metering neutrals minimum 4mm.^{2}
3. Time switch fuse is required for all installations other than domestic.
4. Refer to Fig. 6.32 and 6.33 for meter and time switch templates.

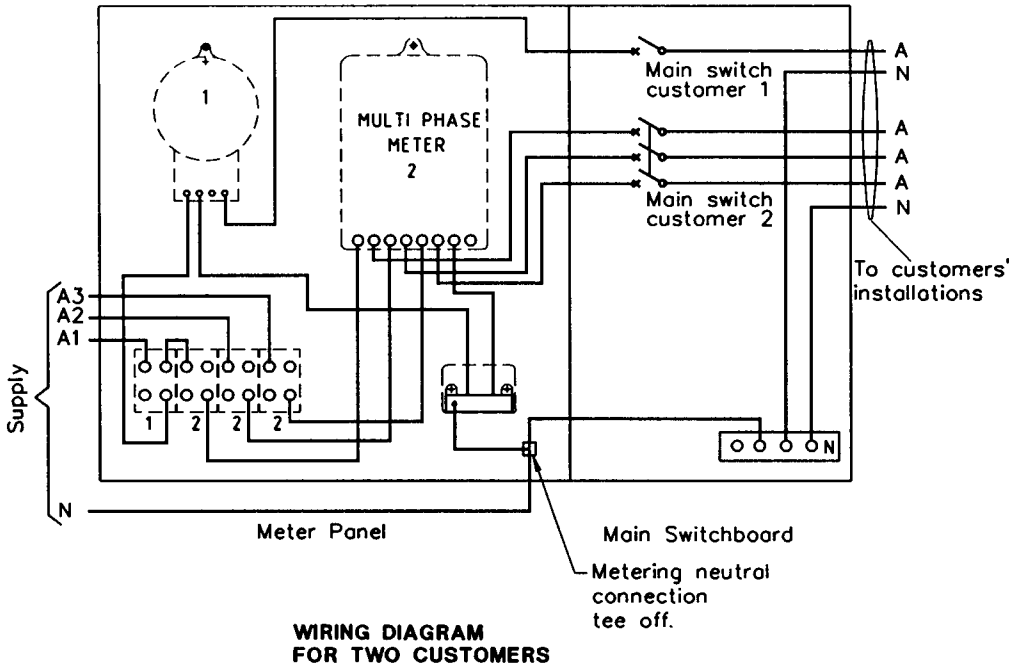


NOTE: ALL HOLES 3mm DIA UNLESS SHOWN.

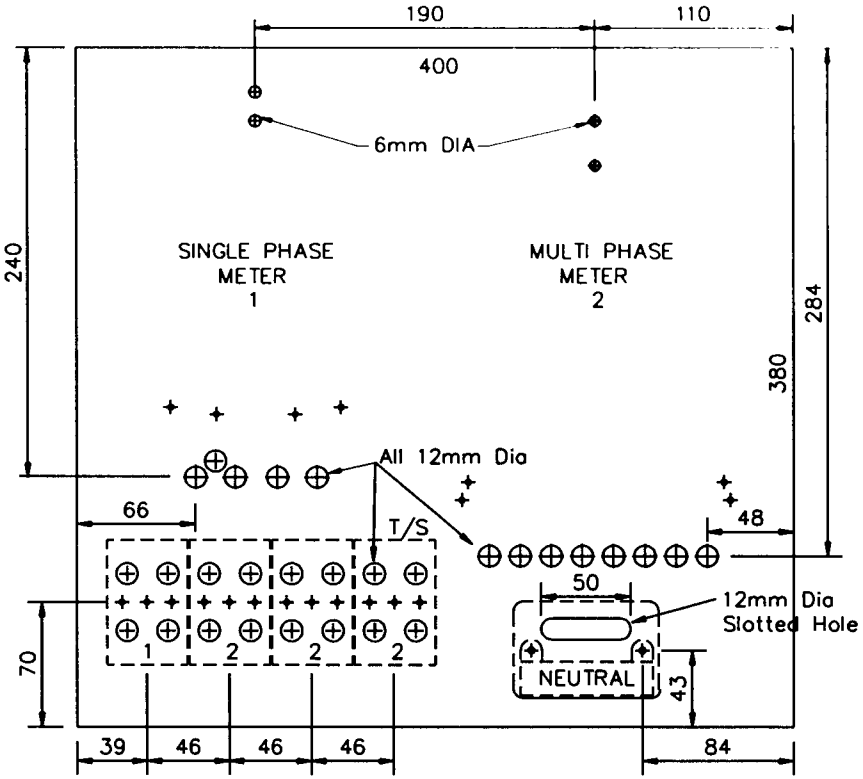
METER PANEL LAYOUT

TYPICAL METERING DETAILS FOR ONE CUSTOMER MULTIPHASE 2 RATE MAXIMUM 16mm^2 CONDUCTORS PANEL SIZE 400mm W x 380mm H

Figure 6.10



WIRING DIAGRAM FOR TWO CUSTOMERS



NOTE: ALL HOLES 3mm DIA UNLESS SHOWN.

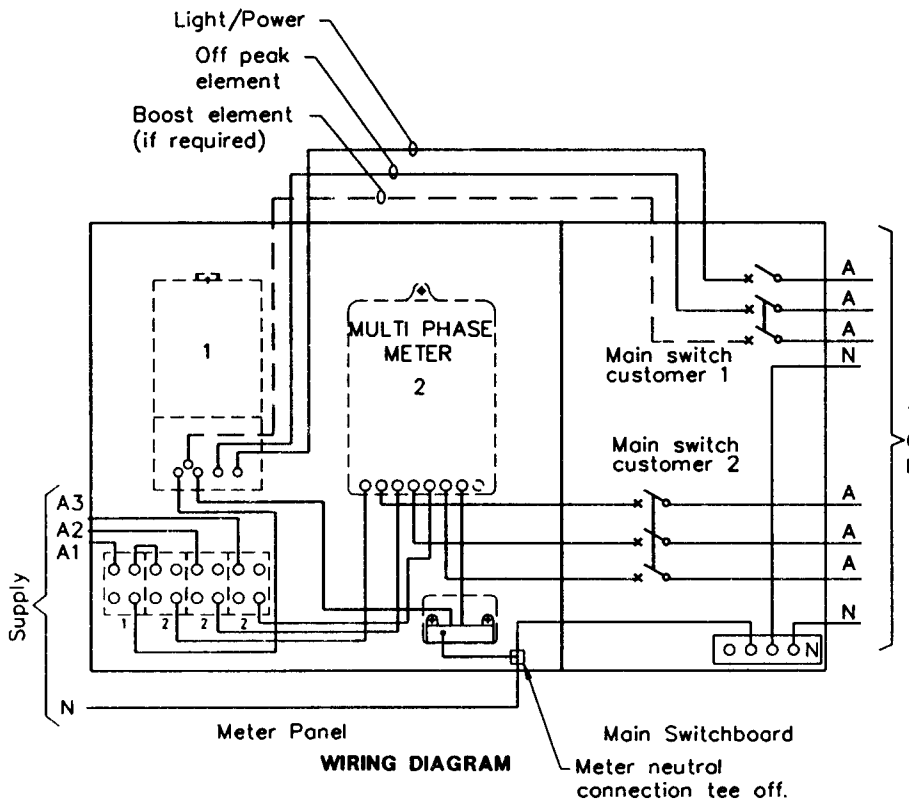
METER PANEL LAYOUT

Notes

1. Meter panel fuses are required for each customer in overhead or underground supply areas.
2. All metering neutrals minimum 4mm²
3. Refer to figures 6.31 and 6.32 for meter templates.

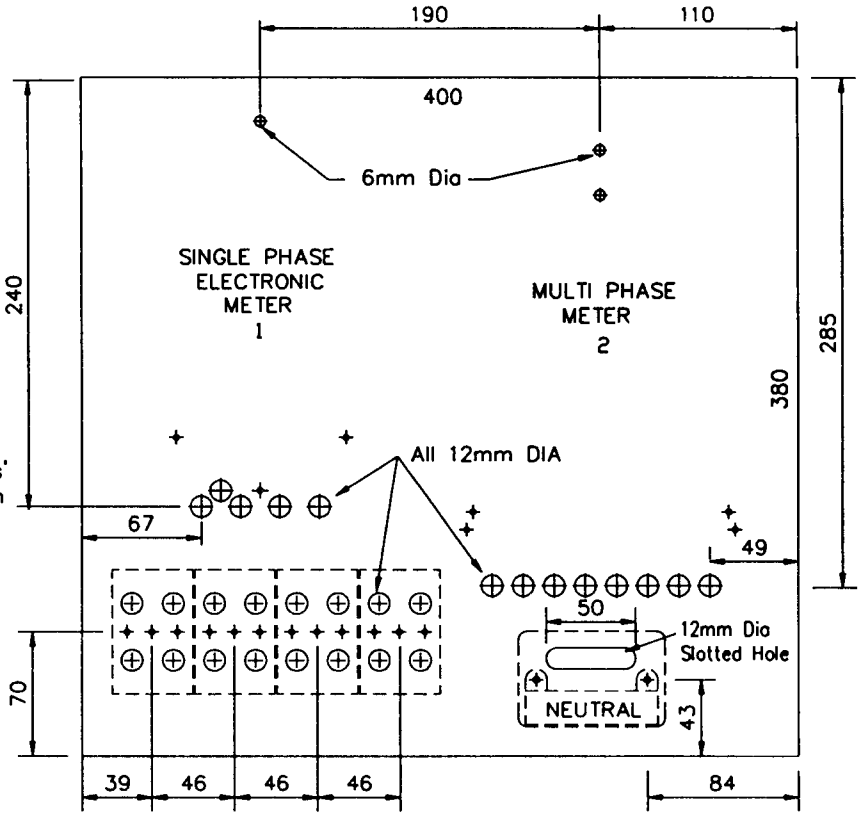
TYPICAL METERING DETAILS FOR TWO CUSTOMERS 1- MULTIPHASE ONE RATE & 1- SINGLE PHASE ONE RATE METER MAXIMUM 16mm² CONDUCTOR PANEL SIZE 400mm W x 380mm H

Figure 6.11



WIRING DIAGRAM

Notes
1. Meter panel fuses are required for each customer in overhead or underground supply areas.
2. All metering neutrals minimum 4mm².
3. Refer to Figures 6.31 & 6.32 for meter templates.

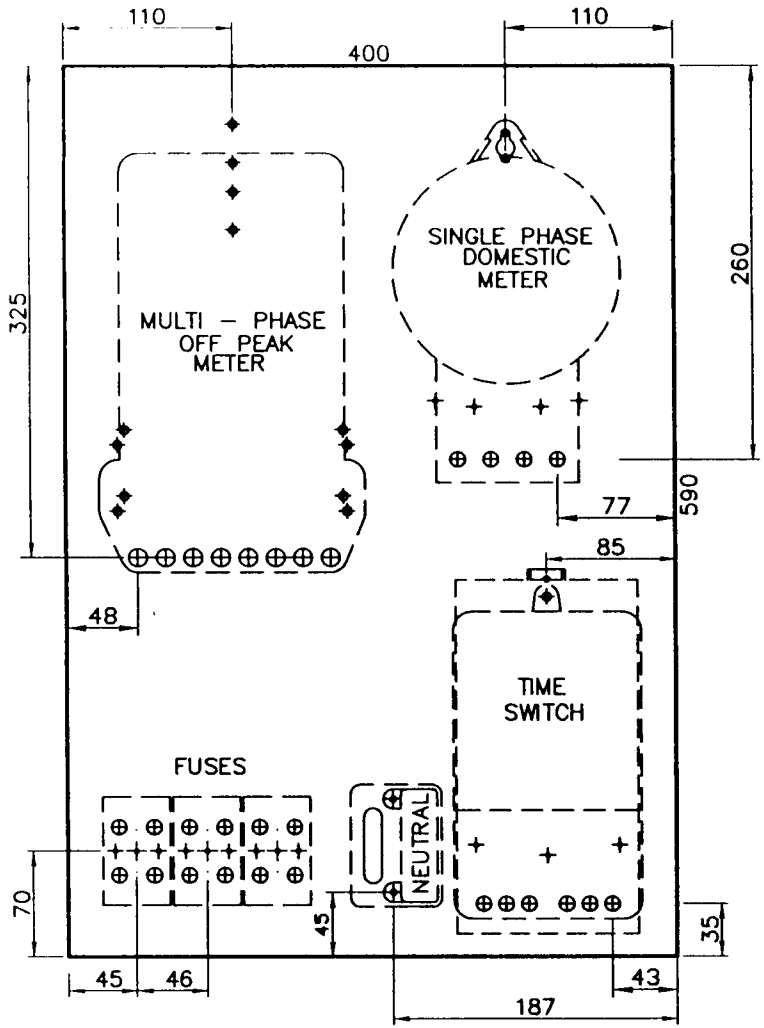


NOTE: ALL HOLES 3mm DIA UNLESS SHOWN

METER PANEL LAYOUT

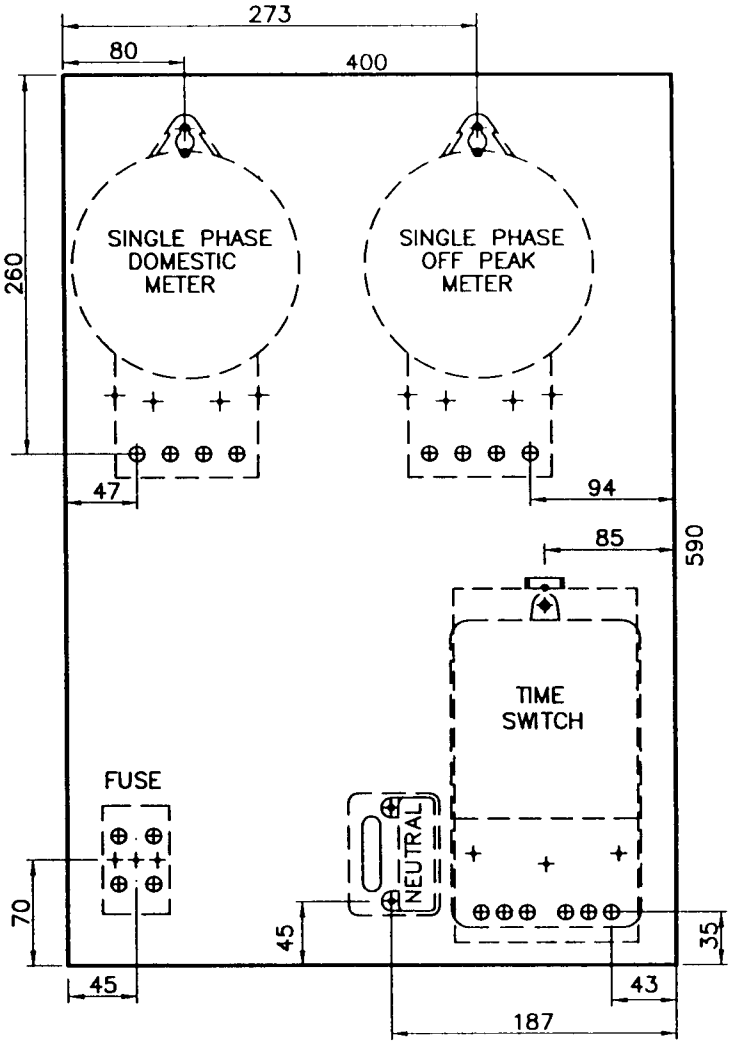
TYPICAL METERING DETAILS FOR TWO CUSTOMERS
1-MULTIPHASE ONE RATE AND
1-SINGLE PHASE ELECTRONIC METER
WITH OFF PEAK LOAD
MAXIMUM 16mm² CONDUCTORS
PANEL SIZE 400mm W x 380mm H

Figure 6.12



TYPICAL METER PANEL LAYOUT
1 CUSTOMER MULTI PHASE
TWO OFF PEAK LOADS

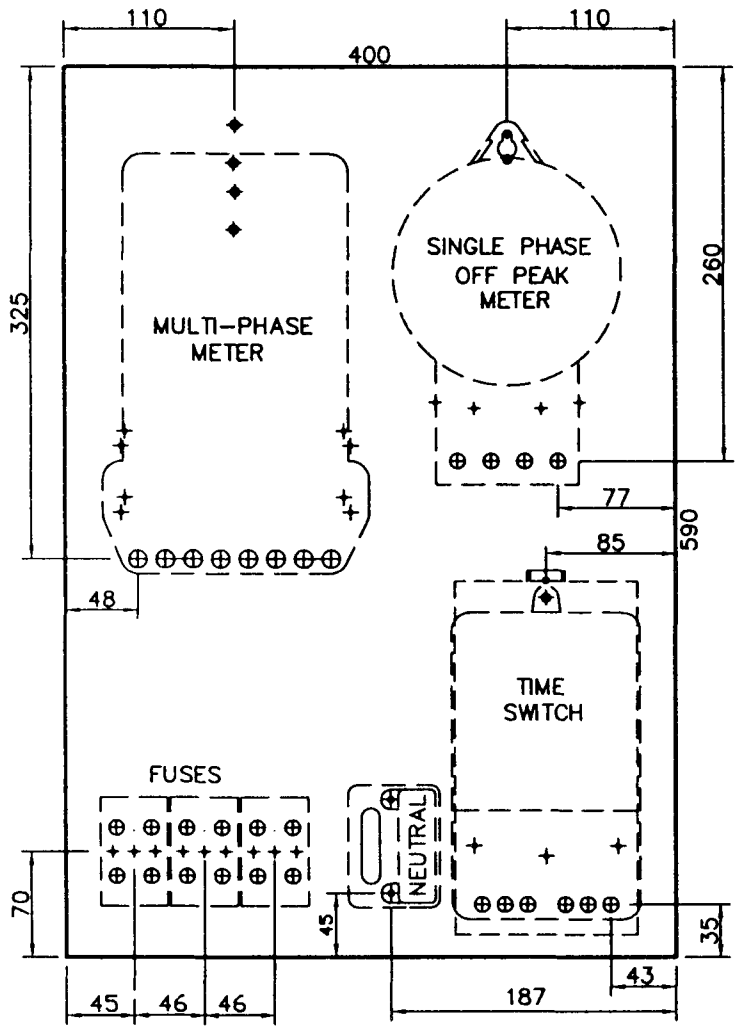
(WIRING DIAGRAM 6.21)



TYPICAL METER PANEL LAYOUT
1 CUSTOMER SINGLE PHASE
TWO OFF PEAK LOADS

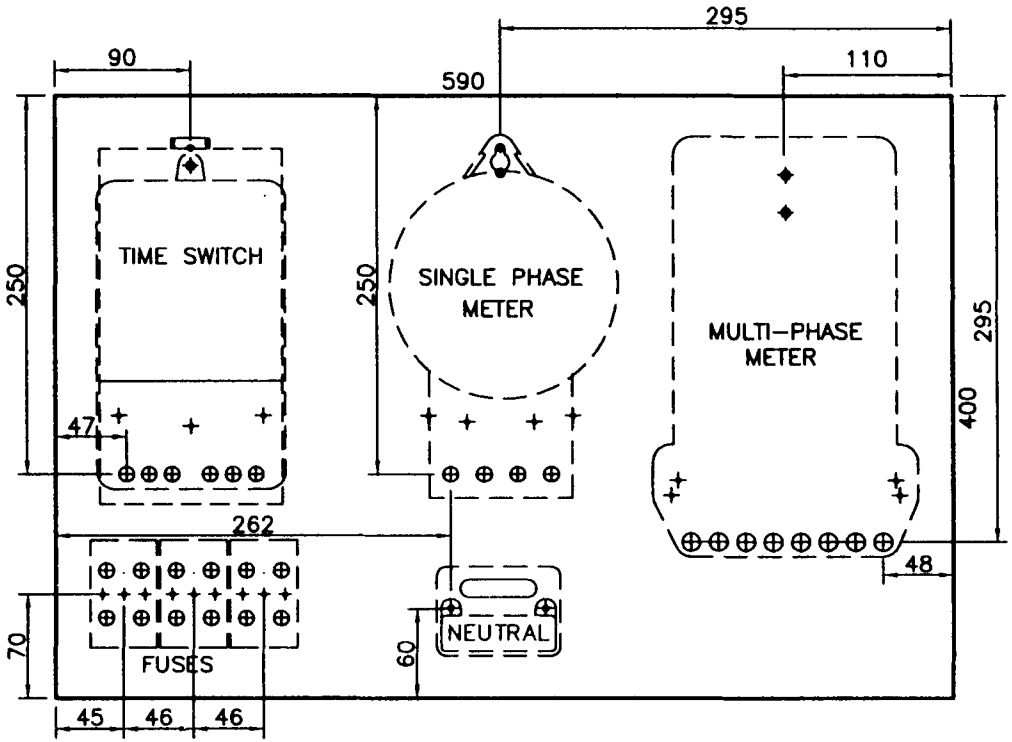
(WIRING DIAGRAM 6.20)

Figure 6.13



VERTICAL LAYOUT

(WIRING DIAGRAM – FIG 6.22)

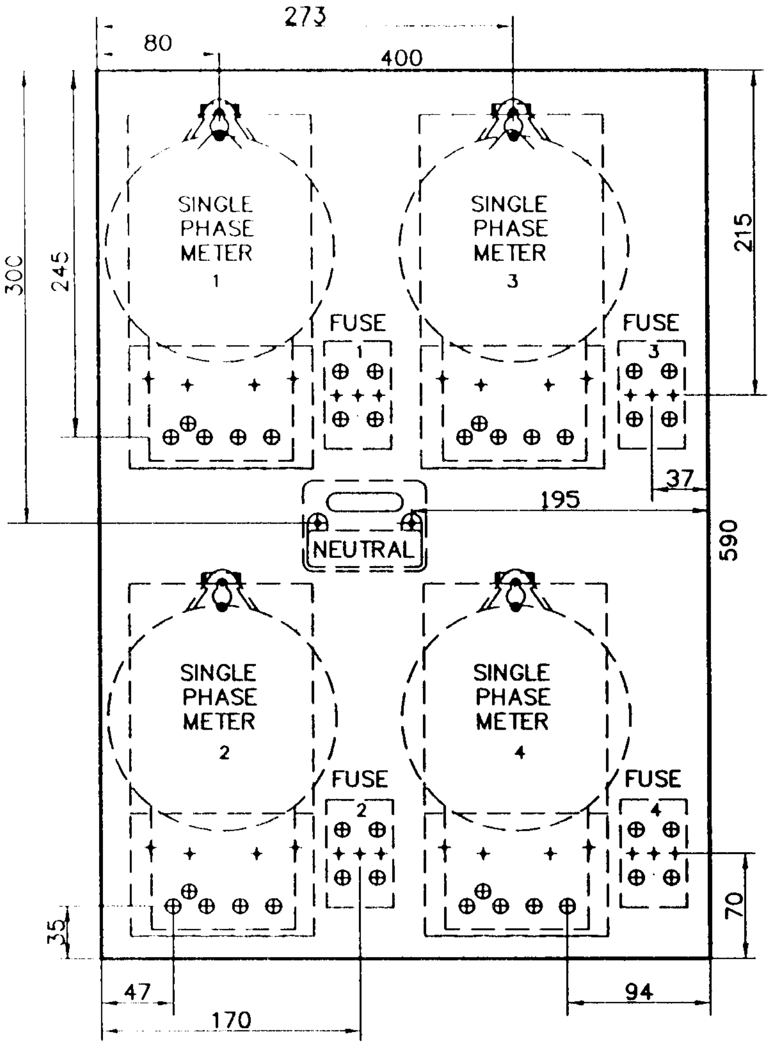


HORIZONTAL LAYOUT

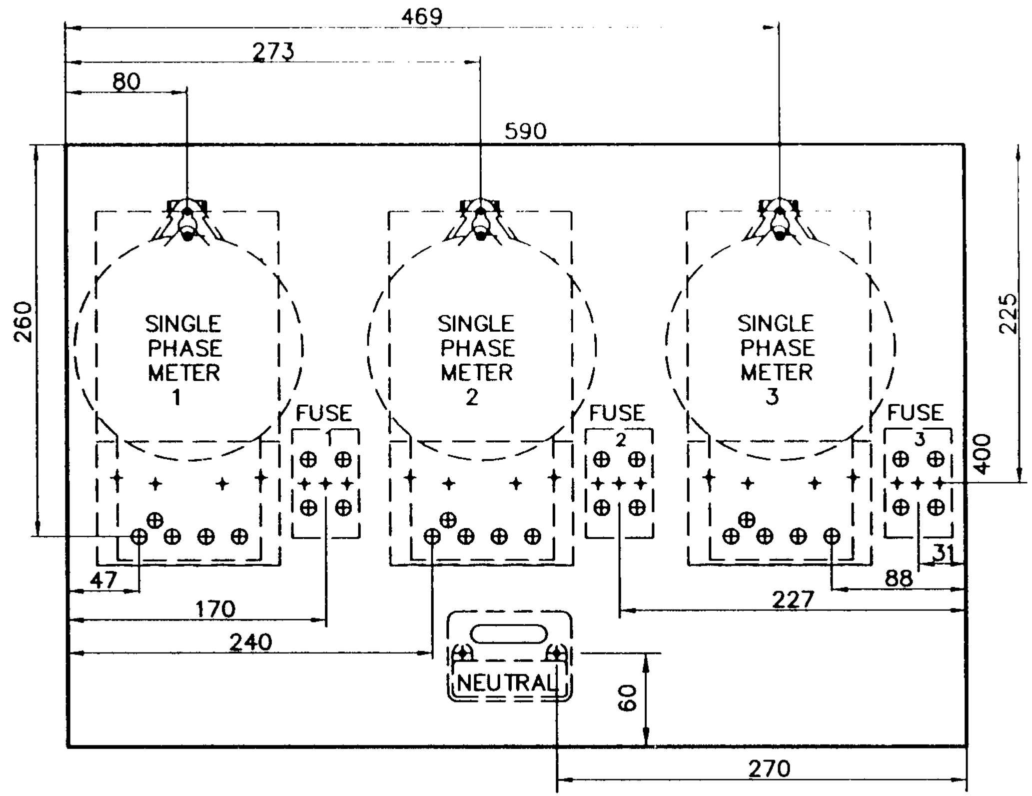
(WIRING DIAGRAM – FIG 6.23)

TYPICAL METER PANEL LAYOUTS
1 CUSTOMER
MULTI PHASE
WINNER
WITH OFF PEAK LOADS

Figure 6.14



TYPICAL METER PANEL LAYOUT
4 CUSTOMERS SINGLE PHASE
1 RATE or ELECTRONIC
(WIRING DIAGRAM – FIG 6.25)



TYPICAL METER PANEL LAYOUT
3 CUSTOMERS SINGLE PHASE
1 RATE or ELECTRONIC
(WIRING DIAGRAM – FIG 6.24)

Figure 6.15

TYPICAL METER PANEL LAYOUT
6 CUSTOMERS SINGLE PHASE
1 RATE or ELECTRONIC
(WIRING DIAGRAM – FIG 6.26)

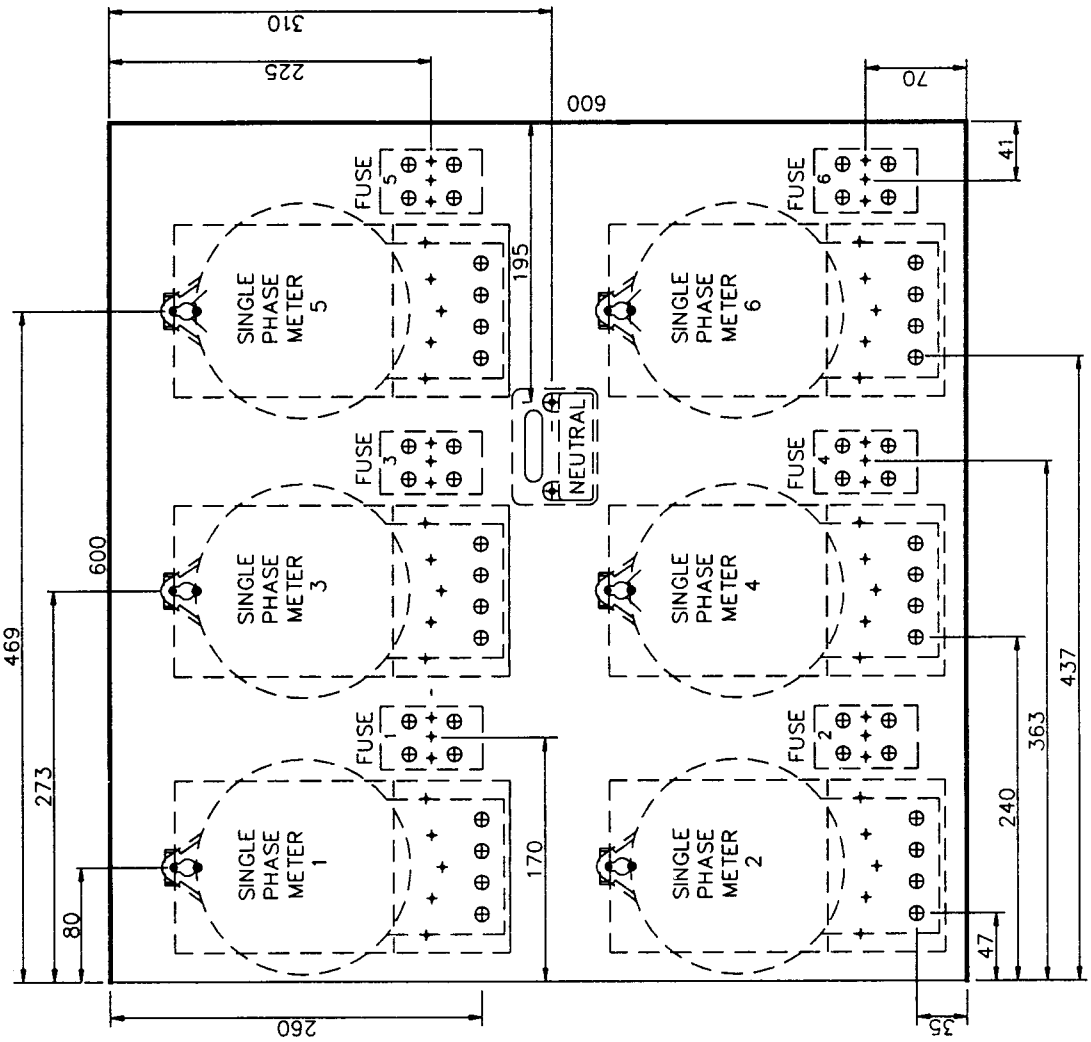
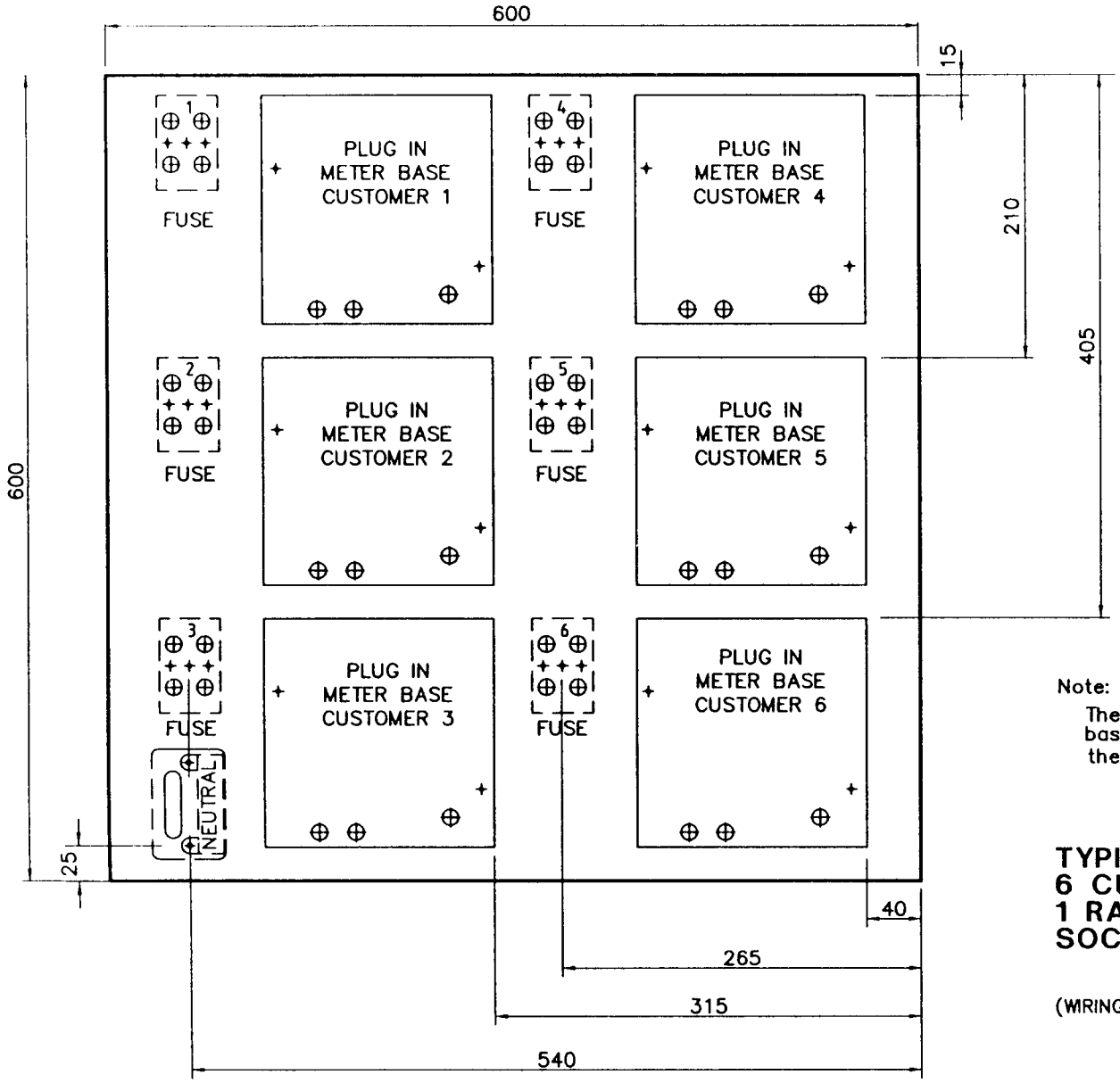


Figure 6.16



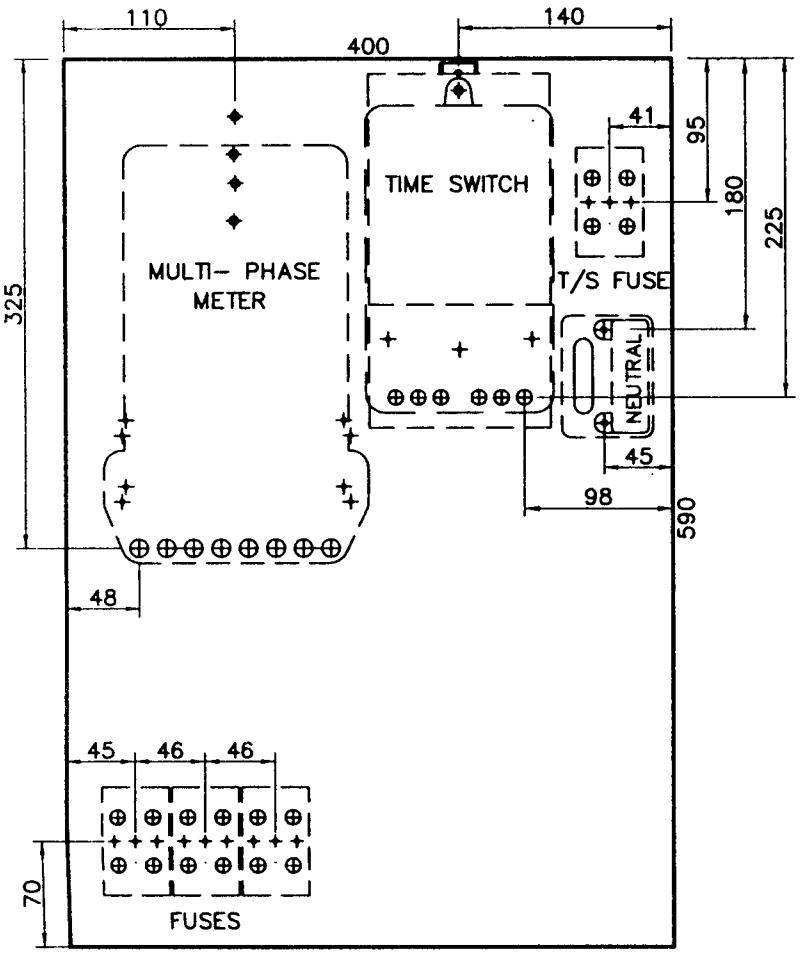
Note:

These measurements are for the socket base. The cover extends over perimeter of the base by approx 5mm

TYPICAL METER PANEL LAYOUT 6 CUSTOMERS SINGLE PHASE 1 RATE or ELECTRONIC SOCKET METERING

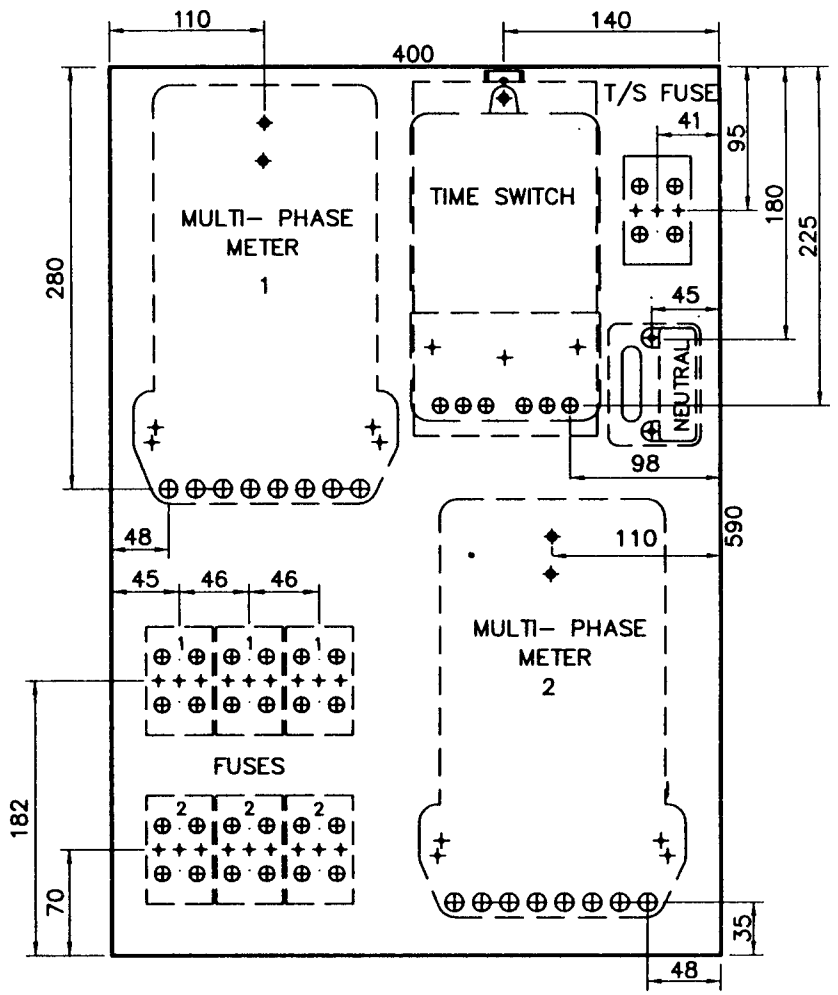
(WIRING DIAGRAM – FIG 6.27)

Figure 6.17



TYPICAL METER PANEL LAYOUT
1 CUSTOMER
MULTI PHASE 1 or 2 RATE

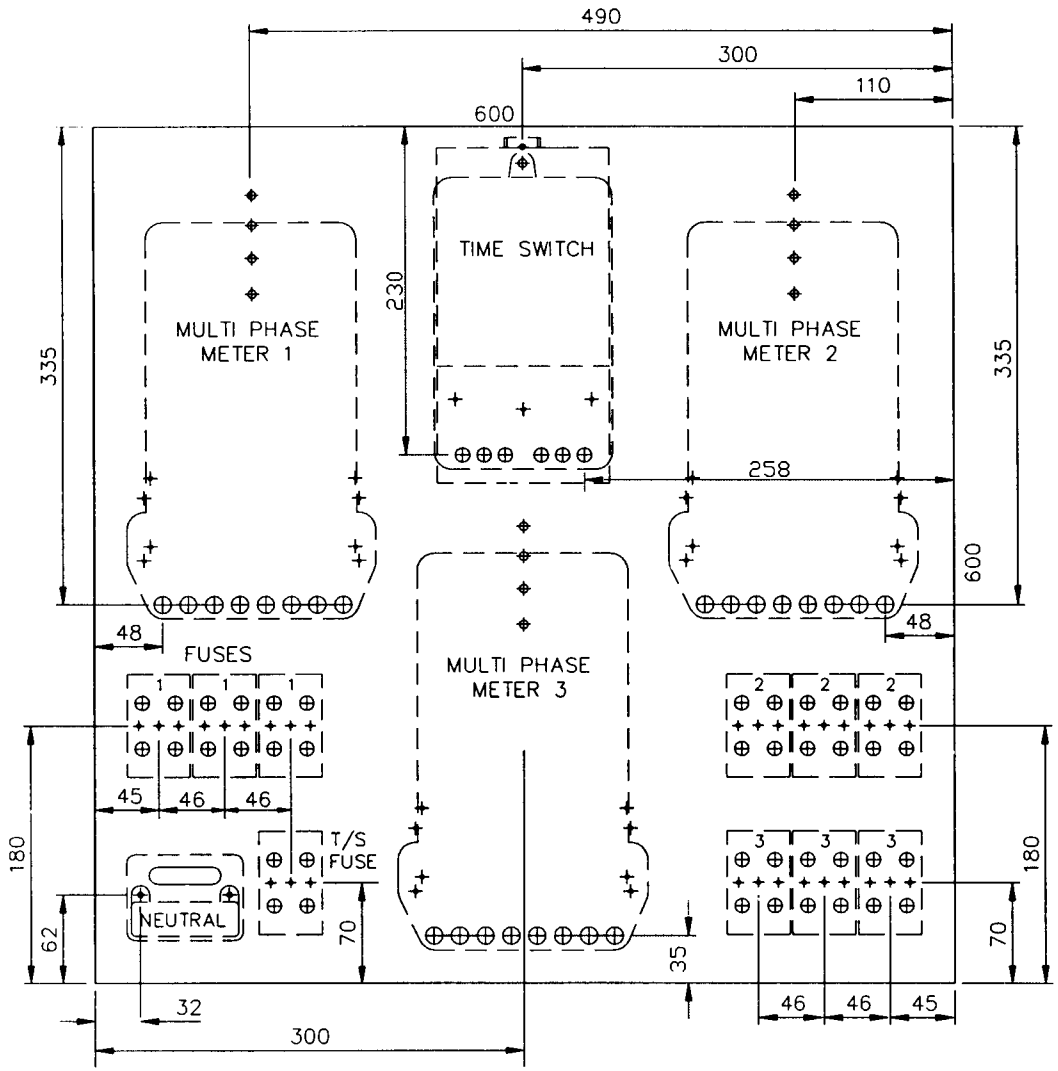
(WIRING DIAGRAM – FIG 6.28)



TYPICAL METER PANEL LAYOUT
2 CUSTOMERS
MULTI PHASE 1 or 2 RATE

(WIRING DIAGRAM – FIG 6.29)

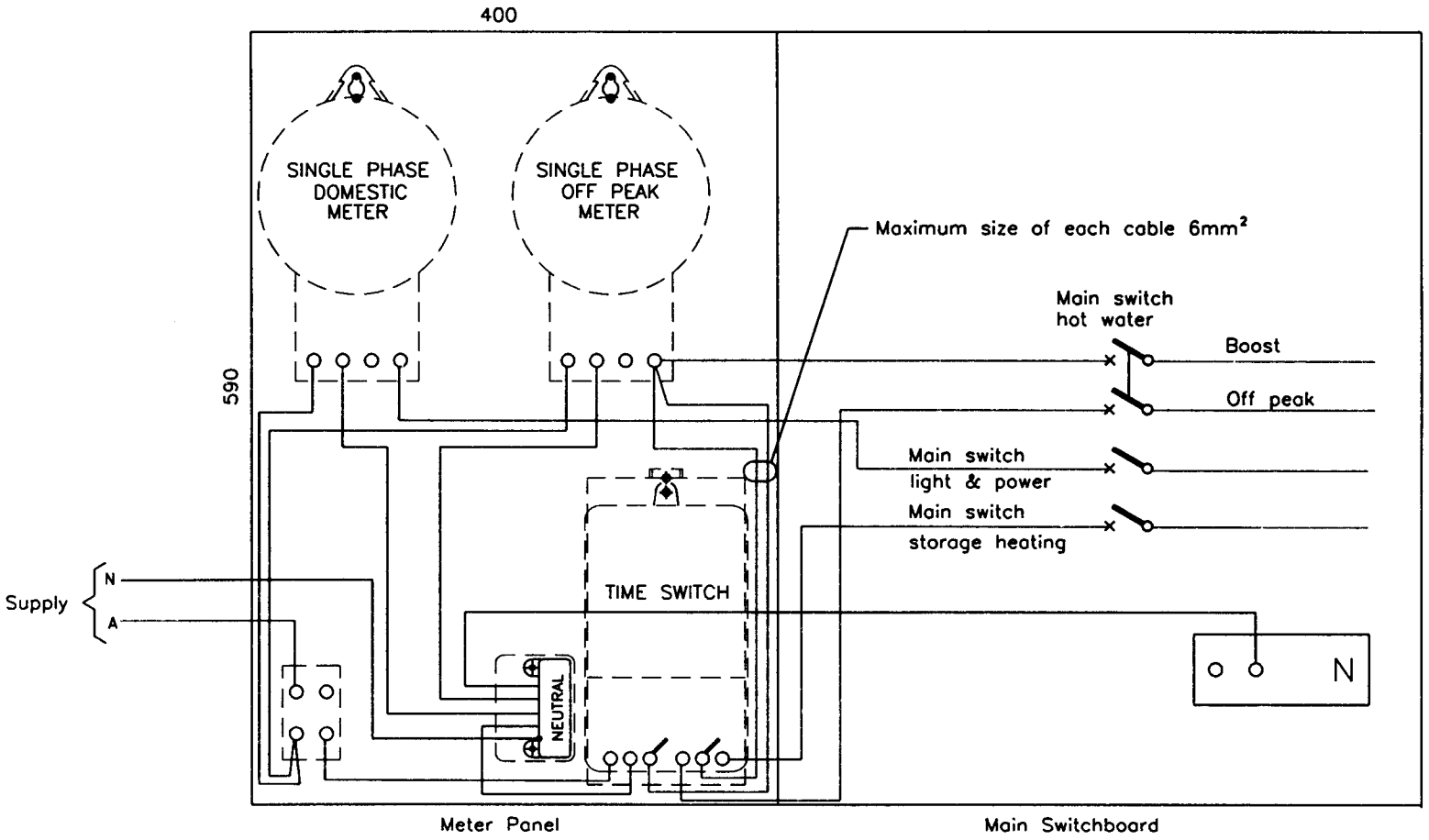
Figure 6.18



TYPICAL METER PANEL LAYOUT
3 CUSTOMERS MULTI PHASE
1 or 2 RATE

(WIRING DIAGRAM – FIG 6.30)

Figure 6.19

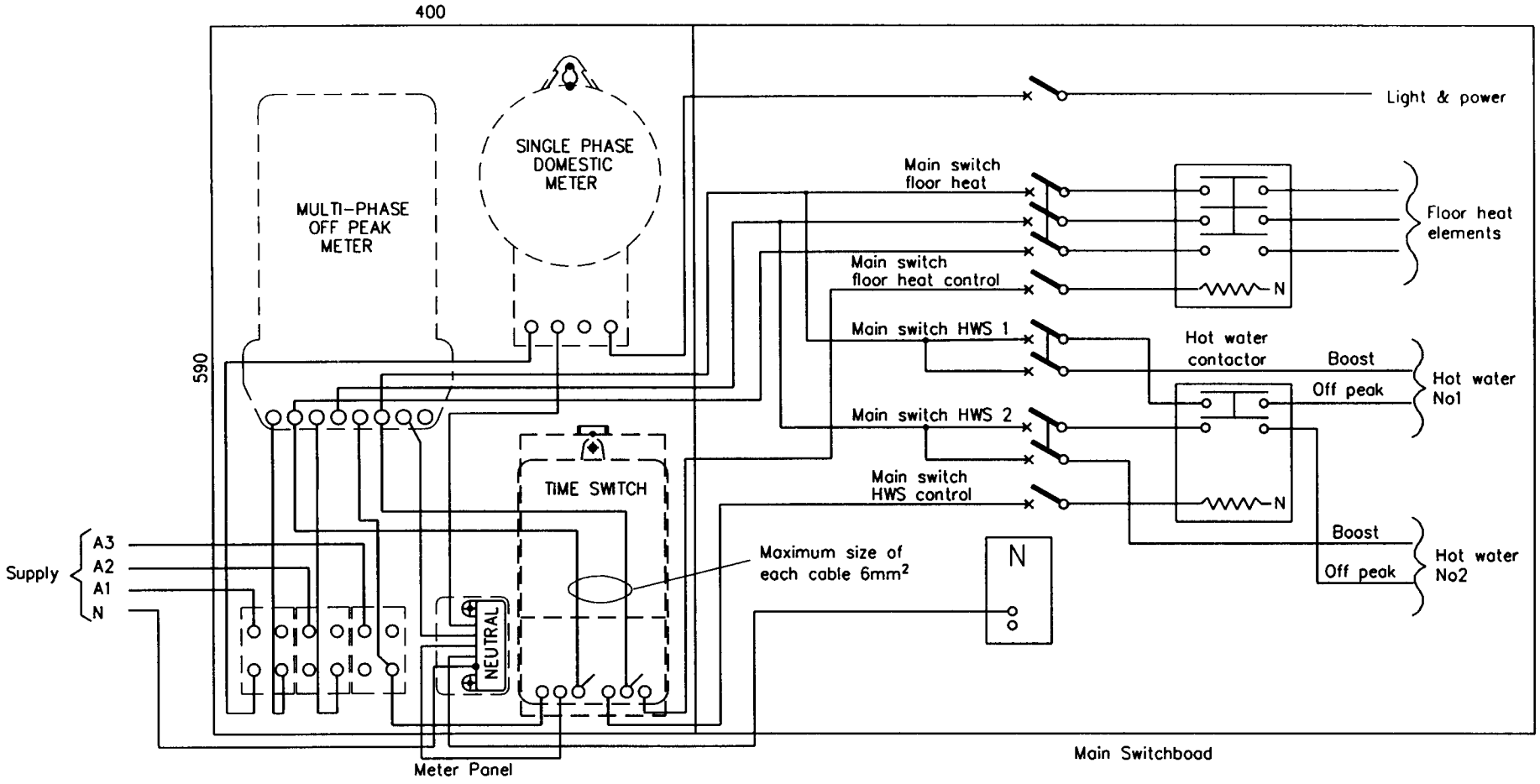


Notes:

1. Maximum load of time switch contacts 30amps. For switching loads exceeding 30A refer Fig 6.21.
2. All metering neutrals minimum 4mm².
3. Meter panel fuse is not required for an overhead supply.

TYPICAL WIRING DIAGRAM
SINGLE PHASE STORAGE HEATING & TWIN ELEMENT OFF PEAK HOT WATER SERVICE.
PANEL SIZE 400mm W x 590mm H

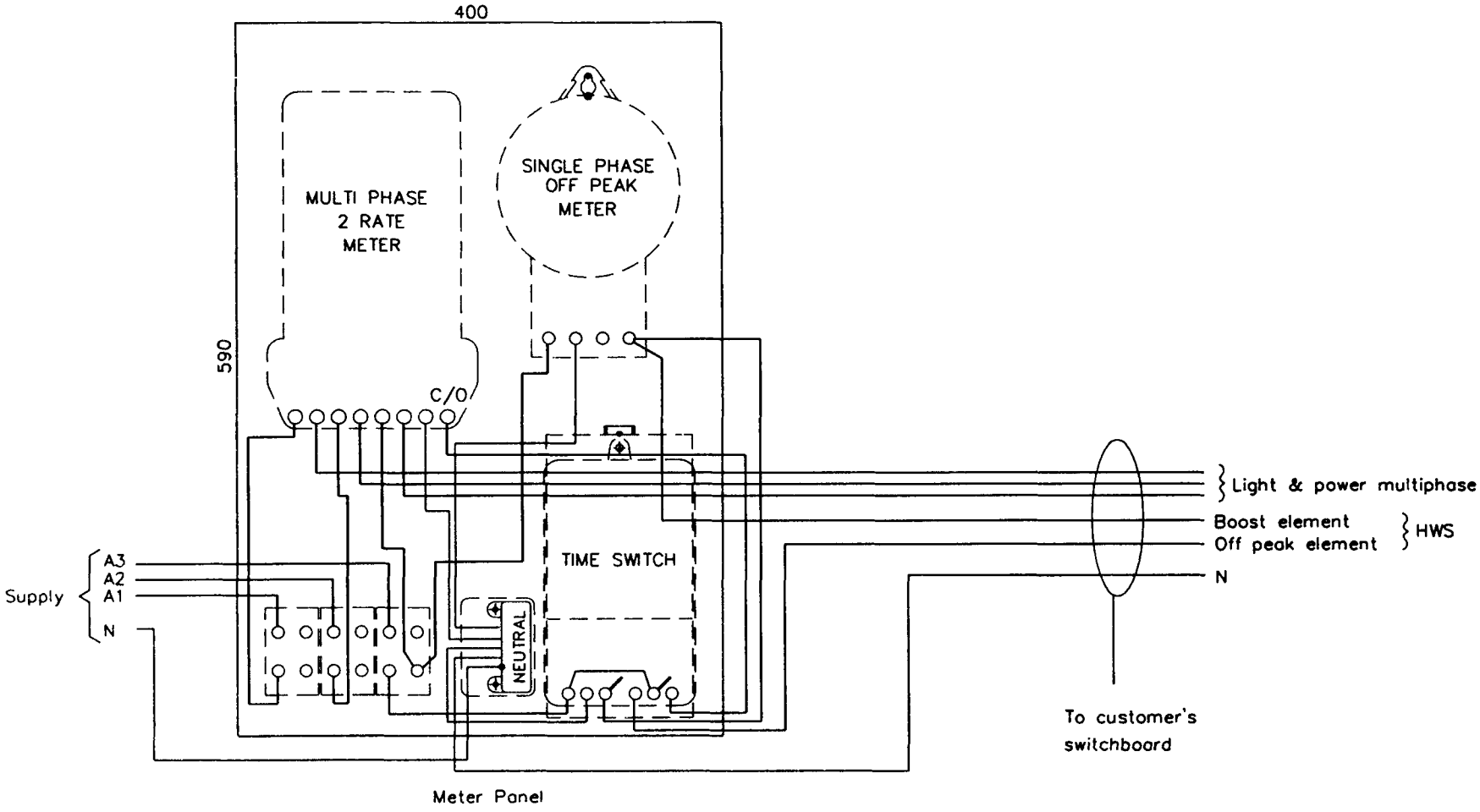
Figure 6.20



Notes:
1. Maximum load of time switch contacts 30A.
2. Contactor coils 240v.
3. For clarity control thermostats not shown.
4. All metering neutrals minimum 4mm².
5. Meter panel fuses are not required for an overhead supply.
6. Refer Clause 4.8.2 re Balancing of Load.

TYPICAL WIRING DIAGRAM
MULTI PHASE FLOOR HEATING & TWO TWIN ELEMENT
OFF PEAK HOT WATER SERVICES.
PANEL SIZE 400mm W x 590mm H

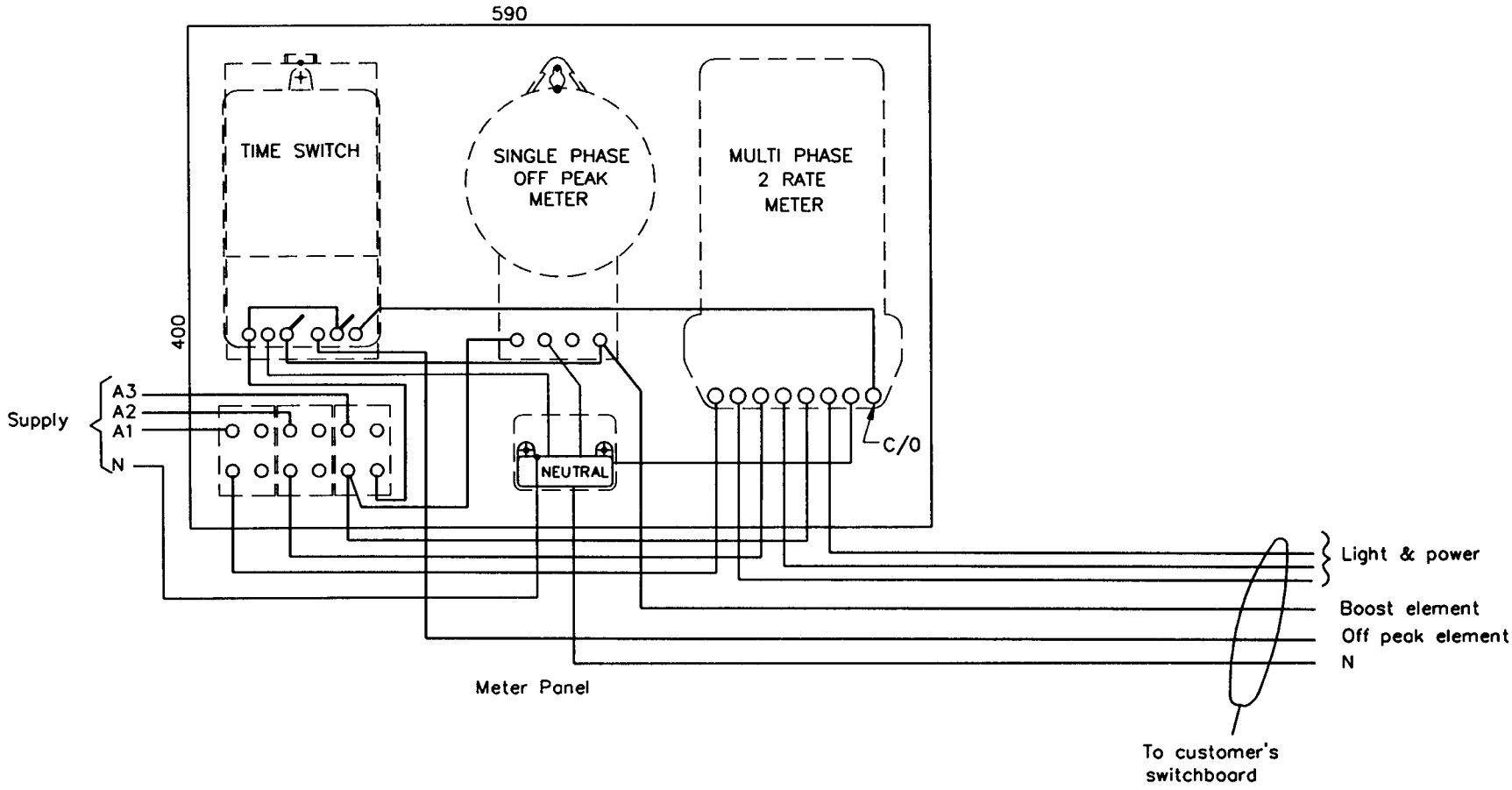
Figure 6.21



Notes:
1. Maximum load of time switch contacts 30A. For switching loads exceeding 30A refer Fig. 6.21.
2. Meter panel fuses are not required for an overhead supply.
3. All time switch wiring and metering neutrals min. 4mm².

TYPICAL WIRING DIAGRAM.
MULTIPHASE WINNER WITH OFF PEAK LOAD/S.
MAXIMUM 35mm² CONDUCTORS.
PANEL SIZE 400mm W x 590mm H

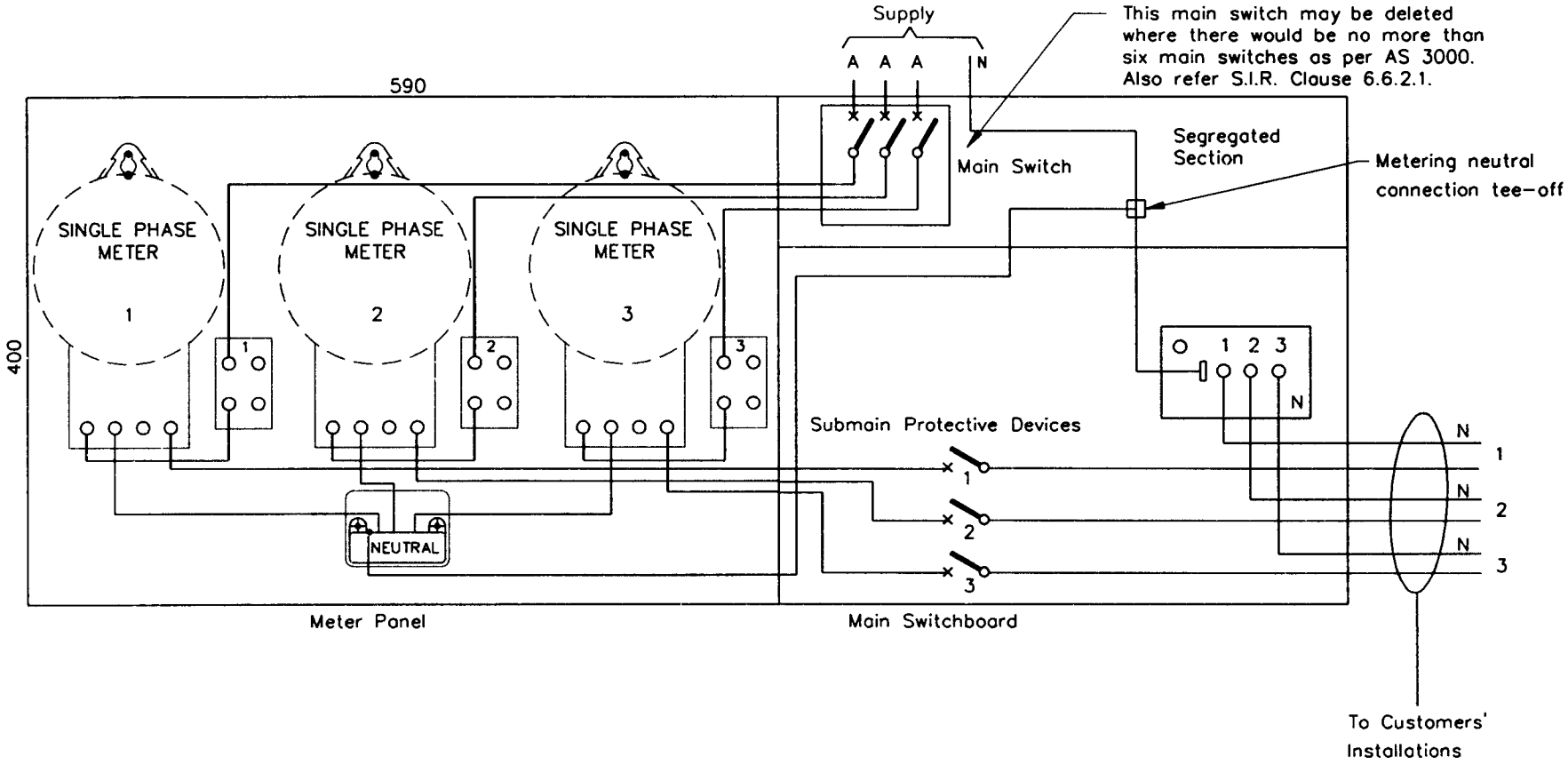
Figure 6.22



Notes:
1. Maximum load of time switch contacts 30A. For switching loads exceeding 30A refer Fig. 6.21.
2. All time switch wiring and metering neutrals min. 4mm^2.
3. Meter panel fuses are not required for an overhead supply.

TYPICAL WIRING DIAGRAM
MULTIPHASE WINNER WITH OFF PEAK LOAD
MAXIMUM 35mm^2 CONDUCTORS.
PANEL SIZE 590mm W x 400mm H

Figure 6.23

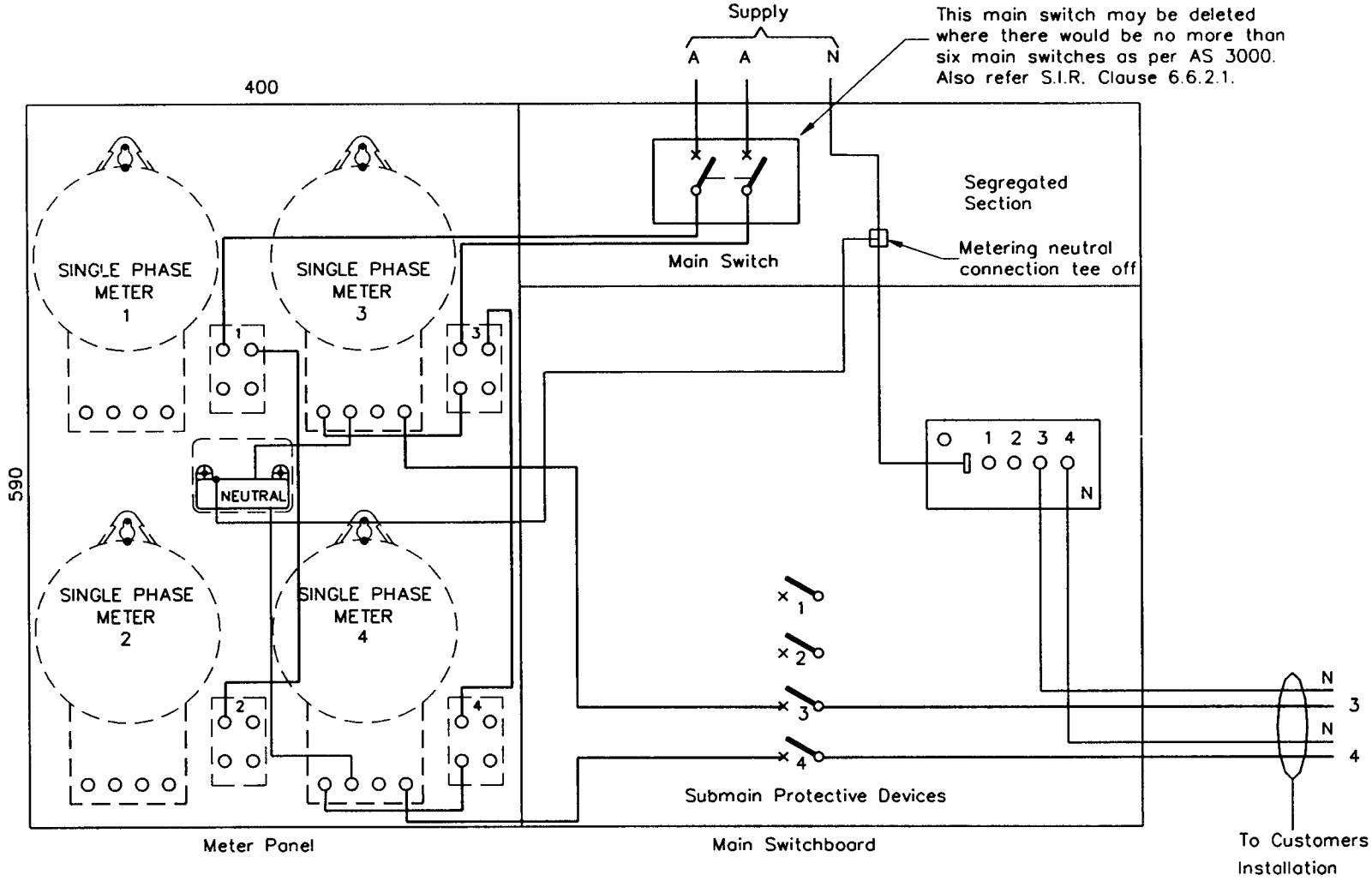


Notes:

1. All metering neutrals minimum 4mm.^{2}
2. For off peak loads refer figures 6-6 & 6-7.

TYPICAL WIRING DIAGRAM
3 CUSTOMERS EACH SINGLE PHASE
MAXIMUM 35mm^2 CONDUCTORS.
PANEL SIZE 590mm W x 400mm H

Figure 6.24

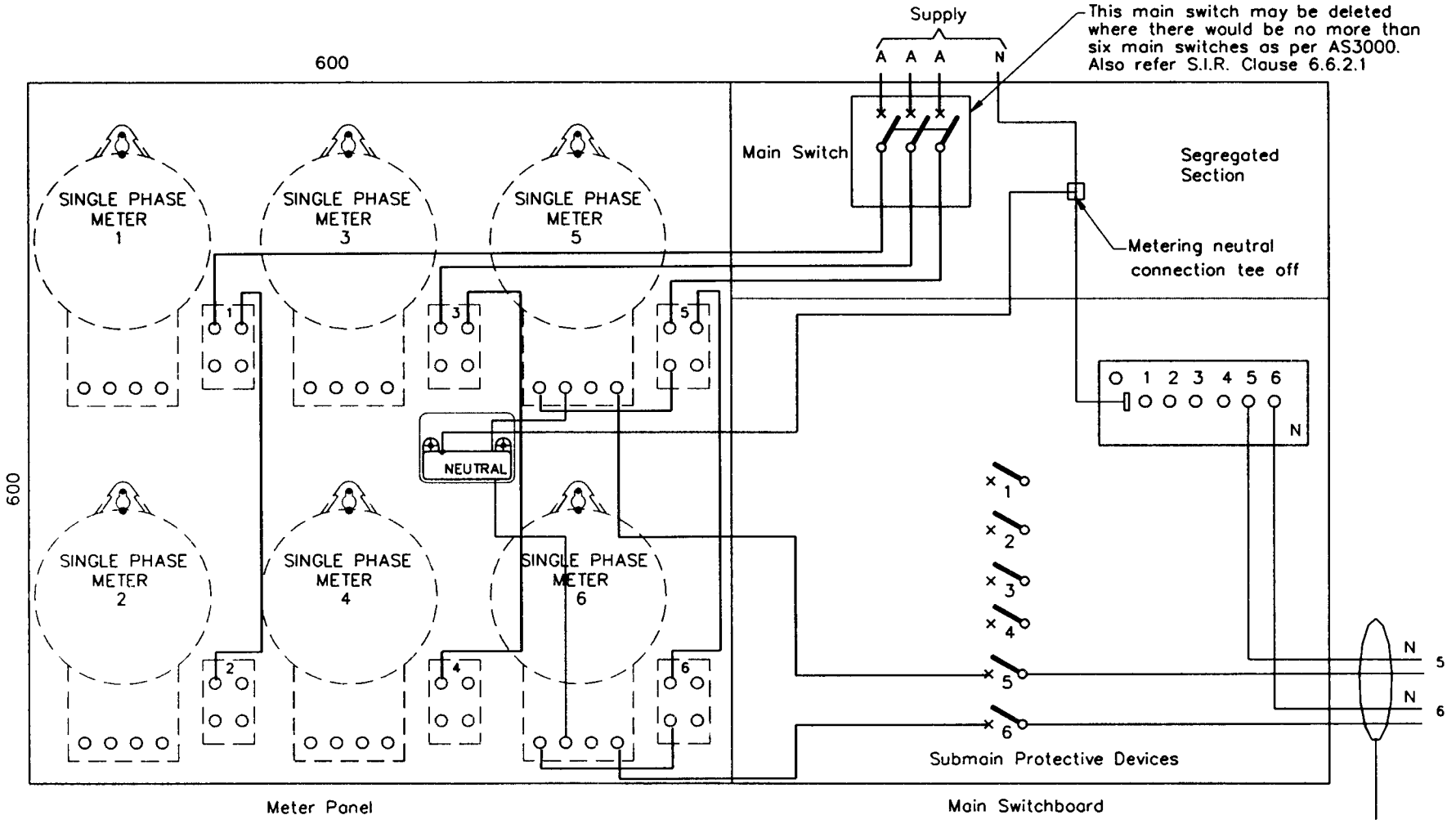


Notes:

1. All metering neutrals minimum 4mm²
2. For off peak loads. refer Figures 6–6 & 6–7
3. For simplicity wiring shown only for customers 3 & 4.

TYPICAL WIRING DIAGRAM
4 CUSTOMERS EACH SINGLE PHASE
MAXIMUM 35mm² CONDUCTORS.
PANEL SIZE 400mm W x 590mm H

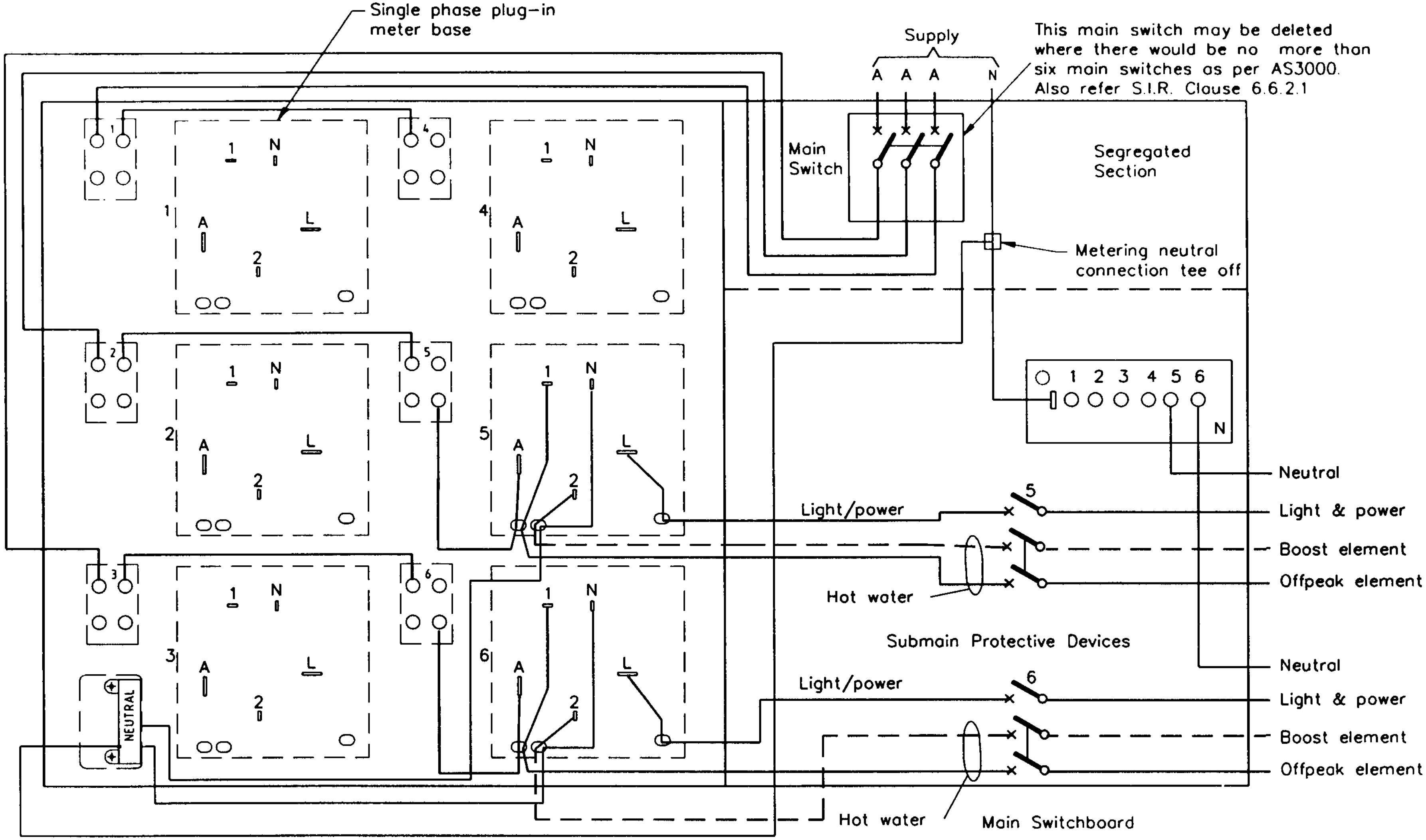
Figure 6.25



Notes:
1. All metering neutrals minimum 4mm^2
2. For off peak loads. refer figures 6–6 & 6–7.
3. For simplicity wiring shown only for customers 5 & 6.

TYPICAL WIRING DIAGRAM
6 CUSTOMERS EACH SINGLE PHASE
MAXIMUM 35mm^2 CONDUCTORS
PANEL SIZE 600mm W x 600mm H

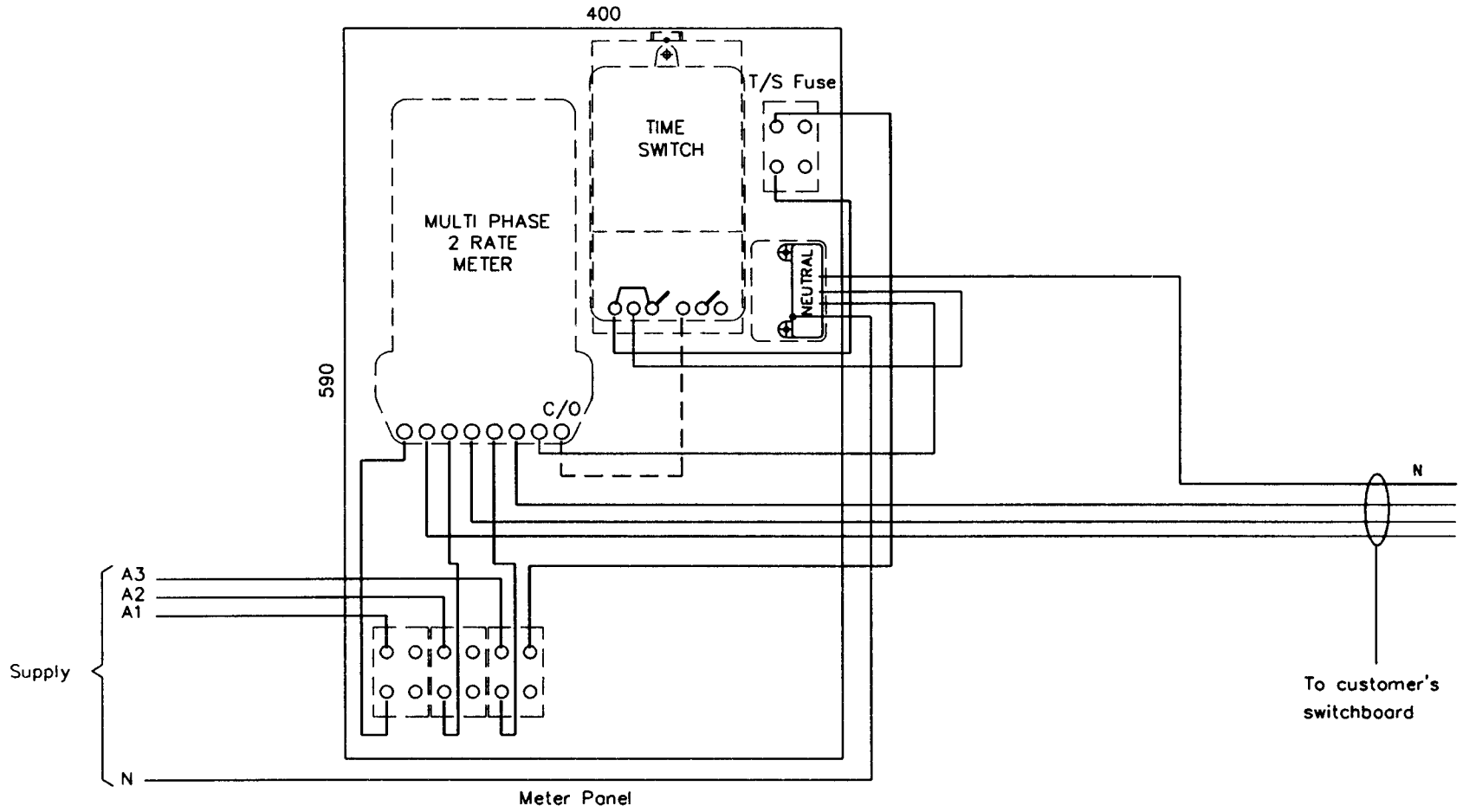
Figure 6.26



Notes:
1. Maximum load of time switch contacts 30A. For switching loads exceeding 30A refer Fig 6.21.
2. All metering neutrals minimum $4mm^2$.
3. For simplicity wiring shown only for customers 5 and 6.

TYPICAL WIRING DIAGRAM
6 CUSTOMERS EACH SINGLE PHASE WITH TWIN ELEMENT OFFPEAK HOT WATER SERVICE WITH PLUG IN METERS.
PANEL SIZE 600mm W x 600mm H

Figure 6.27

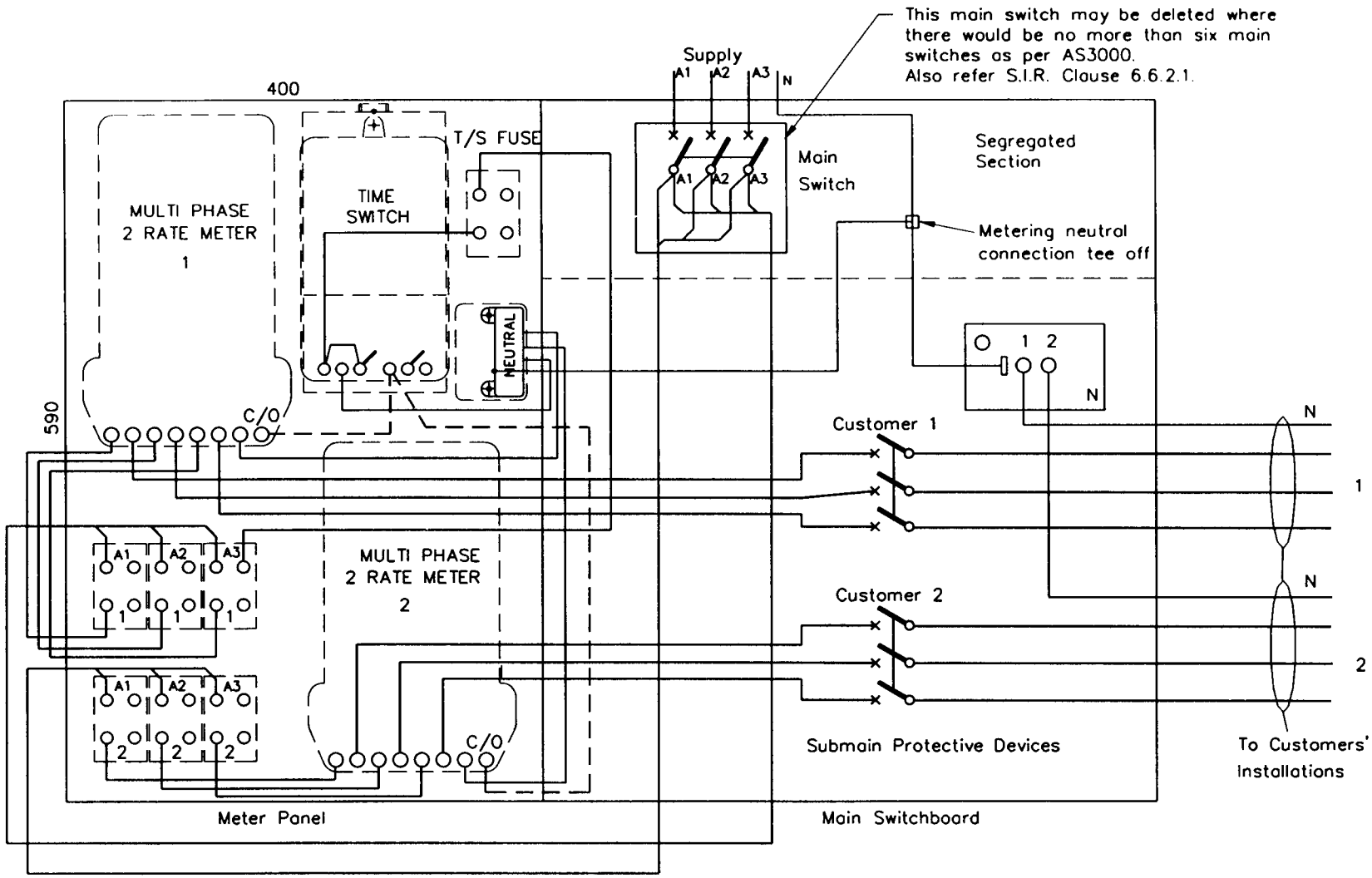


Notes:

1. — — — Denotes switch wire if two rate metering installed.
2. All time switch wiring and metering neutrals min. 4mm^2.
3. Meter panel fuses are not required for an overhead supply.
4. If 2 rate meter is not required delete time switch, time switch fuse and associated wiring.

TYPICAL WIRING DIAGRAM
1 CUSTOMER MULTI PHASE FOR 1 OR 2 RATE
MAXIMUM 35mm^2 CONDUCTORS
PANEL SIZE 400mm W x 590mm H

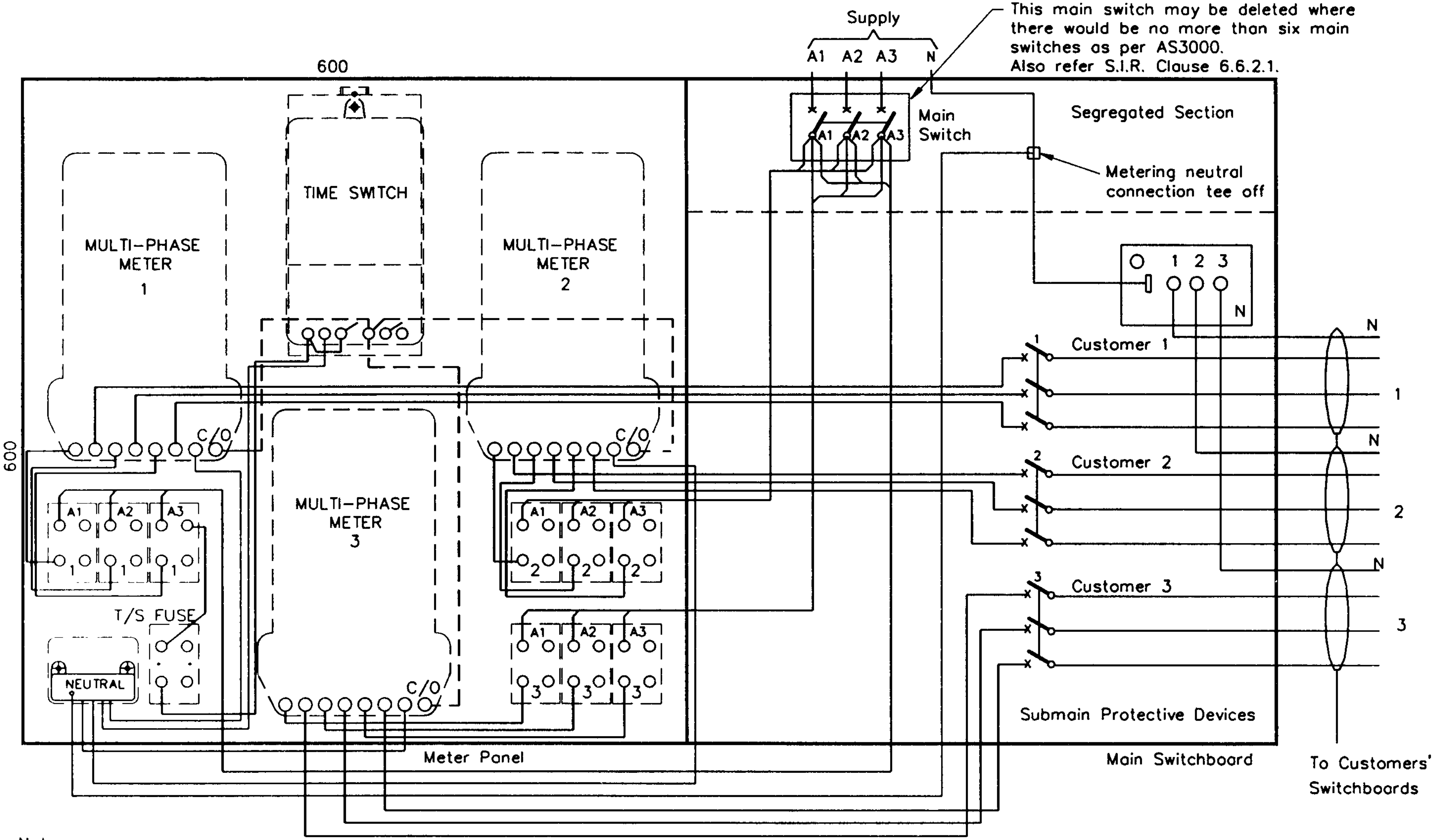
Figure 6.28



Notes:
1. — — — Denotes switch wire if two rate metering installed.
2. All time switch wiring and metering neutrals min. 4mm^2
3. If 2 rate metering is not required delete time switch, time switch fuse and associated wiring.

TYPICAL WIRING DIAGRAM
2 CUSTOMERS MULTIPHASE 1 OR 2 RATE
MAXIMUM 16mm^2 CONDUCTORS.
PANEL SIZE 400mm W x 590mm H

Figure 6.29



Notes:

1. — — — Denotes switch wire if two rate metering installed.
2. If 2 rate metering is not required delete time switch, time switch fuse and associated wiring.
3. All time switch wiring & metering neutrals minimum 4mm^2

TYPICAL WIRING DIAGRAM
3 CUSTOMERS MULTIPHASE 1 OR 2 RATE
MAXIMUM 35mm^2 CONDUCTORS
PANEL SIZE 600mm W x 600mm H

Figure 6.30

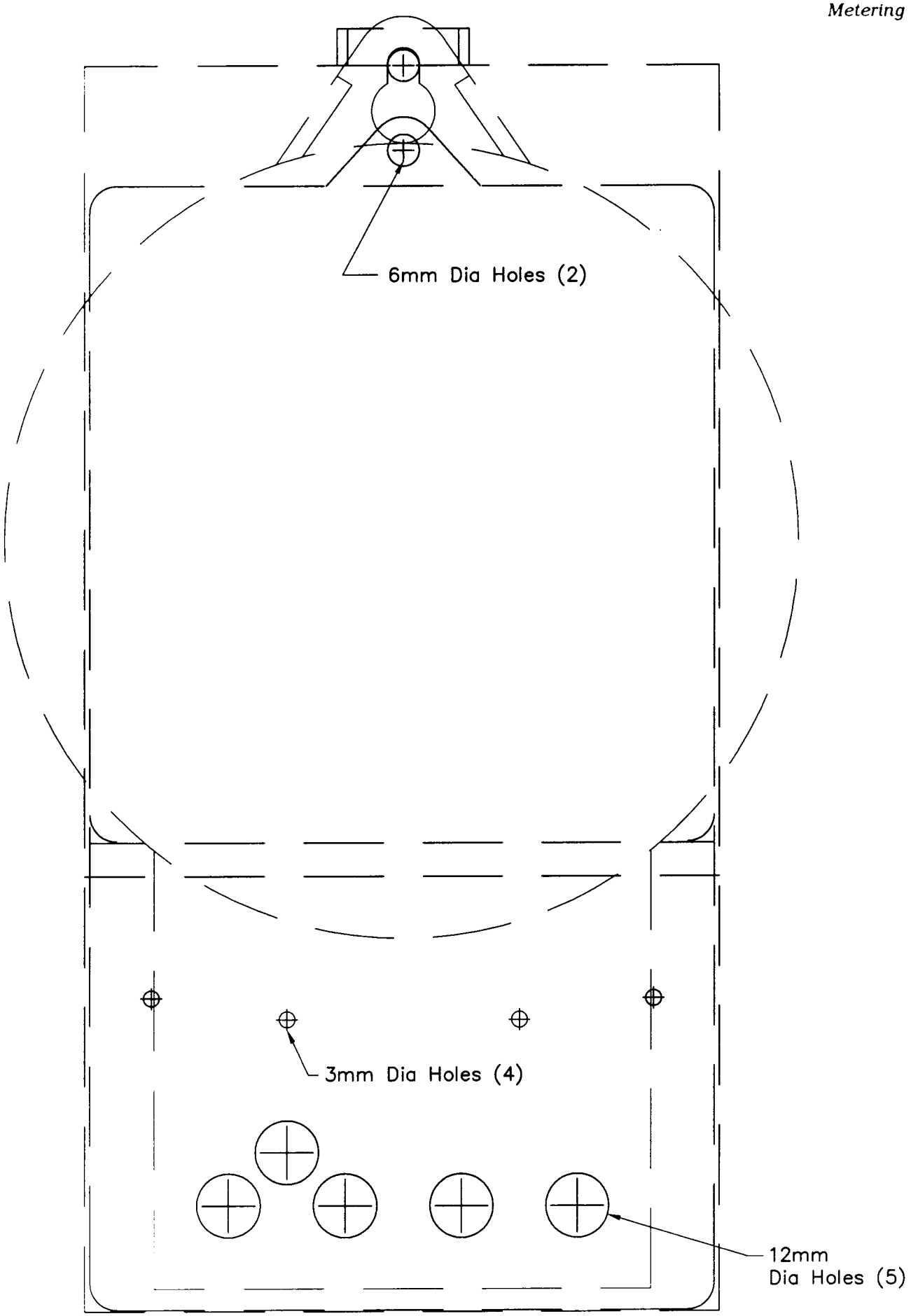
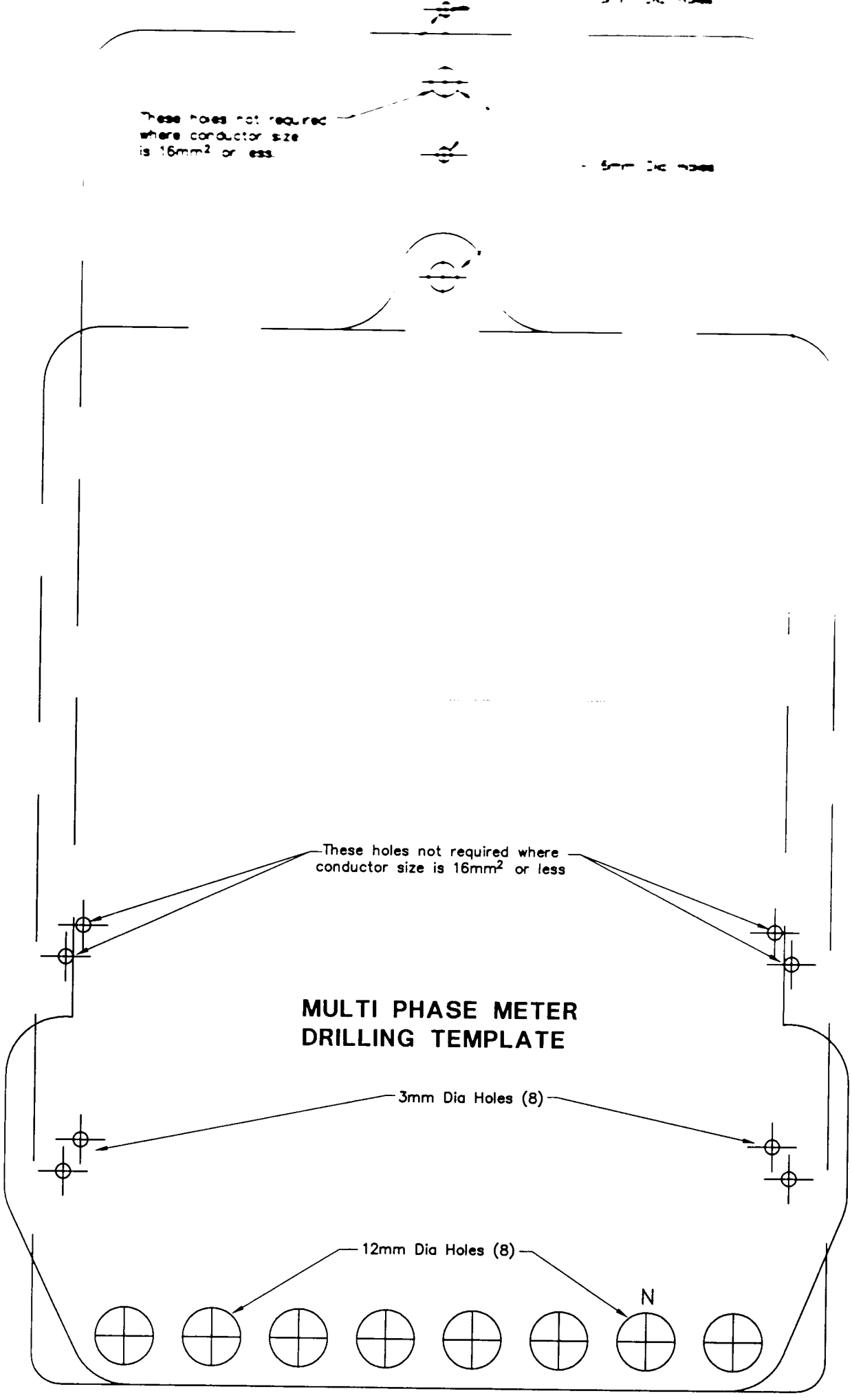


Figure 6.31 Single Phase Meter Drilling Template


These holes not required where conductor size is 16mm² or less
MULTI PHASE METER
DRILLING TEMPLATE
3mm Dia Holes (8)
12mm Dia Holes (8)
N

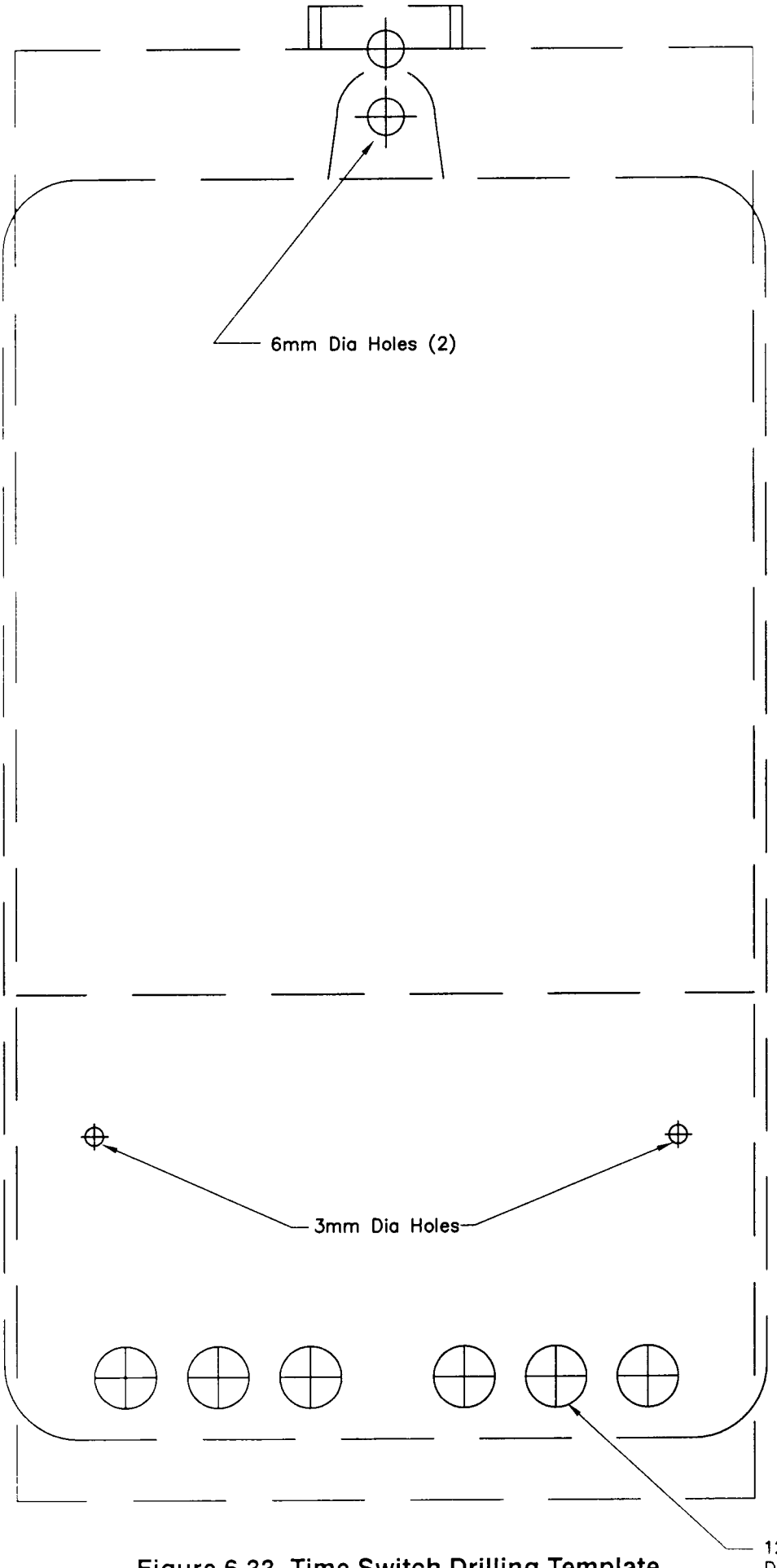
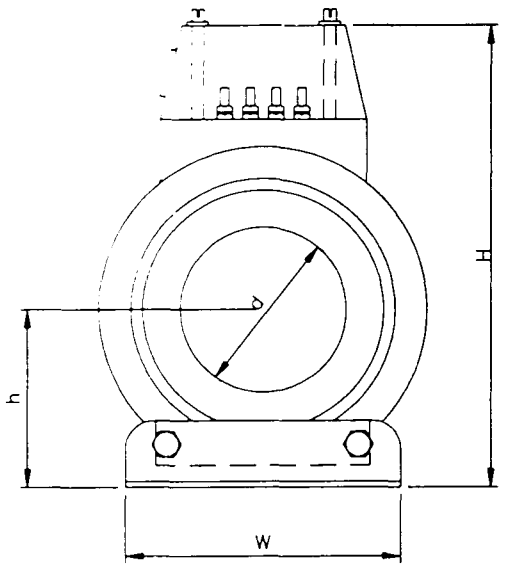


Figure 6.33 Time Switch Drilling Template

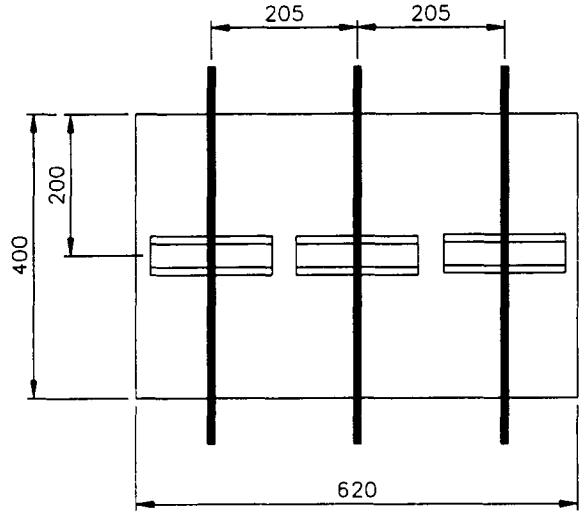


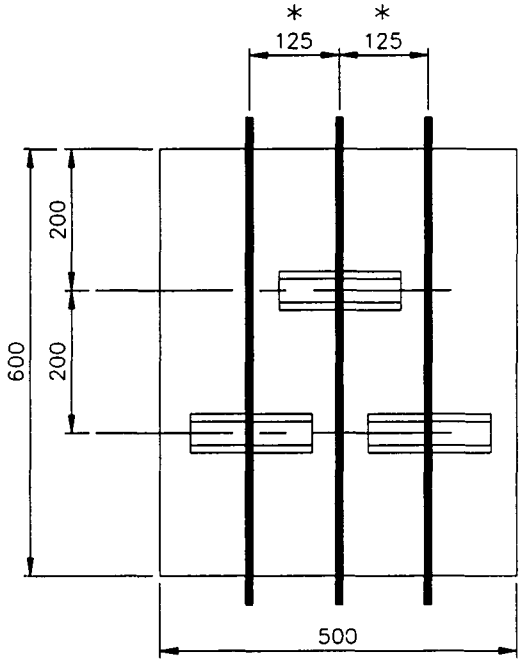
DIMENSIONS (mm)

DESIGNATION *	MAX WIDTH (W)	MIN WINDOW DIA. (d)	POSITION OF WINDOW CENTRE (h)	MAX HEIGHT (H)
S	130	45	65	165
B	165	85	85	230
C	200	112	85 or 115	270
T	167	112	95	210
W	167	85	95	210

NOTE: REFER CLAUSE 6.7.4.1

CURRENT TRANSFORMERS

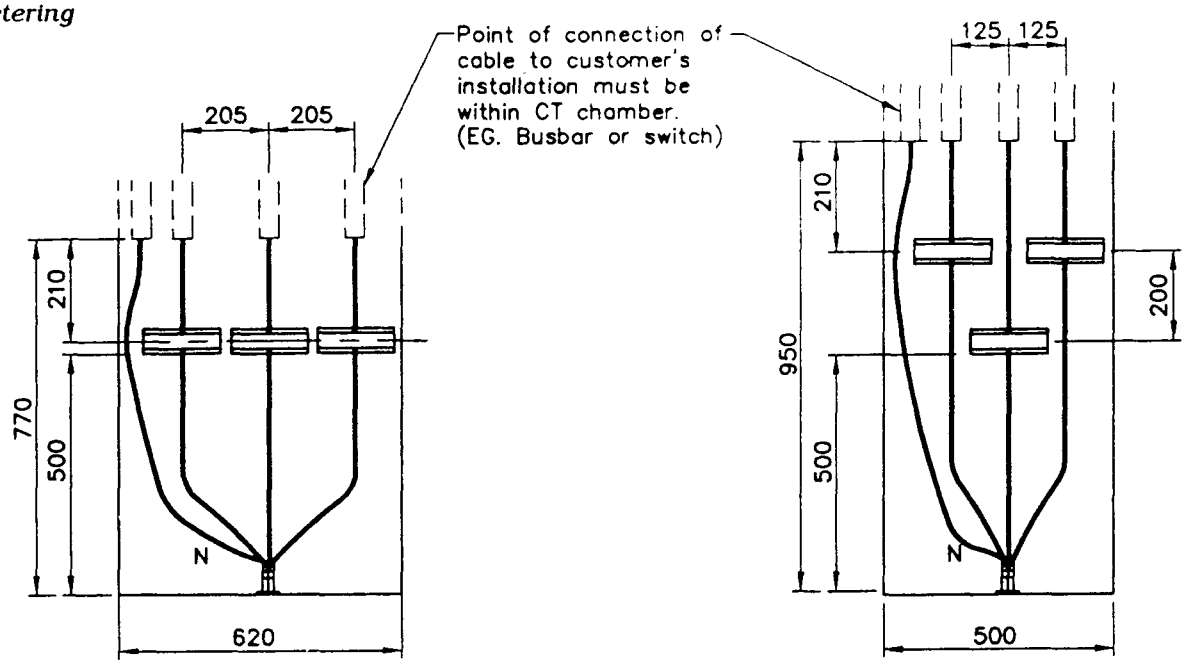




* For circuits carrying greater than 1200A, spacing shall be increased to not less than 150mm.

MINIMUM SPACE IN CUBICLES FOR CURRENT TRANSFORMERS ONLY

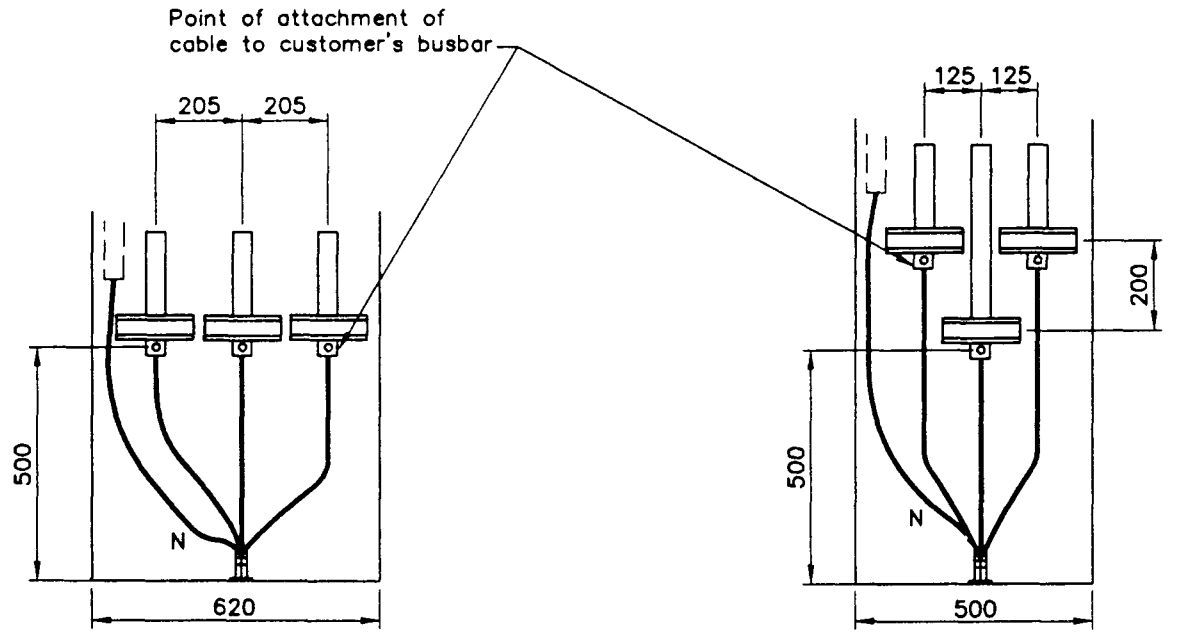
Figure 6.34 Dimensions of Current Transformers and Minimum Space Required in Enclosures for Current Transformers



Where multicore cables of 50mm² or less are installed 500 can be reduced to 250 and 770 to 520

Where multicore cables of 50mm² or less are installed 500 can be reduced to 250 and 950 to 700

SPACE REQUIRED FOR TERMINATION OF DISTCO 185/240mm² UNDERGROUND SERVICE CABLES, WHERE CABLE PASSES THROUGH CURRENT TRANSFORMERS.



Where multicore cables of 50mm² or less are installed 500 can be reduced to 250

Where multicore cables of 50mm² or less are installed 500 can be reduced to 250

SPACE REQUIRED FOR TERMINATION OF DISTCO 185/240mm² UNDERGROUND SERVICE CABLES, WHERE BUSBAR PASSES THROUGH CURRENT TRANSFORMERS.

NOTES
1. Dimensions of all cubicles, front to rear are 300mm
2. These drawings do not show 32 Amp meter voltage supply fuses in enclosures.

Figure 6.35 Minimum Space Required in Enclosures for Current Transformers and DistCo Underground Cable Terminations

Multiple Occupancies

7

Section 7 Contents

7.1 Multiple Occupancy Premises

7.1.1 General

A plan of the installation showing the location of the metered and unmetered mains and submains in relation to the main structural features, together with a schematic diagram indicating the control, protection and earthing arrangements of the installation, shall be submitted to the Responsible Officer for approval prior to the intended commencement of the installation.

Where lots on a subdivision do not directly abutt a public road, access shall be by way of common property, the extent of which will have been shown on the plan of subdivision. Such lots shall be serviced underground from the point of supply in such a way that all common mains are located in common property and individual mains or submains to a given lot do not pass through other lots.

Where some of the lots on a plan of subdivision abutt a public road in which the DistCo has mains, they may be given separate points of supply.

For subdivision of buildings, wiring passing from one premises to another shall be placed in common property or in service ducts which shall be common property.

Where wiring other than the wiring originating from a separate occupancy switchboard passes through that occupancy, the occupancy switchboard shall be marked -

Warning - Multiple Occupancy. "Not all wiring passing through this premises is controlled from this switchboard".

Any switchboard which incorporates control or protection devices associated with more than one individually metered occupancy within a multiple installation shall be installed in a common area and shall not be installed within any individual occupier's premises. **Where the multiple occupancy involves a subdivision, the common area shall be registered on the plan of subdivision as common property.**

Notes:

- **Attention is directed to Clause 6.2.4 regarding meter locations and Clause 4.4.1 regarding number of supplies.**
- **Consult the DistCo for servicing arrangements for building subdivisions and other multi-unit developments including dual occupancies.**
- **For the subdivision of existing buildings, Section 12(2) of the Subdivision Act 1988 applies where the Notice of Installation Work (NIW) was received prior to 2nd August 1991. Where wiring passes through one occupancy to another in an implied easement, the requirements for switchboard labelling as contained within this Clause 7.1.1 should apply.**
- **Refer to Clause 1.2 for definition of "Property".**
- **Refer to Clause 2.4.2 regarding Earthing arrangements.**
- **Refer to Clause 5.1.2.1 regarding Type of Service Cable for subdivisions.**

7.1.2 Main Switch/es

The installation for premises comprising a number of separately metered occupancies shall be controlled in accordance with the requirements of the Wiring Regulations, the Wiring Rules and shall be arranged to the satisfaction of the Responsible Officer.

ANY SWITCH INSTALLED ON THE LINE SIDE OF DISTCO METERING EQUIPMENT SHALL BE CLEARLY AND PROMINENTLY MARKED "TO BE OPERATED BY AUTHORISED PERSONS ONLY" AND BE CAPABLE OF BEING SECURED IN BOTH THE ON AND OFF POSITION TO THE SATISFACTION OF THE RESPONSIBLE OFFICER.

The sealing provisions of Clause 6.3 shall also be **STRICTLY OBSERVED**. Refer also to Clause 4.4 regarding number of supplies to one property.

Typical arrangements for grouped metering for multiple occupancies are shown in Figures 7.1, 7.2 and 7.3. Refer to Clause 6.6.5 and Figures in Section 6 as appropriate.

7.1.3 Labelling

Where premises are divided into separate occupancies and a separately metered supply is given to occupiers of individual rooms, suites of rooms, flats, units, shops, factories, etc, an identification number or letter or combination of both shall be assigned and marked at the main entrance of each occupancy. A durable corresponding marking shall be placed on the distribution board and at the meter position for each occupancy to identify the supply equipment to that portion of the premises.

All meter panels shall be permanently labelled to indicate relationship between meters, fuses, etc., as described above. Such labelling shall remain clearly visible after installation of all equipment.

Where the occupancy consists of a number of separate areas or street addresses, each shall be marked or some other approved system of identification shall be adopted. A corresponding marking shall also be made on the conductors for each occupancy at the meter panel location to enable present and future identification of conductors.

Where in accordance with Clause 4.4, premises are supplied from more than one service, labels shall be provided at each set of Consumer's Terminals and at the main switchboard associated therewith, indicating the portion of the installation supplied. The location and conditions of operation of any alternative source of supply to the installation shall also be indicated.

Note: Refer to Clause 2.4.2 regarding labelling of MEN connection.

7.1.4 Metering in Multiple Occupancies

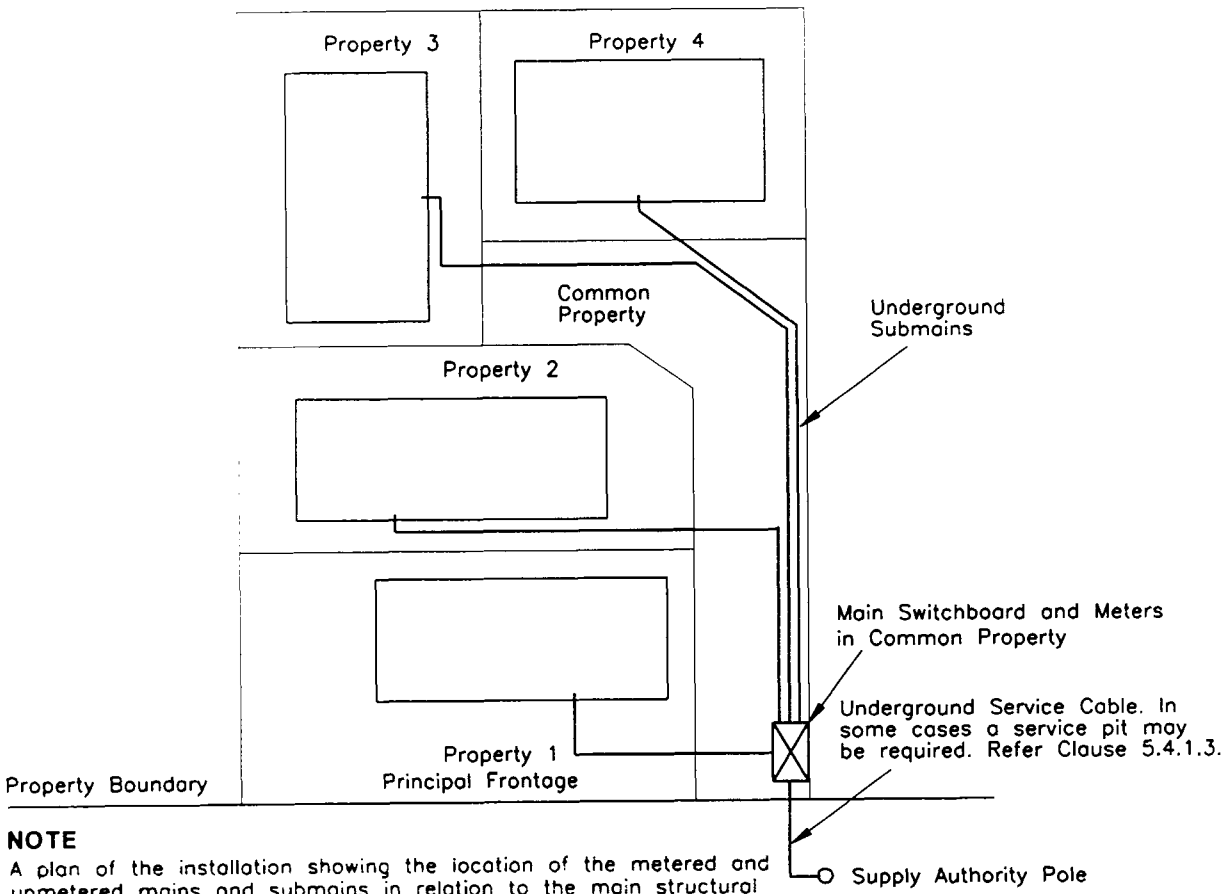
Where DistCo metering is to be installed in group locations in multiple occupancies, the metering shall be located in a common area or common property which is accessible to all occupants. This arrangement shall be to the satisfaction of the Responsible Officer. Refer to Section 6 for metering arrangements.

7.1.5 URD Areas of Supply

In URD areas of supply the Consumer's Mains shall be insulated up to the first Service Protection Device in accordance with Clauses 5.4.3.8 (b) & 5.4.3.3 (c).

The Service Protection Device shall be installed as required by Clause 5.2.2 and may be in the form of a fuse or circuit breaker.

MAIN SWITCHBOARD AND METERS IN COMMON PROPERTY



NOTE

1. A plan of the installation showing the location of the metered and unmetered mains and submains in relation to the main structural features, together with a schematic diagram indicating the control, protection and earthing arrangement of the installation, shall be submitted to the Responsible Officer for approval prior to the intended commencement of the installation.
2. In URD areas the DistCo may require a Service Protection Device/s to be installed in the consumers mains.

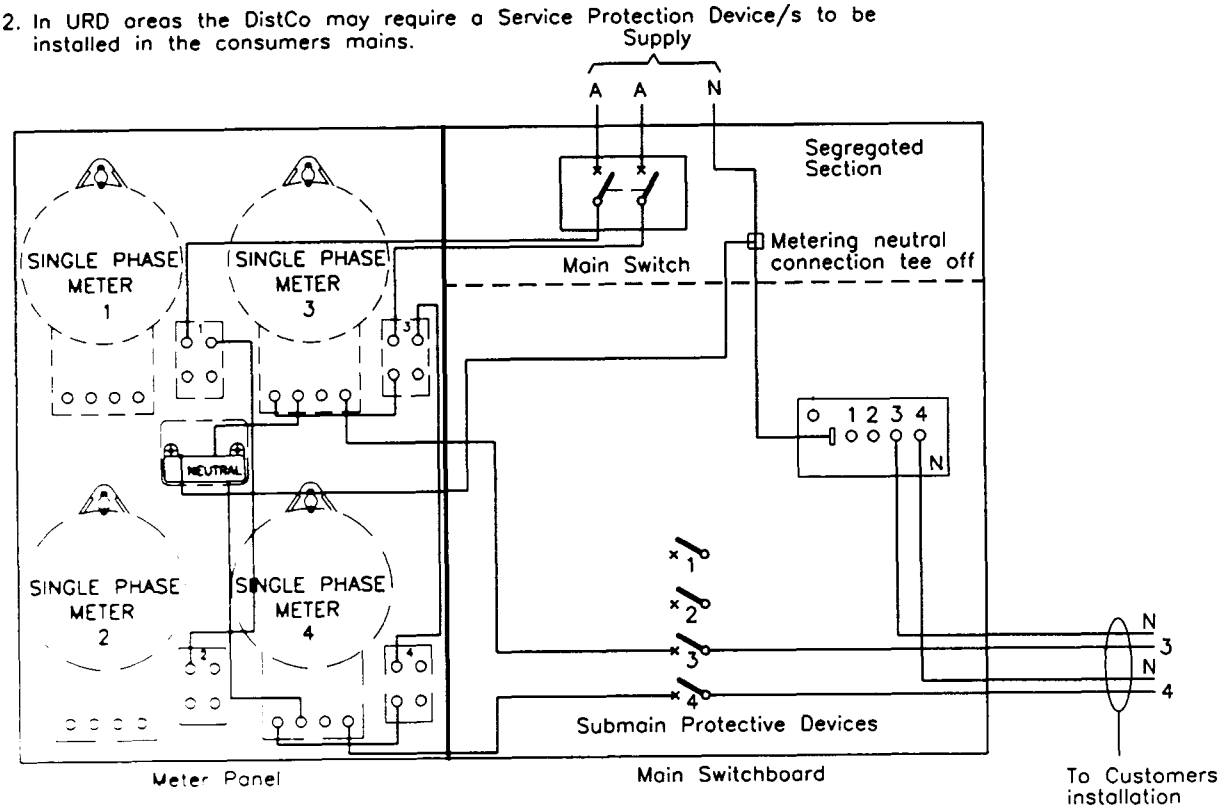
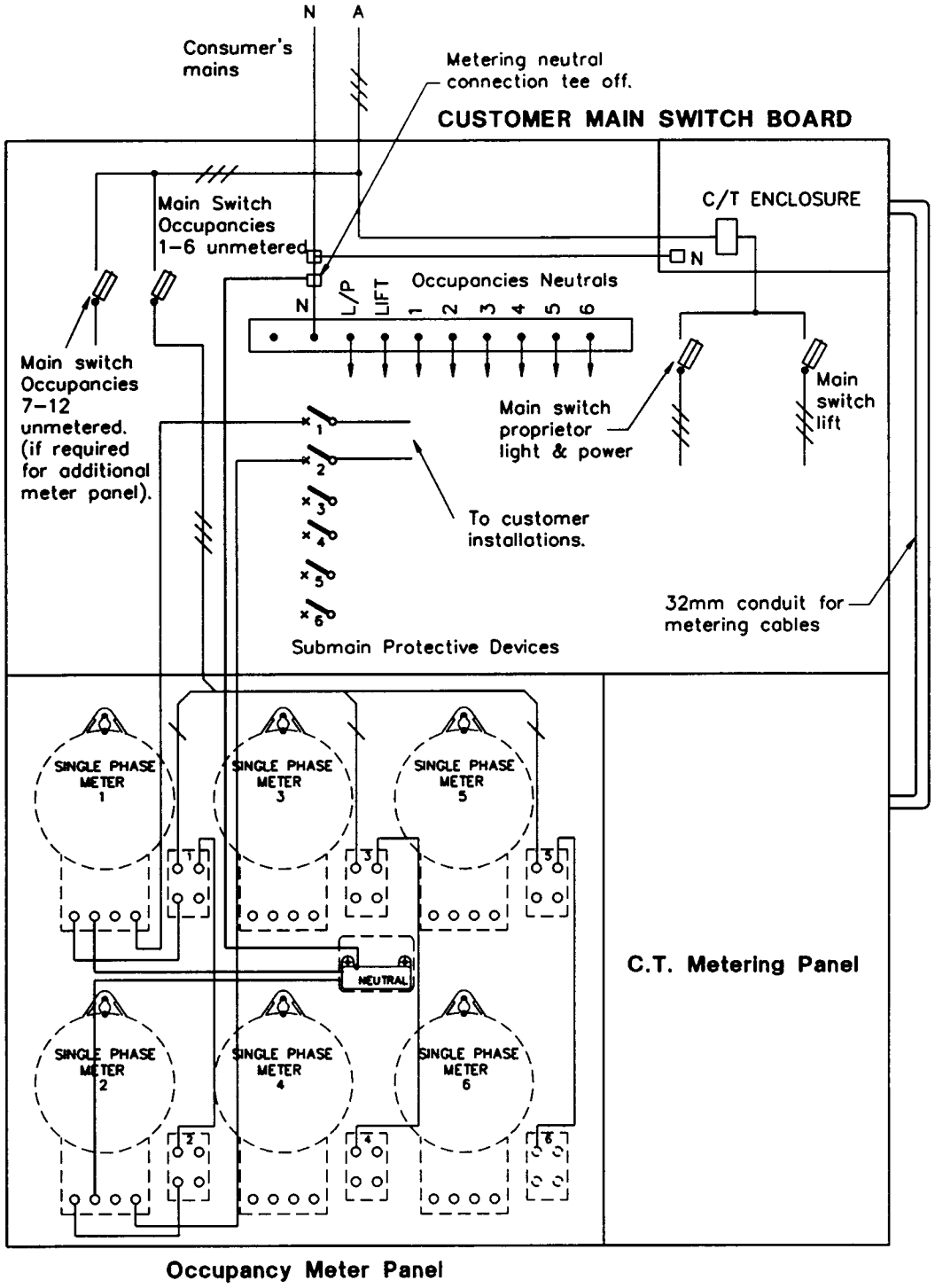


Figure 7.1 Typical Arrangement for Separately Metered Occupancies

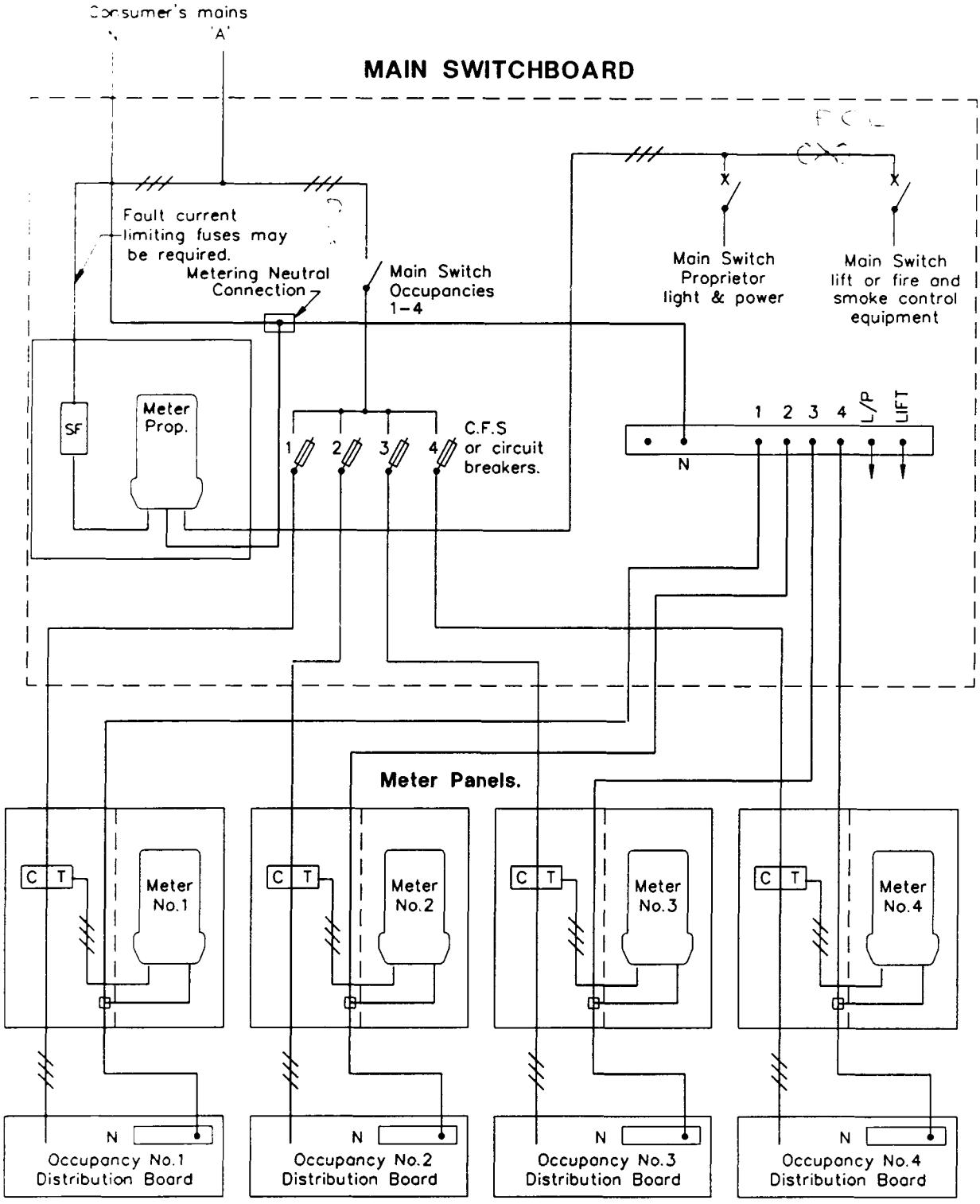


Occupancy Meter Panel

NOTES

1. A plan of the installation showing the location of the metered and unmetered mains and submains in relation to the main structural features, together with a schematic diagram indicating the control arrangement of the installation, shall be submitted to the Responsible Officer for approval prior to the intended commencement of the installation.
2. For simplicity wiring shown only for occupancies 1 and 2. Refer to Fig.6.26.

Figure 7.2 Typical Arrangement for Separately Metered Occupancies Including CT Metering for Proprietor



NOTES

1. SF – Service fuse (DistCo Disconnect Device.)
2. A plan of the installation showing the location of the metered and unmetered mains and submains in relation to the main structural features, together with a schematic diagram indicating the control arrangement of the installation, shall be submitted to the Responsible Officer for approval prior to the intended commencement of the installation.

Figure 7.3 Typical Arrangement for Four CT Metered Occupancies and Proprietor with Direct Connected Metering

High Voltage Installations

8

Section 8 Contents

Section 8 Contents

8.1 Introduction

This Section details the requirements of a DistCo for Customers taking supply at high voltage, up to and including 22 kV, from the DistCo's supply system.

The purpose of this Section is to ensure the Customer's high voltage installation consists of suitable equipment, provides a safe environment to operating personnel and the general public and does not adversely affect the DistCo's supply system.

These requirements are additional to the requirements of SEC Wiring Regulations (mainly set out in Section 8 of AS 3000) and apply to both new installations, and alterations or extensions to existing Customer installations.

Customers should consider supply at high voltage when their load exceeds 1 MW and is likely to grow or a tariff comparison reveals that their load pattern would be better suited to a high voltage tariff.

For loads above 10 MW which are either likely to grow or cause significant voltage fluctuations to the DistCo's supply system, supply at 66 kV should be considered.

Please note that this Section does not cover the requirements for supply at 66 kV or higher voltages.

8.2 Electricity Supply Contract

A Customer requiring a supply of electricity at high voltage shall be required to enter into an Electricity Supply Contract which shall specify the terms and conditions which relate to the provision and operation of such supply.

Similarly, Customers who require only partial supply from the DistCo or who wish to operate private generating equipment in parallel with the DistCo's supply system shall also be required to enter into an Electricity Supply Contract.

8.3 Systems of Supply

The DistCo will determine the system of supply and the voltage of supply with regard to the proximity of its relevant high voltage systems to the Customer's point of supply and the nature of the Customer's load.

In general, one of the following nominal supply voltages would be made available :-

- 6.6 kV
- 11 kV; or
- 22 kV

As most of the existing 6.6 kV areas of supply are scheduled for conversion to either 11 kV or 22 kV, any Customer currently taking supply at 6.6 kV should take this into account.

The supply shall be made available at a nominal frequency of 50 hertz (cycles per second).

8.4 Approval of Designs and Equipment

The earliest possible notice (preferably twelve months) should be given of the intention to plan for a high voltage supply.

Ensuing discussions would facilitate determination of the merits or otherwise of supply at high voltage. These discussions should precede detailed design work, placement of orders for equipment and letting of contracts to avoid loss to the Customer arising from designs or equipment being found by the DistCo to be unsuitable for connection to the supply system.

The equipment shall have suitable ratings and performance parameters for connection to the supply system as detailed in this Section.

All plant and equipment shall comply with the relevant Australian Standards, including, but not limited to :-

- Circuit Breakers — AS 2006, AS 2067, AS 2086, AS 1824
- Transformers — AS 2374
- Underground Cables — AS 1026, AS 1429.1
- High Voltage Motors — AS 1329
- Generators — AS 1359
- Current Transformers — AS 1675
- Voltage Transformers — AS 1243
- Protection Relays — AS 2481 or IEC 255 as appropriate
- High Voltage Fuses — AS 1033 or IEC 282

The Customer shall submit the following detailed drawings for written approval prior to entering a commitment to commence installation works :-

- single line diagram showing the general arrangement of substations and other high voltage equipment;
- proposed earthing arrangement;
- schematic diagrams for control wiring, tripping supplies and protection circuits;
- protection schedule and relay settings, including protection CT performance details;
- labelling schedule;
- details of overhead line design;
- maintenance schedule;
- underground cable design; and
- site plan and plan/elevation of switchrooms/substations including major high voltage plant items.

These drawings should be submitted at the earliest possible date. Failure to submit the above drawings 20 working days prior to commencing installation works, or drawings that do not conform to the agreed parameters, could result in delays to the proposed commissioning date.

The following information, including type test certificates where appropriate, shall be provided at the earliest possible time.

Circuit Breakers

- manufacturer;
- type number;
- class - indoor or outdoor;
- rated voltage;
- rated insulation level (lightning impulse withstand level);

- rated load current;
- rated short circuit breaking current;
- rated short circuit making current;
- minimum clearances in air - between phases and to earth;
- type of closing mechanism;
- whether trip free or fixed trip and with lock-out preventing closing;
- rated supply and /or pressure of closing mechanism; and
- details of any interlocking systems.

Transformers

- manufacturer;
- rated voltages and tapping range;
- rating (kVA);
- lightning impulse withstand level;
- vector group symbol;
- insulating medium; and
- type of connections.

Underground Cables

- manufacturer;
- voltage designation;
- number of cores;
- conductor material, size and where applicable, size of reduced neutral conductor;
- type of insulation;
- construction details;
- type of terminations proposed;
- fault withstand rating of core and screen;
- proposed method of installation including mechanical protection; and
- screen earthing details for each end of any incoming supply cable.

High Voltage Motors

- manufacturer;
- type of motor and if an induction motor - cage or wound rotor;
- rated power (kW or hp);
- rated voltage;
- rated current;
- method of starting to be employed;
- starting torque in terms of the rated load torque and the maximum starting current which may be taken from the supply with the starting apparatus in the circuit;
- if thyristor control equipment is proposed, details relating to the harmonic current generation is required; and
- frequency of starting.

Generators

- manufacturer;
- type of generator;
- rated output;
- rated voltage;
- rated current;
- synchronous, transient and sub transient reactances. (if generator is connected to the supply system through a solid state inverter indicate three phase short circuit current at output side of inverter);
- details of generator neutral earthing;
- type of excitation;
- voltage regulation; and
- speed regulation.

Protection and Control Equipment

- current transformers :
  - rated transformation ratios;
  - primary current rating;
  - secondary current rating;
  - type classification;
  - accuracy classification;
  - accuracy limit factor;
  - rated burden;
  - rated secondary reference voltage;
  - manufacturer serial number(s);
  - secondary winding configuration; and
  - applicable standard if not to AS 1675.
- voltage transformers :
  - rated transformation ratios;
  - rated secondary voltage;
  - type classification;
  - accuracy classification;
  - rated burden;
  - rated output;
  - rated voltage factor and duration;
  - manufacturer serial number(s);
  - secondary winding configuration;
  - primary connections; and
  - applicable standard if not to AS 1243.
- protection relays
  - manufacturer;
  - type; and
  - settings.

- High voltage fuses : – type;
  – rated current or reference current; and
  – time-current characteristic.
- Battery and battery charger details.

8.5 General Design

8.5.1 Circuit Connections

The normal supply arrangement is via a single DistCo high voltage feeder, however arrangements can usually be made for a second high voltage feeder where required.

Paralleling of the DistCo's high voltage feeders is normally not permitted, however paralleling may be permitted subject to the conditions as detailed in Clause 8.5.4

8.5.2 Insulation Co-ordination

The safety clearances, separation of live parts, and insulation levels (impulse strength) shall be in accordance with AS 2067 and AS 1824.1. The clearances as detailed in Table 8.1 shall be maintained at all times.

Table 8.1 Impulse Withstand Voltages & Clearances in Air of Switchgear Assemblies. (Based on Table 9.1, AS 2067)

Rated Voltage kV rms	Rated Lightning Impulse Withstand Voltage kV Peak (see Note 1)	Minimum Phase - Earth Clearance mm (see Notes 2 & 3)	Minimum Phase - Phase Clearance mm (see Notes 2 & 3)
Up to 3.6	40	60	70
7.2	60	90	105
12	75	120	140
24	125	220	225

Notes to Table 8.1 :

- Insulation co-ordination is required to ensure that the surge diverters installed provide adequate protection for equipment.
- Clearances less than those shown in columns 3 and 4 will be considered subject to the presentation of a test certificate.
- It is desirable to increase the phase to earth clearances where the presence of birds or vermin could cause a hazard, or for construction reasons.

8.5.3 Short Time Withstand Current

High voltage switchgear, conductors, associated equipment and earthing systems shall be capable of withstanding the maximum fault current which may be imposed on it for a duration of at least one second and in some instances for three seconds.

The maximum design fault current for the various supply voltages are as follows:

- 22 kV - 13.1 kA (500 MVA)
- 11 kV - 18.4 kA (350 MVA)
- 6.6 kV - 21.9 kA (250 MVA)

Actual fault currents and their maximum durations at any particular location on the DistCo's high voltage system will be made available upon request.

8.5.4 Control of Incoming High Voltage Supply

The main switch shall consist of an automatic circuit breaker capable of making and breaking the maximum prospective fault currents on all three phases.

The main switch shall be located as near as possible to the Customer's point of supply, and shall be readily accessible to authorised persons and shall be provided with adequate means of isolation for maintenance purposes.

Normally, where more than one high voltage supply is provided to a Customer, the main switches shall be interlocked in such a manner that paralleling of the high voltage supplies shall not be possible.

Where technically feasible, consideration will be given to allowing momentary paralleling of the DistCo's high voltage feeders, to permit transfer from one feeder to the other without interruption to supply.

Permanent paralleling of high voltage feeders to provide a no break supply may also be considered, subject to the installation of additional protection at the zone substation and the Customer's installation at the Customer's expense.

8.6 Metering

The following high voltage metering requirements are applicable to single feeder high voltage installations (up to 22 kV) and comply with the Wholesale Metering Code and Retail Tariff Metering Code (as appropriate). Dual high voltage feeders and co-generation installations will require additional provisions.

8.6.1 General Requirements

Metering equipment shall be located at a position determined and approved by the DistCo.

- A clear, illuminated, paved and level space as specified in Clause 6.2.1, shall be provided in front of the metering position to allow access for meter reading and to accommodate test personnel and their equipment.
- Access must be direct (ground floor), or by stairs or lift. Ladder access is not acceptable.
- Metering equipment shall not be installed in unsuitable locations as described in Clause 6.2.1.1
- Metering equipment must not be subjected to industrial contamination, extremes in temperature, or vandalism. The minimum enclosure requirement is IP 23 to AS 1939.
- Unless enclosed in an independent enclosure having no projections, open, live or bulky apparatus is not permitted below the meter panel. Any controls, push buttons, etc., should be enclosed. The DistCo will not accept responsibility for inadvertent operation of any unprotected apparatus located below or in front of the meter panel.

The enclosure of the meter, metering transformers and any metal supporting structure/s shall be connected to the same earth grid as the Current Transformer and Voltage Transformer secondaries (see Figures 8.2 and 8.5).

A suitable earth grid is required for all wall mounted metering installations. The DistCo will, in consultation with the Customer, specify the earthing requirements. The specifications contained in Figure 8.2, concerning the earthing grid, are to be treated as minimum requirements.

8.6.2 Metering Requirements (Single Feeder)

8.6.2.1 Meters Mounted on an Interior Wall

The customer shall provide a suitable enclosure or surround for mounting a lift-off hinged panel to mount the metering equipment. For details see Figures 6.4 and 6.5.

A clear wall space of 2.0 m high by 1.2 m wide is required for the mounting of metering equipment. See Clause 6.2.1.

8.6.2.2 Meters Contained in a Wall Mounted Cubicle

The minimum size meter panel for cubicle mounting is:-

- Height 900 mm
- Width 600 mm

The enclosure door must be side hinged, and have either lift-off hinges, or be fitted with a stay, to retain it in an open position. The door shall be labelled **"Electricity Meters"**.

Meter boxes shall comply with Figure 6.5. A specification is available from the DistCo to meet the above requirements.

8.6.2.3 Meter Panels Supplied by the Customer

Meter panels shall comply with the requirements of Clause 6.5.1.

The DistCo will normally provide and install the wiring for the meter panel.

8.6.2.4 Meters Housed Outdoors (ie. in vicinity of Outdoor C.T.'s & V.T.'s.)

Metering equipment shall be enclosed in a cubicle complying with the requirements of Clauses 8.6.3 and 6.5.1

The Specifications for the supporting structure and foundations for this cubicle, are shown in Figure 8.1. The Customer shall supply and install the cubicle, foundations and supporting structure to these specifications.

Where there are no made roads to within 10 metres of the meter position, there shall be at the very minimum, a formed all-weather roadway for vehicles, from the nearest made roadway to the meter position.

8.6.3 Metering Transformers

8.6.3.1 Overhead Supply

Metering transformers shall be mounted on a pole structure to DistCo standards. These transformers are of an oil-filled variety, which combine both current transformers (CTs) and voltage transformers (VTs), and will be mounted in a manner shown by Figure 8.2.

Secondary wiring and associated conduits located on the high voltage metering structure/pole shall be installed by the DistCo. Protective conduits for secondary wiring from the high voltage structure/pole to the metering structure shall also be installed by the DistCo.

8.6.3.2 Underground Supply

(a) Metering Transformers Located Outdoors

As an alternative to mounting metering transformers on a high voltage pole structure, metering transformers may be enclosed within a cubicle meeting the specifications of Figure 8.4. This cubicle will be mounted on a concrete pad, which shall be supplied by the Customer, meeting the specification in Figures 8.3.

(b) Metering Transformers Located Indoors

Where metering transformers are located indoors and enclosed in a cage or cubicle, the requirements of Clause 8.6.3.3 shall apply in addition to the following.

The transformer enclosure shall be to the satisfaction of the DistCo. A cubicle shall comply with, and meet at least the minimum space requirements as shown in Figure 8.4.

The Customer shall provide protective conduits for the secondary wiring, from the transformer enclosure to the metering position. Secondary wiring will be provided by the DistCo, but should be installed by the Customer in those conduits prior to the conduits being permanently fixed in position.

The layout of the transformer will be such that identification of transformer polarities can be readily established, and that there is ready access to the secondary terminals of all transformers.

The enclosure shall also contain a suitable earthing bar between the CTs and VTs, so as to allow for the earthing of secondary wiring circuits.

Locking facilities suitable for padlocks (10 mm HASP) must be provided for securing of the metering transformer enclosure.

8.6.3.3 Metering Transformers Mounted in Switchgear

(a) General Requirements

Metering transformers mounted within the Customer's high voltage switchgear shall only be acceptable following approval from the DistCo.

The following requirements must be met when metering transformers are mounted in high voltage switchgear:-

- The transformers must be mounted within a chamber which is able to be placed under DistCo seals. The chamber design must be approved by the Responsible Officer prior to purchase and construction.
- No other devices apart from metering equipment shall be located within the chamber.
- The voltage transformers will be permanently mounted within the metering chamber.
- The secondary terminals of the transformer must be easily accessible.
- Where the meter panel is remote from the metering transformers, provision must be made for protection of the secondary windings of the voltage transformers. The fuses must be placed in an accessible position where an access permit would not be required. The fuses would normally be 10 Ampere rated, HRC.
- Where fuses are placed on the secondary windings of the voltage transformers, provision must be made to place the fuses under DistCo seal.
- The white phase secondary winding of the voltage transformer, which is earthed, must not be fused.
- Provision for Customer switching or isolation prior to the metering transformers is not permitted.
- It should be noted that secondary wiring from the transformer to the meter position will be hard wired; that is, no breaks or links will be allowed between the transformers and the meter position.
- Provision will also be made within the transformer chamber for bonding primary conductors to earth, should the need arise to disconnect the supply and carry out work on the metering transformers.
- It is not DistCo policy to install primary voltage transformer fuses, however if the Customer chooses to install them they must be DistCo approved. Spare fuses must be readily available and kept in a mutually acceptable location.
- If the metering transformers are supplied by the Customer and they are not able to be directly replaced by DistCo spares, then the Customer shall be required to purchase suitable spares and have them available on site.

(b) Metering Transformers Supplied by the Customer

Where metering transformers are provided by a Customer the following requirements must be met :-

- The current and voltage transformers shall be completely encapsulated with the secondary terminal box part of the resin body of the transformer.
- The voltage transformers shall comply with AS 1243, Voltage Transformers for Measurement and Protection, and the current transformers shall comply with AS 1675, Current Transformers for Measurement and Protection. The transformers shall meet the performances shown in Table 8.2.

Table 8.2 Performance requirements for metering transformers

Description	DistCo Requirement
Voltage Transformers	
ratio - 11 kV	11 000 / 110 V
ratio - 22 kV	22 000 / 110 V
class	0.5 M
rated burden	4 mS for three phase units or 12 mS for single phase units.
rated output	50 VA (min)
voltage factor	1.9 / 30 s
insulation level - 11 kV	28 kV (PFWV), 95 kV (LIWV)
insulation level - 22 kV	50 kV (PFWV), 125 kV (LIWV)
Current Transformers	
ratio	100 - 200 / 5 A or 200 - 400 / 5 A
class	0.5 M
rated burden	0.6 ohm
rated output	15 VA
thermal limit current	
100 - 200 / 5 Amps	300 A
200 - 400 / 5 Amps	600 A
rated short time current - 11 kV	18.4 kA / 2 s
rated short time current - 22 kV	13.1 kA / 2 s
insulation level - 11 kV	28 kV (PFWV), 95 kV (LIWV)
insulation level - 22 kV	50 kV (PFWV), 125 kV (LIWV)

- The transformers shall be solely for DistCo metering purposes and their installation shall be subject to approval.
- Test certificates from a NATA registered laboratory or a previously approved equivalent laboratory shall be provided prior to installation. The certificates shall be written in English.

Minimum information to be included on the test certificate is :-

- The test certificate shall show conclusive evidence that the transformers comply with the relevant Australian Standard specification.
- Serial No.;
  Make ----------
  Rating ----------
  Burden ----------
  Class ----------
  Specification ----------
  Date of Test ----------
- Proof of compliance with high voltage insulation requirements.
- Test ratio(s), Burden(s), Currents, Voltages. Absolute values of Magnitude and Phase Errors at each test point.
- Statement of uncertainty in determination of errors.

(c) Metering Transformers Supplied by the DistCo

Supply of metering transformers by the DistCo for installation in Customer's high voltage switchgear is the preferred option. There are many benefits in using DistCo supplied metering transformers, they include:-

- Guaranteed DistCo approval of metering transformers.
- Availability of DistCo spares, which otherwise would need to be carried by the Customer.

8.6.4 Customer's Maximum Demand Control Equipment

If a Customer wishes to monitor and control energy management equipment, energy and time impulses are available on request from the DistCo. The cost of this will be in addition to other costs incurred. Pulses will not be supplied to installations supplied under energy-only tariffs. The form of pulses provided will be at the discretion of the DistCo. The DistCo will bear no liability under any circumstances for possible malfunctions of the pulsing equipment.

Energy and time synchronisation pulses will be supplied from DistCo metering, via an interposing relay to the Customer. The contact rating of these relays and the form of the outputs can be obtained from the DistCo.

8.7 Protection

The main switch or switches shall be fitted with a protection system which is compatible with the DistCo's high voltage protection system. The Customer shall test the main protection system at the time of commissioning the installation to demonstrate that the performance meets the design parameters. Customers shall discuss the protection requirements with the DistCo prior to detailed design work and placing orders for equipment.

All circuit breakers shall be fitted with at least three phase overcurrent and earth fault protection that incorporates three phase tripping (lockout) as a minimum. More complex protection arrangements may be required, in particular cases to meet acceptable protection performance criteria depending on the Customer's installation arrangement, the DistCo's system arrangement and the required protection performance levels.

All switch fuses shall be fitted with simultaneous overcurrent operation of all three phases.

It is preferred that current transformers for overcurrent protection be located on the supply side of the circuit breaker.

Protection settings and equipment shall be subject to the approval of the DistCo prior to commissioning. Any modification of the settings shall be subject to the approval of the DistCo.

In general the Customer's primary phase fault protective devices for faults at the voltage level of the supply shall have an operating time of not greater than 150 milliseconds. Any proposed operating time greater than 150 milliseconds shall be discussed with the DistCo at an early stage.

8.8 Interference to the DistCo Supply System

The Customer shall ensure that the high voltage installation complies with the requirements of the Distribution Code, which details the acceptable levels of load generated interference.

8.9 Installation of Conductors

8.9.1 Underground Cables

The high voltage underground cables shall be installed in accordance with both the Wiring Regulations and the Electricity Supply and Construction Regulations.

Before backfilling, all high voltage underground cables and conduits shall be inspected by the DistCo. After installation and before activation, the cables shall be tested in accordance with the relevant Australian Standards.

The DistCo requires that immediately after the installation of the high voltage underground cables, a detailed drawing recording the route, depth of laying and other relevant information be produced by the customer. This drawing shall be available for the use of all persons concerned with future ground openings on the property.

8.9.2 Overhead Lines

Overhead lines shall be designed and constructed in accordance with the Electricity Supply and Construction Regulations and the DistCo's Overhead Line Design Manual and shall be approved by the DistCo prior to construction.

Unless otherwise set out in the Wiring Rules, current ratings of aerial conductors shall be determined in accordance with Electricity Supply Association of Australia Limited (ESAA) Document D(b)5 - 1987. If adequate information is not available, current ratings determined from assumed operating conditions shall be subject to the approval of the DistCo.

8.9.3 Substations

All apparatus shall be clearly and uniquely labelled to ensure correct identification by operating and maintenance personnel.

The energy pulses will be via a 3 wire, form C, and the time synchronisation via a 2 wire system, with the choice of normally open or closed contacts. Further options, such as transducer outputs for load control are able to be engineered and offered to suit specific customer requirements.

It is recommended that consideration be given to the provision of suitable safety clearances and earthing points to allow safe access for maintenance and inspection without the need to de-energise the entire installation.

8.10 Earthing

8.10.1 General

The earthing system of the Customer's high voltage installation shall comply with AS 3000 Section 8.

The following Clauses are set out to clarify the DistCo's requirements.

8.10.2 Combined Earthing System

The preferred earthing system is the "combined earthing system". A combined earthing system is one where the high voltage and low voltage equipment is earthed to a common

terminal bar. A guide to the application of the combined earthing system is shown in Figure 8.6.

This system of earthing requires that at least two separate and distinct groups of electrodes shall be connected to the common terminal bar, so that any connection may be removed for testing without interference to others.

The use of underground water piping as an earth electrode is not acceptable.

The combined earthing system shall have a resistance to earth not greater than 1 ohm and may be achieved by connections to electrode systems, metallic cable sheaths or low voltage neutrals, provided that when any such connection is removed, the resistance of the remaining earth connections does not exceed 30 ohms.

Each substation on the Customer's property shall have its own independent earthing system. Where there are multiple substations on the Customer's property it may be necessary that the earthing systems be connected together by a conductor of the same size as the high voltage earthing conductors.

Earthed primary neutral windings are not permitted on any transformer of the voltage at which the Customer takes supply. It is recommended that the Customer use Delta-Star transformers to comply with this requirement.

The transformer tank, sheaths of any high voltage underground cables, and all accessible metallic parts containing or supporting high voltage conductors and all parts metallically connected thereto shall be bonded to the common terminal bar.

The star point of the distribution transformer low voltage windings, sheaths of any low voltage underground cables and all accessible metallic parts containing or supporting low voltage conductors, and all metallic parts connected thereto shall be bonded to the common terminal bar.

8.10.3 Separate Earthing System

If the requirements of the combined earthing system cannot be met, then a separate earthing system shall be installed in accordance with the relevant clauses of Section 8 in AS 3000, following approval from the DistCo.

8.10.4 Size of Earthing Conductors

All conductors used within the combined or separate earthing systems referred to above shall have a minimum equivalent copper cross-sectional area as follows :-

- High voltage earthing conductors: 22 kV - 70 mm^2, 11 kV - 95 mm^2;
- Low voltage earthing conductors : 120 mm^2;

and shall have a cross sectional area not smaller than the size calculated on the nomogram "Fault Level and Duration for Stranded Aluminium and Copper Non-Tensioned Earthing Conductors" in Table 8.1 of AS 3000.

8.10.5 Other Earthing Requirements

All metallic substation fences, doors or enclosures shall be connected to the earthing system and a grading ring shall be installed around the substation enclosure in accordance with AS 2067.

Reinforcing in the substation floor or walls shall be connected to the common terminal bar.

8.11 Conversion from Low Voltage to High Voltage

In order for a Customer to take supply at high voltage, the Customer may either replace the existing substation(s) and other assets on the property or purchase this equipment from the DistCo.

If the Customer chooses to purchase the existing equipment, the DistCo will sell its assets in good working condition to the Customer as part of the negotiation process for the high voltage supply.

The costs associated with converting the installation to meet the requirements of the Wiring Rules and this Section shall be the responsibility of the Customer.

8.12 Testing and Commissioning

Routine test reports on all high voltage electrical equipment shall be submitted to the DistCo for approval prior to activation.

The high voltage equipment shall be tested on site in accordance with the requirements of AS 3000 (the Wiring Rules) and other relevant Australian Standards as deemed necessary by the DistCo. These tests shall be performed by a competent testing organisation. The certified results of these pre-commissioning tests shall be made available to the DistCo before the high voltage equipment is energised.

On completion of the works, and before any new high voltage equipment is connected to the electrical system, a general inspection of both the high and low voltage installation shall be carried out by the DistCo to ensure compliance with the Wiring Rules.

The DistCo will not connect the whole or any part of the installation which in the opinion of the DistCo is unsatisfactory for connection to the supply system.

8.13 Operation and Maintenance of Customer's High Voltage Installation

8.13.1 Operating Procedures

The DistCo will provide to the Customer a copy of the DistCo's Minimum Operating Procedures, which are based on the requirements set out in the "Code of Practice on Electrical Safety in the Victorian Electricity Supply Industry (Blue Book)".

The Customer will need to provide to the DistCo a copy of the Customer's high voltage operating procedures, prepared in accordance with the DistCo's Minimum Operating Procedures, before permanent supply is connected to the installation.

8.13.2 Trained Operators

The Customer shall ensure that high voltage switches, other than control switches designated for the use of plant operators, shall be operated only by persons selected and authorised by the Customer for that purpose.

The persons shall be referred to as the "Customer's High Voltage Operators" and shall be approved by the DistCo. It is required that these persons be trained at a DistCo approved High Voltage Operators School and that a minimum of two persons be trained to ensure availability at all times.

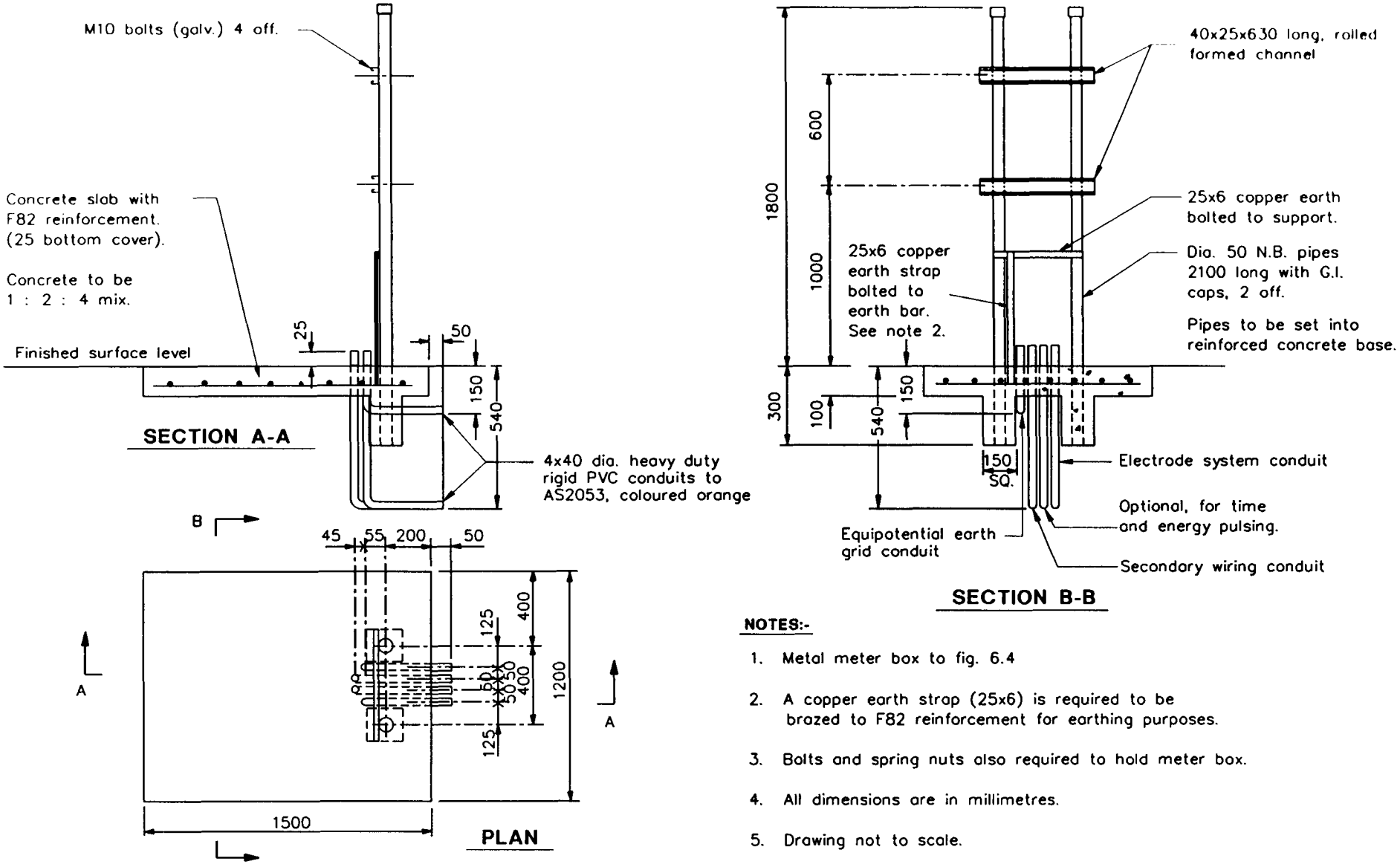
High Voltage apparatus such as operating sticks, safety earths, gloves and insulating mats shall be made available by the Customer in accordance with the Customer's high voltage operating procedure.

8.13.3 Maintenance

A Customer who takes supply at high voltage shall ensure that the high voltage installation is maintained in good order to ensure that any malfunction will not create a hazard or cause interference to the DistCo's supply system.

The Customer will be required to provide a written maintenance proposal before supply is made available, and verification of this proposal may be requested by the DistCo.

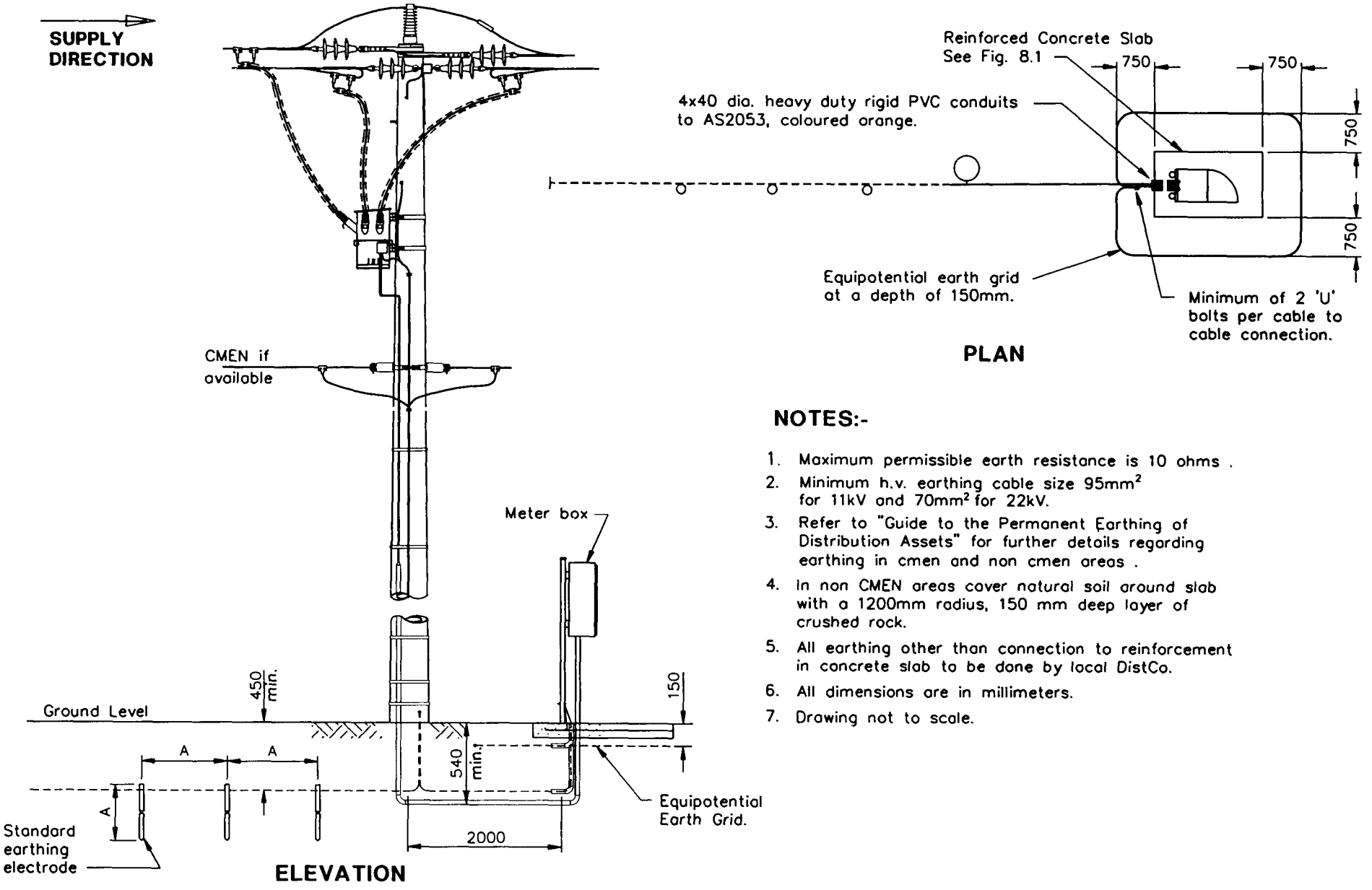
Adequate spare high voltage fuses of the required size and rating shall be available on site at all times. It is recommended that consideration be given to the provision of spare critical high voltage items of equipment.



NOTES:-

1. Metal meter box to fig. 6.4
2. A copper earth strap (25x6) is required to be brazed to F82 reinforcement for earthing purposes.
3. Bolts and spring nuts also required to hold meter box.
4. All dimensions are in millimetres.
5. Drawing not to scale.

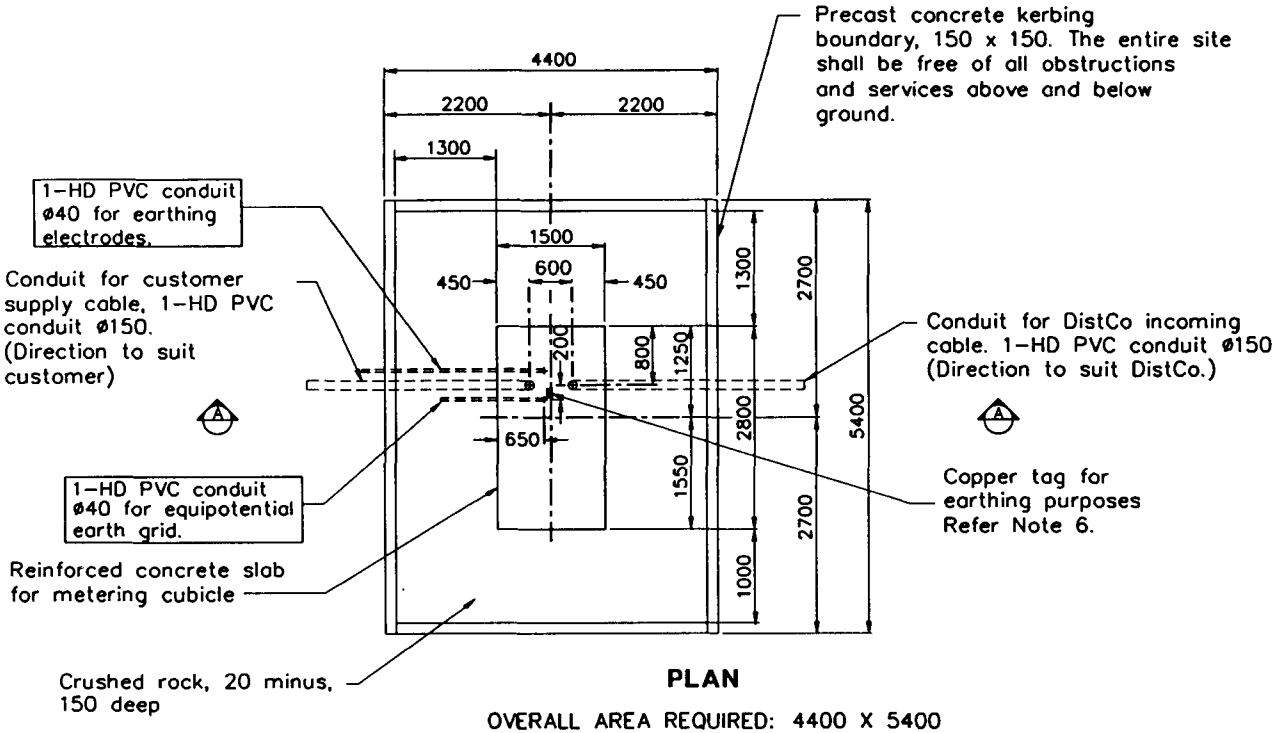
Figure 8.1 H.V. Metering Structure – Foundation and Support Details for Meter Box



NOTES:-

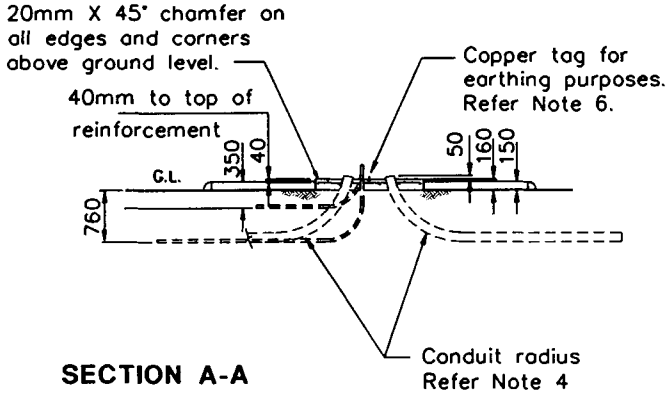
1. Maximum permissible earth resistance is 10 ohms .
2. Minimum h.v. earthing cable size 95mm^2 for 11kV and 70mm^2 for 22kV.
3. Refer to "Guide to the Permanent Earthing of Distribution Assets" for further details regarding earthing in cmen and non cmen areas .
4. In non CMEN areas cover natural soil around slab with a 1200mm radius, 150 mm deep layer of crushed rock.
5. All earthing other than connection to reinforcement in concrete slab to be done by local DistCo.
6. All dimensions are in millimeters.
7. Drawing not to scale.

Figure 8.2 11kV & 22kV Metering Installations - Earthing Diagram



PLAN

OVERALL AREA REQUIRED: 4400 X 5400



SECTION A-A

NOTES :-

1. Concrete shall be graded 25MPa, and nominal slump shall not exceed 75mm.
   Concrete to have a hard surface, levelled and trowelled smooth.
   A suitable slope is required to ensure water run off.

2. Steel reinforcement shall comply with S A A codes as follows:
   F81 wire fabric – to AS1304
   S12 plain bars – grade 230S to AS1302
   Reinforcement to have 50mm cover to all formwork & 40mm cover to top of footing.

3. Crushed rock under footings shall be compacted by three passes (minimum) of a wacker or other approved mechanical means.

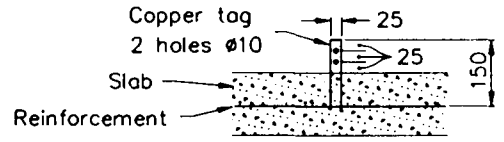
4(a). Conduits for cables :– Heavy duty rigid PVC ø150mm to AS2053, coloured orange.
   Conduits to have 1020mm minimum radius bend where required, and terminate 50mm above slab level.
   Depth to invert level of conduits – 760mm min.

4(b). Conduits for earthing :– Heavy duty rigid PVC ø40mm to AS2053, coloured orange.
   Conduits to have 300mm minimum radius bend where required, and terminate 50mm above slab level.

4(c). All conduits fitted with removable plug in each end and all joints must be free of internal projections.
   Conduits to be inspected by DistCo prior to backfilling.
   Two clear days notice is required.

5. Site to be suitably drained to the satisfaction of the DistCo.

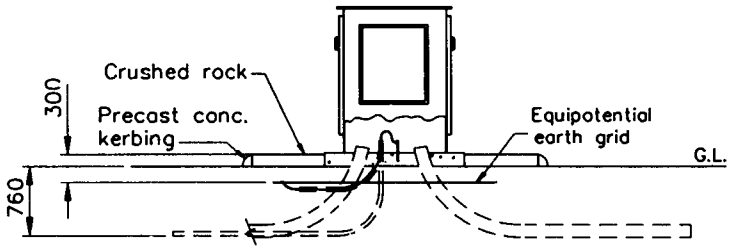
6. A copper tag (25x6x150) shall be brazed to the reinforcement for earthing requirements.
   Tag as per the following detail:



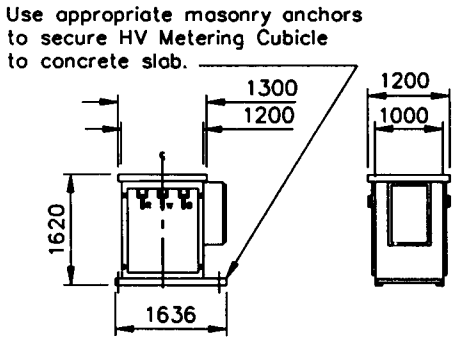
7. All dimensions are in millimetres.

8. Drawing not to scale.

Figure 8.3 Standard HV Metering Cubicle – Foundation Details

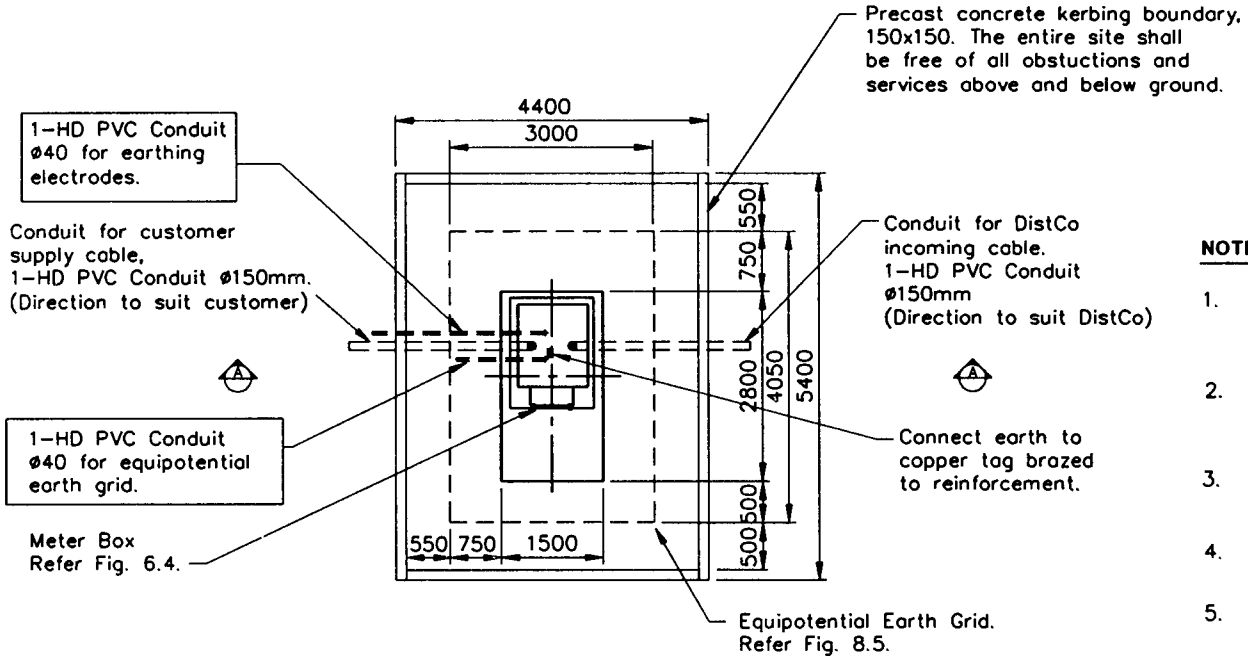


SECTION A-A



FRONT VIEW SIDE VIEW
(DOORS REMOVED)

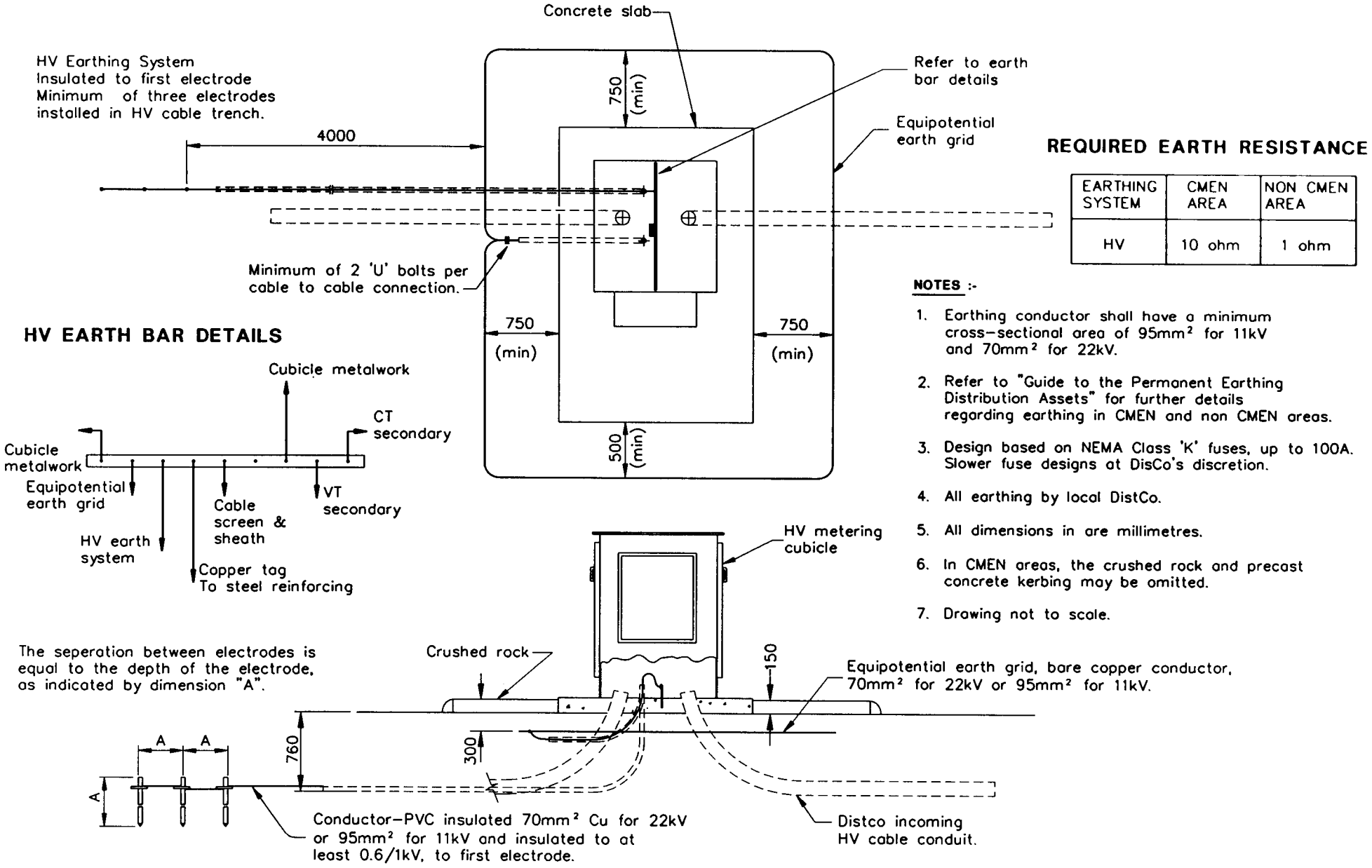
HV METERING CUBICLE



NOTES :-

1. The contractor shall complete all works neccessary for the DistCo to install and connect cables and cable terminations to the point of supply.
2. Braided copper conductor is to be used to earth the two cubicle doors to the earth bar.
3. In CMEN areas, the crushed rock and precast concrete kerbing may be omitted.
4. All dimensions are in millimetres.
5. Drawing not to scale.

Figure 8.4 Standard HV Metering Cubicle - General Arrangemet



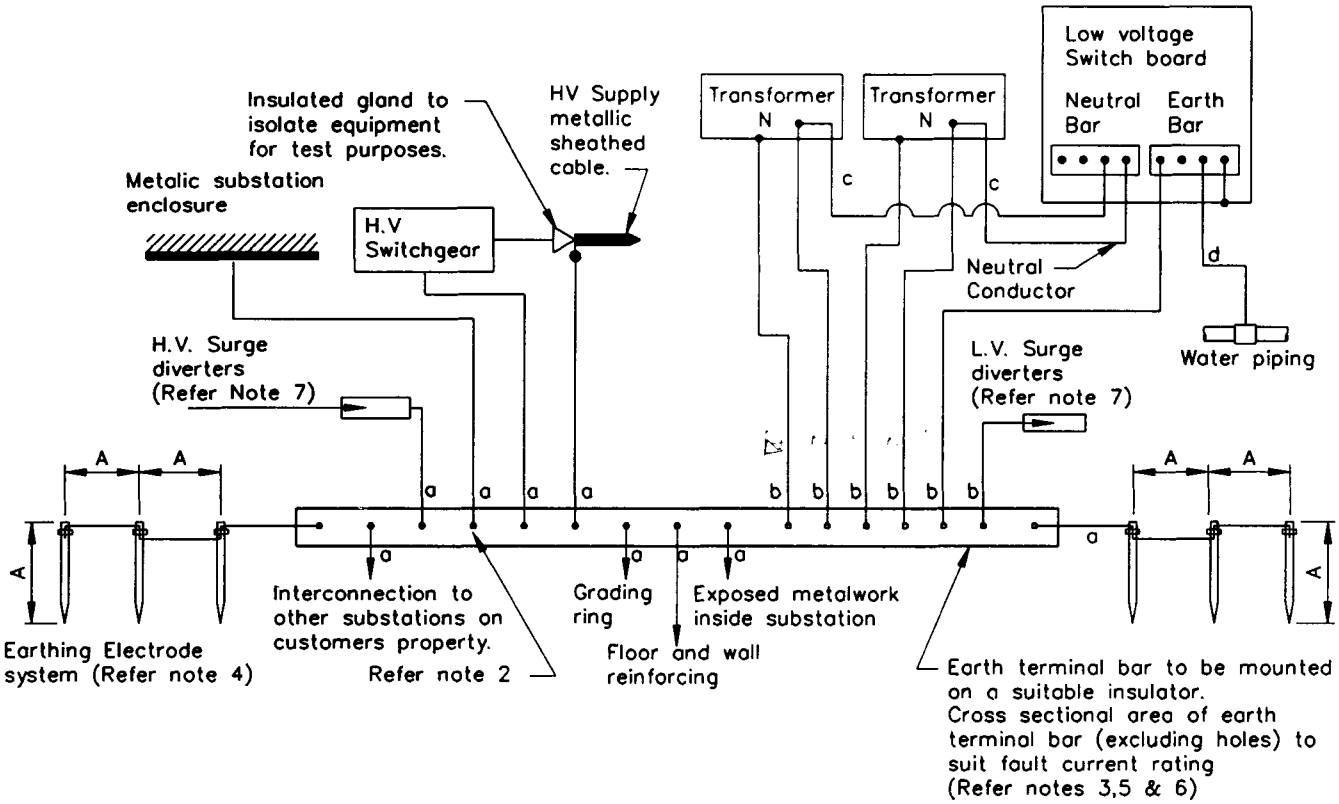
REQUIRED EARTH RESISTANCE

EARTHING SYSTEM	CMEN AREA	NON CMEN AREA
HV	10 ohm	1 ohm

NOTES :-

1. Earthing conductor shall have a minimum cross–sectional area of 95mm² for 11kV and 70mm² for 22kV.
2. Refer to "Guide to the Permanent Earthing Distribution Assets" for further details regarding earthing in CMEN and non CMEN areas.
3. Design based on NEMA Class 'K' fuses, up to 100A. Slower fuse designs at DisCo's discretion.
4. All earthing by local DistCo.
5. All dimensions in are millimetres.
6. In CMEN areas, the crushed rock and precast concrete kerbing may be omitted.
7. Drawing not to scale.

Figure 8.5 Earthing Diagram – Standard HV Metering Cubicle



NOTES :-

1. These requirements are based on the SAA Wiring Rules AS3000 and clause and table referred to below are in AS3000.
2. Connect to the terminal bar a separate conductor for each item and label accordingly.
3. H.V. conductors are to be kept on one side of the terminal bar and L.V. conductors on the other side.
4. The two separate earth electrode systems shall each comprise a minimum of 3–1500mm long copper clad earth electrodes. The preferred minimum spacing between eletrodes– Dimension "A" shall be equal to the length of the electrodes. The preferred minimum spacing between the two earth electrode systems shall be 5 times dimension "A".
5. The resistance of the terminal bar is to be less than or equal to 1 ohm with all connections made and less than or equal to 30 ohms when any one connection to electrode systems, metallic cables sheaths or neutral conductors are removed.
6. The size of the terminal bar and conductors connected to the terminal bar shall be calculated as follows: –
   - The operating time of the DistCo's primary feeder protection is to be used in Table 8.1. of AS3000.
   - For small transformers the H.V. earth conductor may be the determining factor in sizing the L.V. conductor.(The L.V. earth conductor shall not be smaller than the H.V. earth conductor).
7. To afford maximum protection, H.V. & L.V. surge diverters should be connected directly across the equipment being protected, and earthed via cable sheath or equipment frame earthing conductors to the terminal bar.

"a". Conductor sized to H.V. fault current in accordance with Table 8.1 of AS3000, however the following minimum size are to be used: –
22kV–70mm^2 copper (or equivalent)
11kV–95mm^2 copper (or equivalent).

"b". Conductor sized to L.V. fault current in accordance with Table 8.1 of AS3000, however the following minimum size is to be used: –
L.V. 120mm^2 copper (or equivalent)

"c". Conductor sized in accordance with Table 8.2 of AS3000 (Based on cross sectional area of actives) or Clause 2.2.2.3 (based on current carrying capacity of actives), whichever is the larger.

"d". Conductor size to be 4mm^2 copper.

Figure 8.6 6.6kV - 11kV or 22kV 3 Phase Substation Customer's H.V. Installation - Combined Earthing System

Appendix A

Fire Hazard Categories

Category 1 Area

Includes Urban Areas which –

- will not be given a fire hazard rating by the Fire Control Authority; or
- have been given a fire hazard rating of "low" by the Fire Control Authority; or
- have been given a fire hazard rating of "low moderate" by the Fire Control Authority and after consultation between the Distribution Company, the Responsible Person and the Fire Control Authority, the risk of fire ignition is not considered high; or
- are yet to have a fire hazard rating allocated by the Fire Control Authority but where, in the opinion of the Fire Control Authority, the combination of normal build-up of vegetation and general weather conditions could reasonably be expected not to produce conditions conducive to the ignition and/or rapid spread of fire.

Category 2 Area

Includes –

- all Rural Areas; and
- Urban Areas for which the Fire Control Authority has allocated a fire hazard rating of "high moderate"; and
- Urban Areas which have been allocated a fire hazard rating of "low moderate" by the Fire Control Authority and where, after consultation between the Distribution Company, the Responsible Person and the Fire Control Authority, the risk of fire ignition is considered high, but for other reasons the "low moderate" classification was assigned; and
- Urban Areas which are yet to have a fire hazard rating allocated by the Fire Control Authority but where, in the opinion of the Fire Control Authority, the combination of normal build-up of vegetation and general weather conditions could reasonably be expected to produce conditions conducive to the ignition and/or rapid spread of fire; and
- Any areas not otherwise defined.

Urban Area

Section 58 of the SEC Act defines an Urban Area as an area for which the Fire Control Authority has not allocated a fire hazard rating of "high" or "very high" and which is predominantly:-

- subdivided into allotments which, in the case of land used or to be used for residential purposes, are not greater than 0.4 hectares; and
- able to be used or developed under a planning scheme or interim development order for residential, industrial or commercial purposes; and
- provided with constructed streets and public utility services; and
- provided with street lighting which is installed at not less than three lanterns in every 500 metres.

This includes any other area that may from time to time be agreed upon between the Distribution Company, the Fire Control Authority and any person responsible for the management of public land in the area in accordance with Section 58 of the SEC Act.

Appendix B

Specification for Private Overhead Electric Lines.

Appendix B Contents

Part B1 General

Part B2 Private Overhead Electric Line Maintenance

Part B3 Private Overhead Electric Construction Details

Appendix B Contents

Appendix B Contents

Part B1 General

B1.1 Introduction

This specification details the requirements for Customer owned Private Overhead Electric Lines (POELs) operating at low voltage.

New lines are generally not permitted in fire hazardous Category 2 areas. An exception may be granted by the DistCo where digging conditions or obstacles would make the installation of an underground line uneconomic.

It should be noted that such lines form portion of a customer's electrical installation and that this specification complements those requirements set out in the Wiring Regulations for Aerial Conductors.

Important Note: Overhead or Underground.

In the case of a private electric line for a typical individual installation, where reasonable digging conditions are encountered, a low voltage underground cable can usually be installed at a lower cost to an equivalent overhead line. Therefore the use of underground electric lines in lieu of overhead is strongly recommended, particularly for:

- reduction of fire risk;
- continuity of electricity supply;
- reducing maintenance costs; and
- improved aesthetics.

Costs of both construction and ongoing maintenance should be carefully evaluated whenever a private overhead electric line is contemplated. With an underground cable, the risk of starting a bushfire and ongoing maintenance costs are both virtually eliminated.

Proposals for the construction of a private overhead electric line in areas of high fire risk may not be approved by the DistCo (refer to Clause 5.5.2 and B 1.3.2

B1.2 Financial Conditions and Responsibility

The person or body requiring electricity supply to be available on a property shall be responsible for all wiring and apparatus necessary to take electricity from the point of supply. This includes any private electric line, whether forming Aerial Consumer's Mains (ACMs) or otherwise.

Private overhead electric lines form part of a customer's electrical installation and hence are **the responsibility of the customer**, who should ensure that they have an adequate insurance cover for the risk of fire and other events.

B1.3 General Conditions

In accordance with the relevant regulations, all electrical wiring work associated with the erection and maintenance of Private Overhead Electric Lines shall be carried out by appropriately qualified and authorised persons and shall be to the satisfaction of the Responsible Officer.

All Private Overhead Electric Lines shall be constructed in accordance with the standards herein except that those utilising conductors of a size less than 16 mm^2, may be erected on supports to the dimensions given in AS 3000.

The minimum size conductors for Aerial Consumer's Mains (ACMs) shall be 7/1.75 mm or 16 mm^2.

Proposals for the construction of POELs, including where appropriate, a plan of the proposed route, shall be submitted to the Responsible Officer for approval at least two weeks before the proposed date of commencement of construction or maintenance, refer Clause 5.5.2.

ACMs should be as short as is practicable and, in general, should not exceed 200 m in length.

Private Overhead Electric Lines shall not extend beyond the boundary of the property on which the point of supply is established. Hence, lines crossing or entering upon public road reserves, whether opened or unopened or land vested in or legally occupied by another legal entity is generally not permitted.

The proposed route and location of all poles shall be to the satisfaction of the Responsible Officer. When planning the route and pole positions due consideration should be given to the -

- length of line and each individual span;
- proximity to trees or other potential hazards (Refer to Clause B2.1)
- access for construction, maintenance and repairs;
- avoidance of crossings of railway lines, telecommunications lines, navigable waterways, etc;
- requirement that the last pole of ACMs shall be located not further than 20 m from the customer's building; and
- requirement that the first pole of ACMs be within 20 m of the property boundary (if supplied by an overhead service line) & not more than 45m from a DistCo pole.

B1.4 Control and Protection

In the case of ACMs in rural and fringe urban areas, a circuit breaker shall be installed at the commencement of such consumer's mains in accordance with Clause B1.6 whether such consumer's mains commence at the point of supply or otherwise.

In all other cases, control and protection shall be in accordance with the Wiring Regulations.

Where two ACM's commence at the same pole separate protection of each ACM is preferred. This assists the customer or REC in ACM fault location and maintenance.

B1.5 Control of Aerial Consumer's Mains by the Customer or REC

Where aerial consumer's mains are controlled in accordance with Clause B1.6, the REC shall provide a suitable operating stick for the circuit breaker. Figure B1 shows a typical device, although any equivalent arrangement could be used.

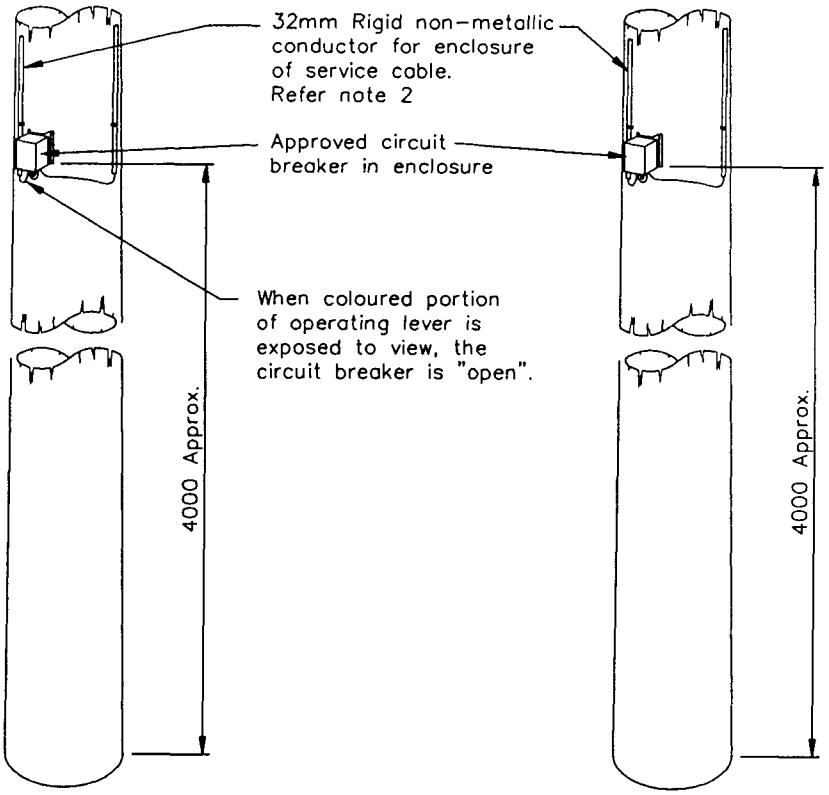
The customer may open the circuit breaker for any reason, however, it must be impressed on customers that they should not assume it is then safe to approach conductors (for tree clearing, etc) until a test is carried out by an electrically qualified person to prove that the conductors are isolated and positive means are taken, such as locking, to prevent inadvertent reclosure of the circuit breaker.

Note: Only suitably authorised and qualified persons may carry out work on a POEL (see Clause 1.3). Refer to Introductory Information - Clause E.

Subject to the provisions of the Wiring Regulations being strictly observed, an REC engaged to carry out repairs to a POEL supplied through a circuit breaker installed in accordance with this Specification may operate the circuit breaker for the purpose of carrying out such repairs.

In each and every case where repairs are carried out, it is VITAL THAT POLARITY TESTING BE PERFORMED by the Licensed Electrical Mechanic in Charge (LEM) IMMEDIATELY upon restoration of supply. Testing procedures shall be at least equivalent to those detailed in Appendix C and this shall also include disconnection of the main neutral and earthing conductors at each installation switchboard until the polarity is proved correct.

In this regard, LEMs engaged on work of this nature are reminded that incorrect connection of consumers' mains may result in "live" earthing and that misleading indications can be obtained by testing an MEN installation only at a GPO.

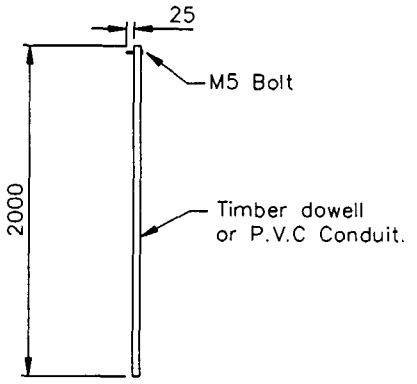


2 or 3 Wire Supply

4 Wire Supply

Special Note

Aerial consumer's mains **In Rural and Fringe Urban Areas** shall be controlled by a circuit breaker supplied by the customer. This shall be installed in lieu of a fused overhead line connector box at the origin of the aerial consumer's main.



Operating Stick

Notes

1. All equipment other than service cable supplied and installed by registered electrical contractor (REC.)
2. Installation shall comply with this specification and relevant Wiring Regulations.

Figure B1 Mounting of Circuit Breakers for Aerial Consumer Mains.

B1.6 Circuit Breakers for the Control of Aerial Consumer's Mains

B1.6.1 General

Only stick operated circuit breakers accepted by the DistCo's as being suitable for the control of aerial consumer's mains shall be used. Details of such circuit breakers are available from DistCo offices.

The circuit breaker (including its enclosure) is to be mounted between 3.0 and 4.0 m above ground level with an operating lever extension protruding below the enclosure. This operating arm shall provide a visual indication of the circuit breaker position (open or closed) and shall provide for locking in the open position.

B1.6.2 First Private Pole on Property

Where supply is made available to the property by means of an overhead service line, the circuit breaker shall be installed on the customer's first private pole (ie. the point of supply). The REC shall install and wire the unit ready for connection of the DistCo's service cable to the supply terminals of the circuit breaker as shown in Figure B1. The REC shall also supply and fix separately a length of rigid light-duty grey non-metallic conduit of not less than 32 mm diameter to the pole extending from the point of attachment for the overhead service line to the lower edge of the circuit breaker enclosure for the installation of the service cable by the DistCo.

B1.6.3 Termination

Circuit breakers shall be suitable for connection of up to 35 mm^2 stranded conductors of either aluminium or copper.

Where consumers mains are increased in cross sectional area to provide for voltage drop, etc, it is the REC's responsibility to make a suitable conversion/connection and satisfy the appropriate Wiring Regulations (e.g. circuit breaker mounted on a junction box).

B1.6.4 Pole or Substation on Property

Where the circuit breaker is to be mounted on a DistCo pole, the REC must supply a circuit breaker unit ready for connection by the DistCo. Standard service cable connections will be used, the service cable being run down the pole in a similar fashion to that described above and as detailed in Figure B1.

The circuit breaker unit will be mounted by the REC and connected by the DistCo. The REC must leave sufficient length of conductors and fixing equipment such as conduit, saddles and bands to enable the circuit breaker to be connected to the DistCo's equipment.

Part B2 Private Overhead Electric Line Maintenance

B2.1 General

The customer shall be responsible for maintenance of the Private Overhead Electric Line, including clearing of trees from the line in accordance with the "Code of Practice for Tree Clearing". However, the DistCo at all times reserves the right, subject to the requirements of Section 61 of the SEC Act, to inspect the line and at the discretion of the Responsible Officer to direct that works be carried out.

Where the DistCo determines that tree clearing is required to maintain the clearances specified in the "Code of Practice for Tree Clearing", the customer shall be advised by written notice that the necessary tree clearing must be performed within a specified period, such period being not less than 14 days.

Notwithstanding the foregoing, where, after consideration of the degree of hazard involved, the DistCo's Responsible Officer considers immediate action is necessary, electricity supply shall be disconnected from the line forthwith after issuing a notice requiring immediate action in compliance with Section 62(6) of the SEC Act.

Maintenance other than tree clearing shall be carried out by a REC who shall consult with the Responsible Officer before commencing work.

B2.2 Requirement to Modify Existing Private Overhead Electric Lines

Customers are advised that any private overhead electric lines which have been constructed to a superseded specification shall be modified so as to comply with this specification where, in the opinion of the Responsible Officer, any addition, or alteration or repair of the line affects the safety of the line. Existing constructions which have not proved satisfactory such as vertical construction may require substantial modification or preferably be replaced with a private underground line.

Notwithstanding the above, a Private Overhead Electric Line which was constructed to a superseded specification and which complies with such superseded specification in every respect may, subject to the following provisions, be repaired to a standard that was acceptable when that part of the installation was originally installed, provided that:

- the tree clearing is maintained to the Code of Practice for Tree Clearing;
- a conductor spreader is fitted to each span of horizontal or vertical open wire constructed line to reduce the likelihood of conductors clashing;
- in the case of aerial consumer's mains in rural and fringe urban areas, a circuit breaker under the control of the customer, is installed at the commencement of such consumer's mains in accordance with Clause B1.6; and
- poles are stayed where appropriate. Additional poles may be required where the foundation of poles can be shown to be inadequate for the actual loads.

Part B3 Private Overhead Electric Line Construction Details

B3.1 Types of Private Overhead Electric Line

Two types of Private Overhead Electric Lines, defined as "Cable Type" and "Open-Wire Type", are described herein :

- Cable Type private lines may be considered as the simplest acceptable form of construction and is confined to the use of multi-core aerial cable within the limits specified in Clause B3.2.
- Open-Wire Type private construction is defined as open-wire construction within the Limits specified in Clause B3.2. For fire and safety reasons, "open wire type" private construction shall not be used for new construction.
- Where the limits of Clause B3.2 are exceeded, full standard DistCo design and construction practices shall be used together with the requirements of Parts B1 and B2 of this Specification.

Notwithstanding the requirements detailed hereinafter, variations may be made at the discretion of the appropriate Distribution Network Manager of the DistCo where considered necessary for particular cases.

B3.2 Limitations

Refer to Clauses B1.1, B1.4 and Clause 5.5.2 regarding conditions of use of Private Overhead Electric Lines.

Private lines to this Specification may be used provided they comply with the following:

- 0.6/1kV grade Insulated cable;
- comprise of not more than 4 conductors;
- the conductor size is not greater than 35 mm^2 copper or 95 mm^2 LVABC; and
- the poles are spaced not more than 45 m apart.

Pole requirements are common to both types of private construction and these have been listed separately.

The requirements for Cable Type private construction cover the use of multi-core cable and the requirements for Open-Wire Type private construction cover the use of single aerial conductors.

B3.3 Poles

B3.3.1 General

Poles shall be of such length as is required to provide the specified clearance for conductors (See Clause B3.6 - "Clearances"), and may be of wood, steel, concrete or other material as may be approved by the DistCo.

All poles shall have a minimum long duration safe working strength of 2 kN and be of suitable durability.

Poles shall be set to a depth of not less than 1/6 the overall length subject to a minimum of 1.3 m and where installed in poor soils shall be set in concrete and have a log placed against the direction of load - refer to Figure B2. The backfill shall be consolidated by ramming and the surface soil sloped away from the pole to assist drainage and pole durability. Where soil provides poor footing strength, additional measures shall be taken such as sinking the pole deeper, setting in concrete, installing surface logs as shown by Figure B2, adding stays or by other suitable means.

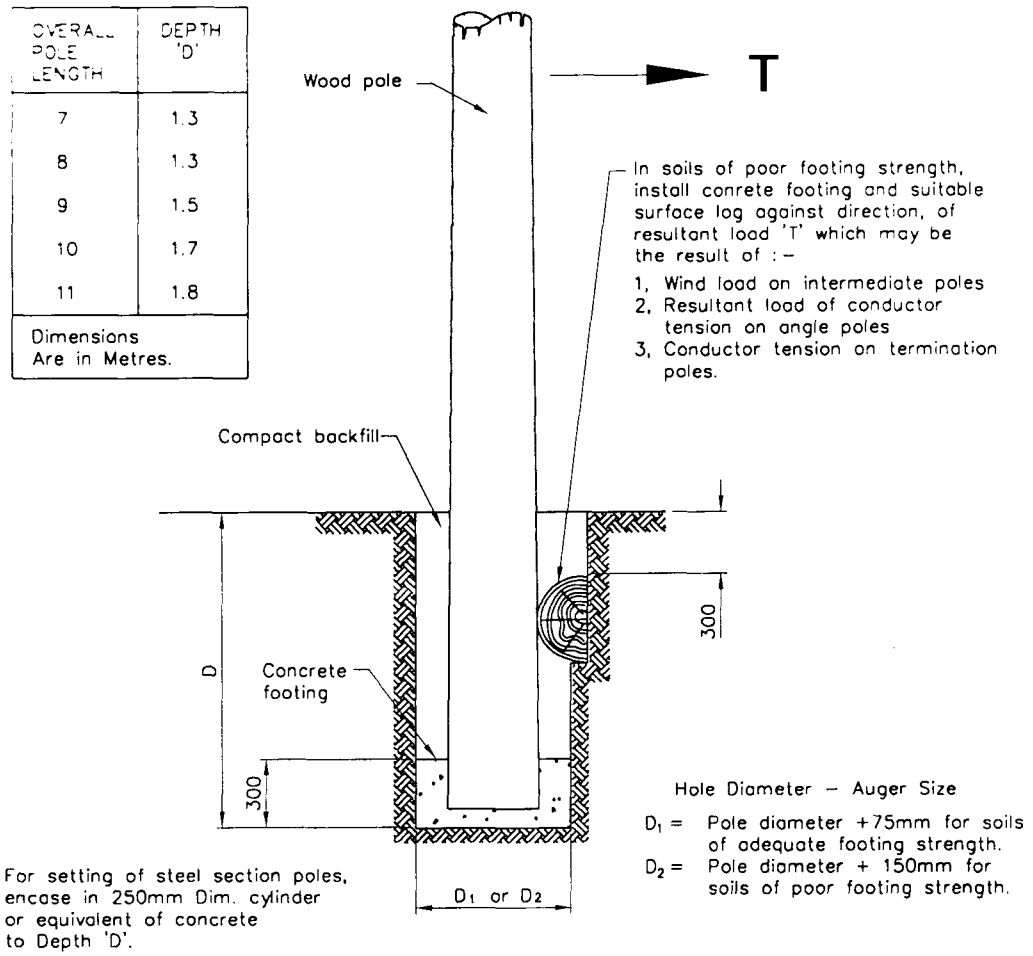


Figure B2 Setting of Poles

B3.3.2 Wood Poles

Wood poles shall be of suitable species of timber, sound and reasonably straight. All bark shall be removed, the butt cut off square and a suitable weather shield fitted to the head of each pole. Wood poles should not be used in known termite areas.

Except for wood poles of Class 1 durability, as shown by Table B1, all natural timber poles shall be pressure treated in accordance with AS 2209 with a suitable timber preservative compound.

Table B1 Wood Pole Types

Wood Poles	
Class 1 Durability Untreated (or treated)	**Lesser Durability (Treated only)**
Ironbark White Mahogany Tallowwood Grey Box Grey Gum	Messmate Yellow Stringybark White Stringybark Radiata Pine Blackbutt & Spotted Gum

The diameter of all wood poles shall not be less than 250 mm at the butt and 175 mm at any point.

Before backfilling, wood poles shall be treated with a suitable timber preservative at the butt end, head and extending 500 mm either side of the ground level.

B3.3.3 Steel Poles

Steel poles shall be suitably protected from corrosion by hot dip galvanising to AS 1650, or may be fabricated from pre-galvanized material having joints, etc., suitably treated from corrosion after fabrication.

Hollow sections shall be coated internally with similar protection for the length below ground level and fitted with a suitable cap at the head of the pole.

All steel poles shall have an additional anti-corrosion protection for the part of the pole which is installed below ground level. Care shall be taken to ensure that any coating system is not damaged during installation.

Steel poles which are capable of withstanding an ultimate load of 4kN in any direction applied horizontally at the head of the pole may be used for Private Overhead Electric Lines.

Alternatively Steel Poles of standard sections are shown in Table B2 and shall be set in concrete to a depth as shown by Figure B2. Approved Commercial Steel Poles shall be installed in accordance with manufacturer's instructions.

Table B2 Steel Pole Types

Steel Poles		
Type	**Minimum Section (mm) for Pole Length**	
	7 Metre.	**10 Metre.**
I Beam Grade 250	205 x 135 x 8	205 x 135 x 8
Channel	152 x 76 x 6	178 x 76 x 7
Tube	165 OD x 4.5 152 x 5.4	168OD x 7.1 165 x 8.0
Hollow Section	127 x 127 x 4.9 152 x 102 x 6.3	152 x 152 x 4.9 203 x 102 x 6.3

Note: Attention is directed to the need to "earth" steel poles and concrete poles where required by the Wiring Regulations.

B3.3.4 Concrete Poles

Commercial concrete poles capable of withstanding an ultimate load of 4kN in any direction applied horizontally at the head of the pole may be used for Private Overhead Electric Lines.

Note: Drilling of concrete poles is **not permitted** as ingress of moisture can lead to pole failure - refer to Clause 5.4.3.6 (c).

B3.3.5 Other Poles

Poles of other material shall be of suitable durability and shall have strengths as follows:

- Pole strength – capable of withstanding a horizontal force applied at the head of the pole of not less than 2 kN in any direction for short duration loads and 1.5kN for long duration loads.
- Footing strength – at least sufficient to satisfy the pole strength.

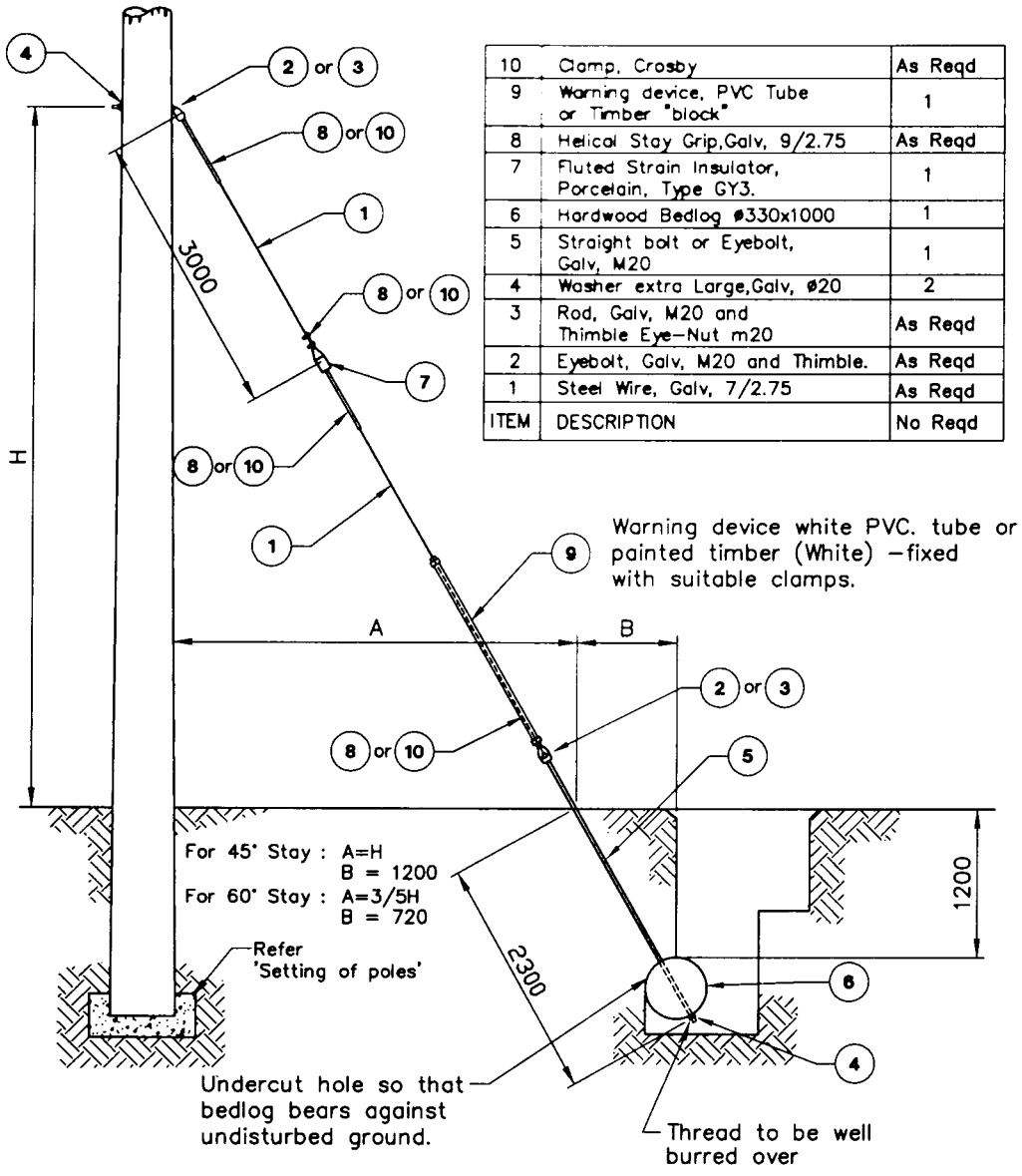
Such poles shall be suitably protected against deterioration below ground level.

B3.4 Stays

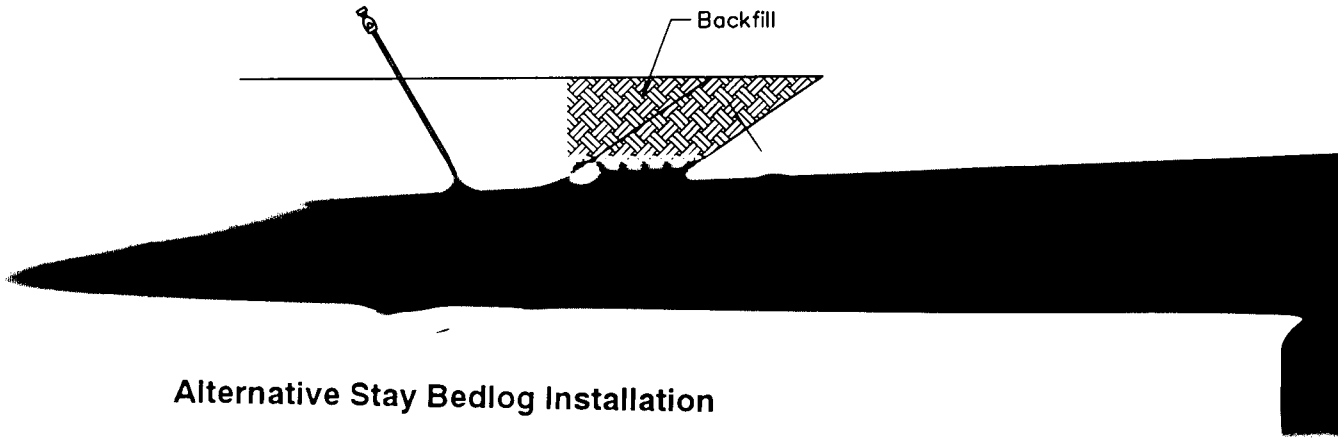
Stays shall be of galvanised steel strand of not less than 7/2.75 mm stranding having an ultimate tensile strength of not less than 1310 MPa. They may be inclined at either 60° or 45° to the horizontal, as convenient, and shall include a fluted strain insulator (for example, Type GY1) to AS 3609. A warning "block" painted white, or other suitable device, may be fitted if desired. In general, stays shall conform with Figure B3 unless otherwise specified herein or authorised by the Responsible Officer.

Stays shall be installed in the following cases:

- where there are two or more poles in the line, at the first pole of the line, against the pull of the cable in the intervening spans and, at the last pole of the line, against the pull of the cable in the intervening spans;
- at poles where the angle of deviation of the line is greater than 15°, against the resultant pull of the cable in line with the bisect of the angle. Where the angle of deviation is greater than 45°, two stays shall be installed, one against the pull of each line of cable; and
- at any other point as specified by the Responsible Officer, ie., where there is unstable soil.

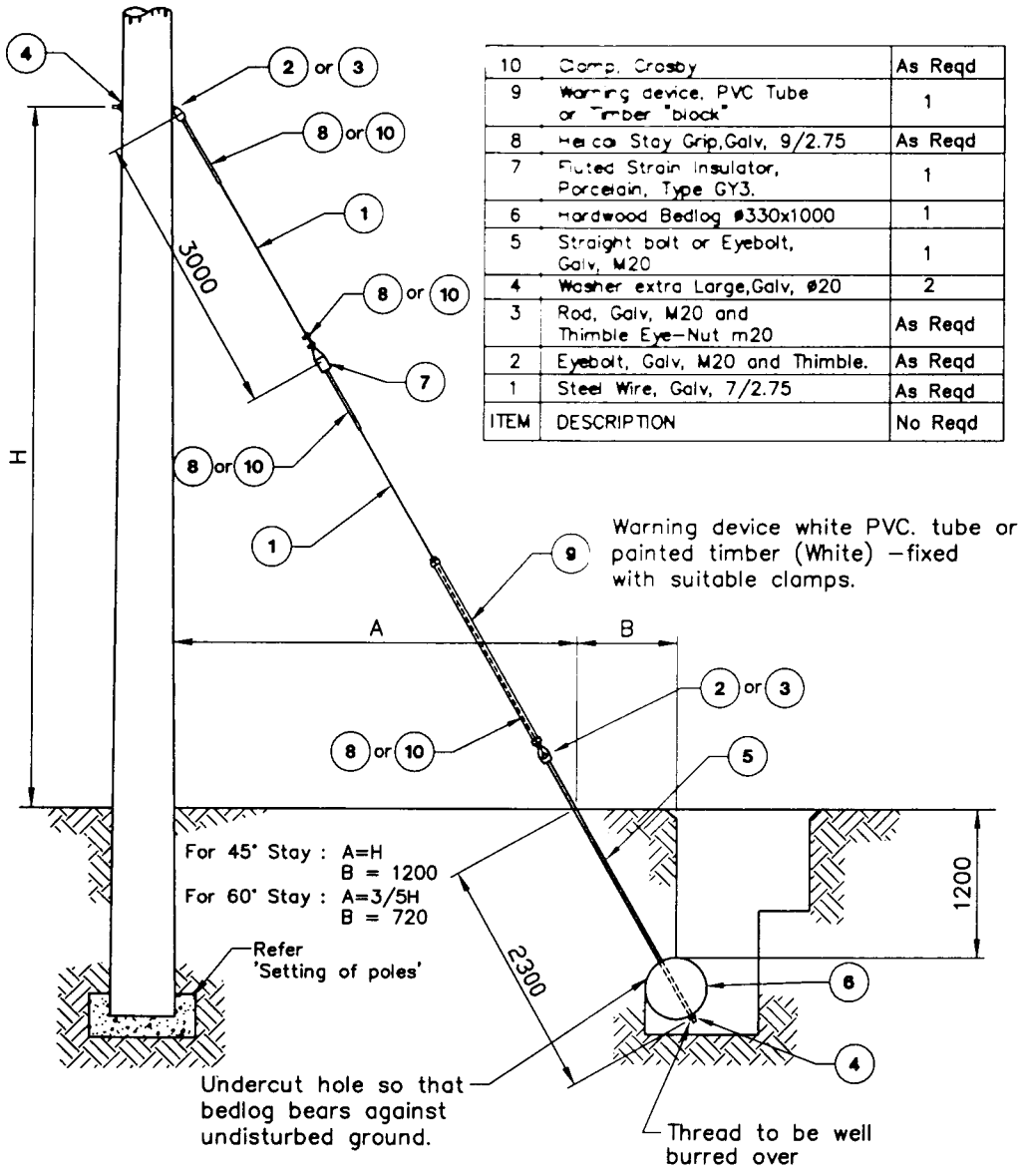


ITEM	DESCRIPTION	No Reqd
10	Clamp, Crosby	As Reqd
9	Warning device, PVC Tube or Timber "block"	1
8	Helical Stay Grip,Galv, 9/2.75	As Reqd
7	Fluted Strain Insulator, Porcelain, Type GY3.	1
6	Hardwood Bedlog ø330x1000	1
5	Straight bolt or Eyebolt, Galv, M20	1
4	Washer extra Large,Galv, ø20	2
3	Rod, Galv, M20 and Thimble Eye–Nut m20	As Reqd
2	Eyebolt, Galv, M20 and Thimble.	As Reqd
1	Steel Wire, Galv, 7/2.75	As Reqd

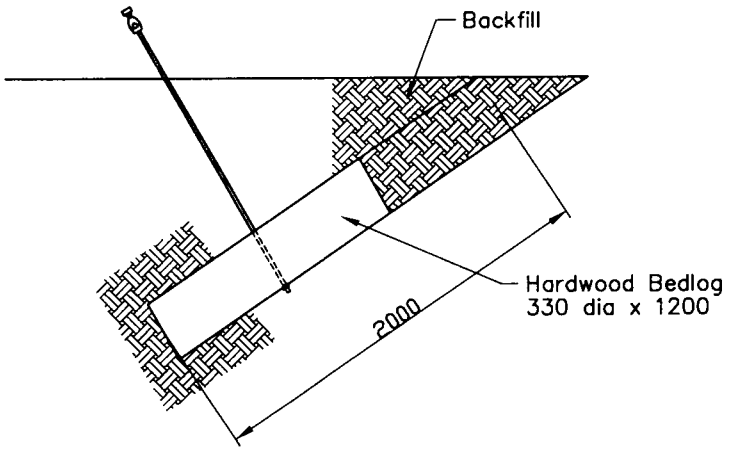


Alternative Stay Bedlog Installation

Figure B3 Methods of Installing Stays



ITEM	DESCRIPTION	No Reqd
10	Comp. Crosby	As Reqd
9	Warning device, PVC Tube or Timber "block"	1
8	Helico Stay Grip,Galv, 9/2.75	As Reqd
7	Fluted Strain Insulator, Porcelain, Type GY3.	1
6	Hardwood Bedlog ø330x1000	1
5	Straight bolt or Eyebolt, Galv, M20	1
4	Washer extra Large,Galv, ø20	2
3	Rod, Galv, M20 and Thimble Eye–Nut m20	As Reqd
2	Eyebolt, Galv, M20 and Thimble.	As Reqd
1	Steel Wire, Galv, 7/2.75	As Reqd



Alternative Stay Bedlog Installation

Figure B3 Methods of Installing Stays

B3.5 Hardware

Brackets shall be attached to poles by means of at least one bolt right through the pole. Where a single bracket is used on an intermediate pole, the bracket shall be installed on the pole on the inside of any angle of deviation of the line.

Ferrous metal used for hardware shall be hot dipped galvanised to AS 1650 or otherwise suitably protected against corrosion. Hardware shall at all points be securely tightened, and when in contact with wood, should be liberally coated with Timber Preservative Compound or a suitable class of chassis grease before fitting

B3.6 Clearances

B3.6.1 Cable Clearance from Ground

For the purpose of this Clause, the term "ground" shall include any unroofed elevated area accessible for traffic or resort such as a terrace, sun deck, landing, platform or bridges. The clearance of cables from ground at an ambient temperature of 50°C shall not be less than that shown in Table B3.

Table B3 Ground Clearances

Type of Conductor	Minimum Height Above Ground			
	Line Span		Last span to customer's building or terminating structure.	
	Centre of Driveway	Elsewhere	Point of Attachment	Elsewhere
Bare	5.5 m	5.0 m	Bare actives not permitted.	
Insulated or Neutral Screened Cable	5.5 m	4.6 m	3.0 m	3.9 m

Notes:

- An allowance of 200mm shall be made for variations in sag from 15°C to 50°C.
- In general, areas subject to farming activities are regarded as accessible to vehicles and hence the clearance for "Centre of Driveway" should be applied.

B3.6.2 Conductor Clearance from Structures

Clearance from structures shall be in accordance with Table B4.

Table B4 Clearance from Structures

Type of Conductor	Clearance from Structures	
	Above any part of any roof or similar structure not normally accessible for traffic or resort.	**From any point of the opening of any window or from any point of any balcony or similar place of resort, provided that the conductor may be erected at a height not less than 0.6 m from the top of any such window.**
Bare (or covered)	3.0 m	1.5 m
Insulated or Neutral Screened Cable	2.1 m	1.0 m

B3.6.3 Conductor Clearance from Telecommunication Lines

All crossings shall be in accordance with the "Code of Practice for Overhead Power and Telecommunication In-Span Crossings", "Code of Engineering Practice for Shared Use of Poles" and Figure B4. A summary of the relevant requirements is set out below -

- Conductors shall cross above telecommunication lines, except that in M.E.N. areas and by arrangement with the Telecommunication Company, neutral screened cable may cross under telecommunication lines.
- Conductors shall be kept to the minimum clearances as shown in Figure B4, in all directions of telecommunication lines and telecommunication subscribers' leads. These clearances shall be increased if the cable span does not terminate on a customer's building or terminating structure - refer to Figure B4.

B3.6.4 Conductor Clearance from Telecommunication Supports

Conductors shall be separated horizontally by at least 2.4 m from the vertical projection of any telecommunication support unless -

- they pass above telecommunication line or subscriber's lead, and a clearance of 2.4m is maintained from the telecommunication conductors and support in all directions; or
- they are attached with the consent of the Telecommunication Company to the head of the telecommunication support and a vertical clearance of 0.75 m or 1.2m for PSTN is maintained between the LV. conductors and the centre of the telecommunication conductor and the centre of the telecommunication conductor support. (PSTN - Telstra's Public Switched Telephone Network)

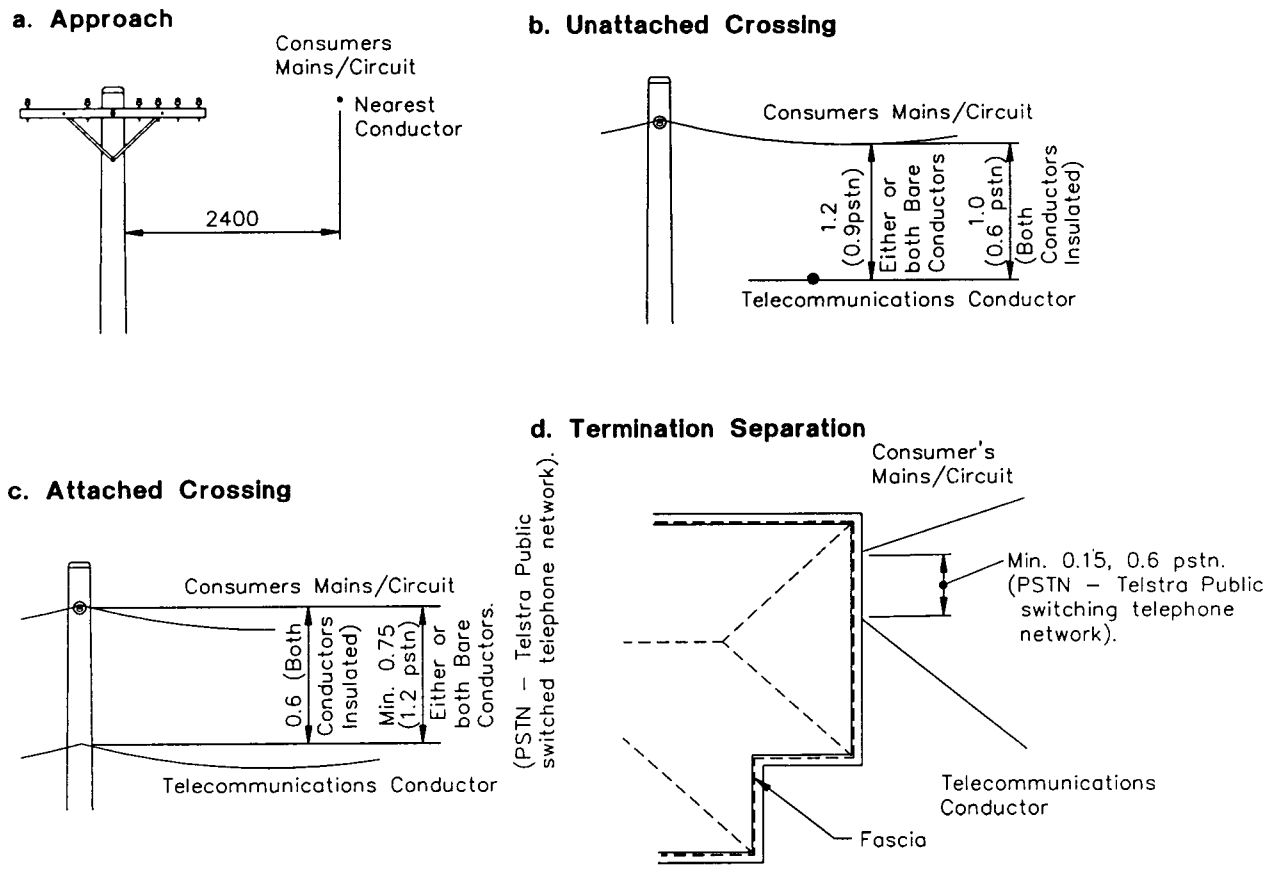


Figure B4 Clearance and Separations from Telecommunication Lines

B3.6.5 Conductor Clearance from Other Electric Power Lines

The requirements for approach or crossings shall be determined by consulting the Responsible Officer. In general, unattached crossing of DistCo lines is not permitted.

Part B3A Cable Type Overhead Electric Lines

B3.7 Structure Types and Deviations Limits

Figures B5 to B7 depicts typical structure types and appropriate deviation limits where the line changes direction. Reference should also be made to Clause B3.4 which specifies the requirements for stays.

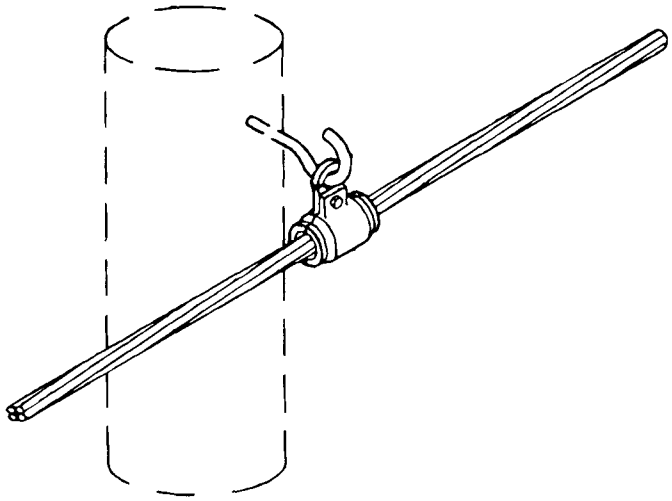


Figure B5 Intermediate and Angle Type 1.
(Where the line changes direction from 0° to 25°)

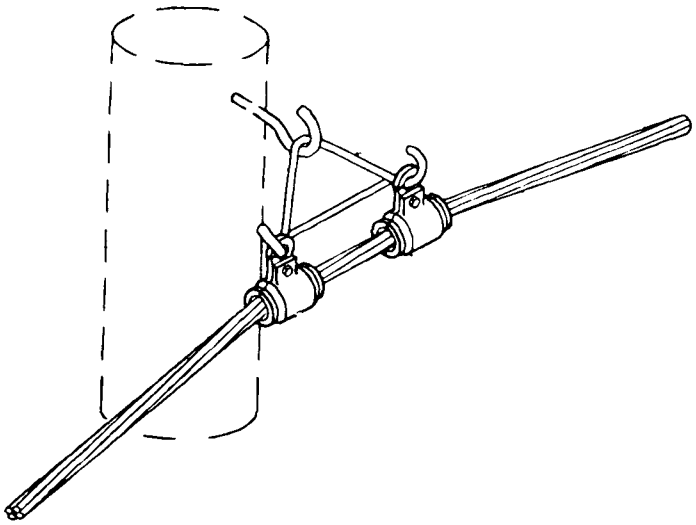


Figure B6 Angle Type 2.
(Where the line changes direction from 0° to 50°)

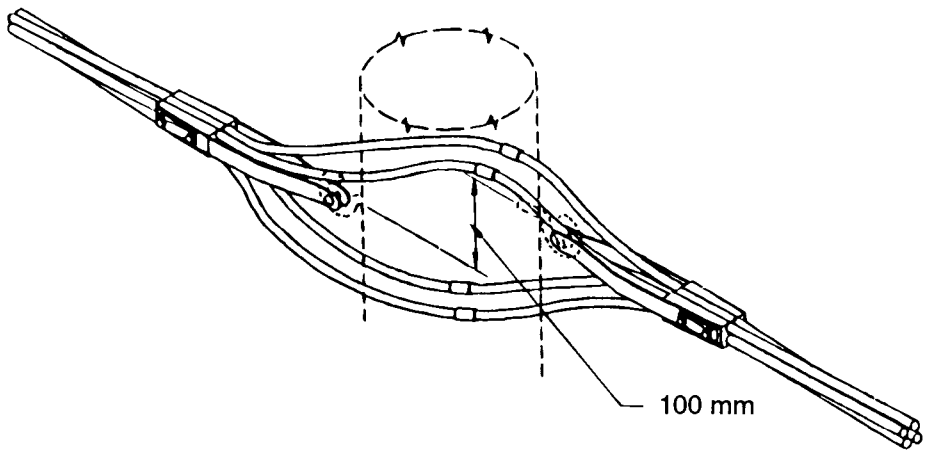


Figure B7 Anchor and Strain. (For changes in tension and/or where the line changes direction from 0° to over 50°)

B3.8 Cable

B3.8.1 Cable and Conductor Types

Aluminium conductor is not permitted in fire prone areas unless it is Low Voltage Aerial Bundled Cable (LVABC) to AS 3560. Copper cables shall comply with AS 3116, AS 3147 or AS 3155.

Note: In areas where birds (particularly members of the parrot family) attack overhead lines, the use of insulated and sheathed neutral screened aerial cable or LV ABC is recommended.

B3.8.2 Conductor Sizes

- The minimum size of copper cable used for ACMs shall be 16 mm^2.
- The minimum size of LV ABC cable used for ACMs shall be 25 mm^2.

Selection of any conductor sizes in terms of length of line and maximum demand of installation shall be calculated in accordance with the Wiring Regulations. Due allowance should be made for future load growth when determining the maximum demand and the permissible voltage drop for each particular case.

B3.8.3 Cable Handling and Straining

Cables shall at all times be handled with care to ensure that no damage is done which might ultimately result in overheating and breaking of conductors in service.

Cable shall be rolled off cable drums and not "flaked off". Care shall be taken to ensure that the conductor is not dragged over rough surfaces and that no severe kinking takes place.

Parallel webbed cable shall be erected with not less than one 360° twist each 5 m of span length.

Cable shall be strained with a rope snotter of appropriate size as shown in Figure B8.

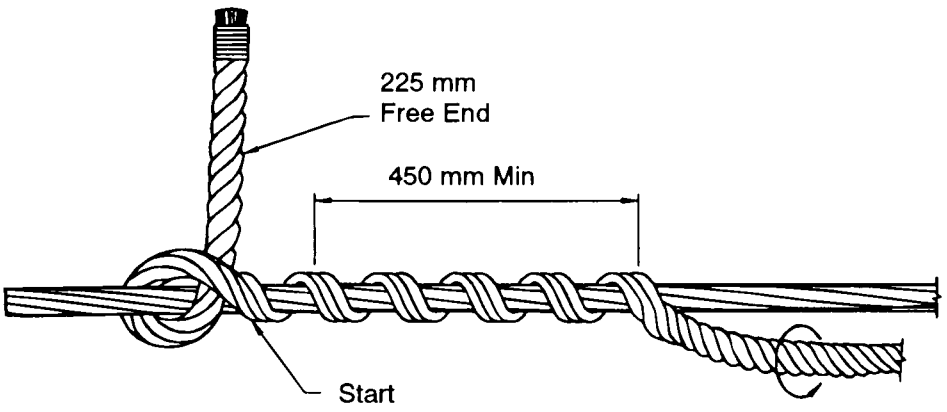


Figure B8 Rope Snotter

B3.8.4 Cable Sagging

Cable shall be sagged to Table B5, Table B6 or Table B7 as appropriate for the type of cable used. Spans must be designed so that after sagging, the cables shall satisfy the clearance requirements as specified in pages B-14 to B-16.

Table B5 Minimum Stringing Sag (m).

Insulated Parallel Webbed and Twisted Copper, Aerial Cable to AS 3147

Cable Type	Standard (2 kN SWL) Bracket			Small (1 kN SWL) Raiser
	Span Length			20 m Span
	15 m	30 m	45 m	
2 x 16 mm^2	0.2	0.4	1.0	0.4
3 x 16 mm^2	0.2	0.5	1.2	0.5
4 x 16 mm^2	0.2	0.7	1.5	0.6
2 x 25 mm^2	0.2	0.7	1.5	0.6
3 x 25 mm^2	0.2	0.8	1.8	0.7
4 x 25 mm^2	0.3	1.0	2.2	0.9
4 x 35 mm^2	0.3	1.4	2.7	1.2

Table B6 Minimum Stringing Sag (m).

Insulated and Sheathed, Neutral Screened, Copper Aerial Cable to AS 3155

Cable Type	Standard (2 kN SWL) Bracket			Small (1 kN SWL) Raiser
	Span Length			20 m Span
	15 m	30 m	45 m	
2 x 16 mm^2	0.2	0.4	1.0	0.4
3 x 16 mm^2	0.2	0.7	1.5	0.6
4 x 16 mm^2	0.3	0.8	1.8	0.7

Table B7 Minimum Stringing Sag (m).

Low Voltage Aerial Bundled Cable to AS 3560

Cable Type	Standard (2 kN SWL) Bracket			Small (1 kN SWL) Raiser
	Span Length			20 m Span
	15 m	30 m	45 m	
2 x 25 mm^2	0.15	0.3	0.85	0.25
3 x 25 mm^2	0.15	0.4	1.05	0.25
4 x 25 mm^2	0.2	0.5	1.25	0.35
4 x 35 mm^2	0.2	0.6	1.5	0.35
4 x 95 mm^2	0.35	1.2	2.8	0.6
4 x 150 mm^2	0.45	1.7	3.8	NA

Notes to Tables B5, B6 and B7 :

- The Sags shown are the **minimum** allowable sags with no electrical load.
- To determine minimum sag for other span lengths, interpolate the values in the tables.
- For other sizes of cable refer to AS 3000.

B3.8.5 Cable Terminations

Cable termination fittings shall be of a type suitable for use with the particular type of cable used.

Termination fittings shall be attached to poles and structures with suitable brackets (Refer to Clause B3.9 - "Structure Types and Deviation Limits").

Cables shall be terminated in the following situations except where otherwise specified or authorised by the Responsible Officer:

- In the case of Aerial Consumer's mains, at the first pole of the line. Such termination shall satisfy the requirements of Clause B1.4.
- At poles where the deviation of the line is greater than 60°.
- At any other point as may be specified by the Responsible Officer.

B3.8.6 Cable Connections

All connections between terminated cables and other conductors shall be made with a suitable overhead line connector, junction box or other approved means.

B3.8.7 Prohibited Joints

Joints shall not be made in cables which are in tension (i.e. mid-span).

Part B3B Open Wire Type Private Overhead Electric Lines (For Maintenance Work Only).

B3.9 Structure Types and Deviation Limits

Open Wire Type Private Overhead Electric Lines construction shall not be used for new construction, however, typical structure types and deviation limits are shown in Figures B9 to B15 for maintenance purposes.

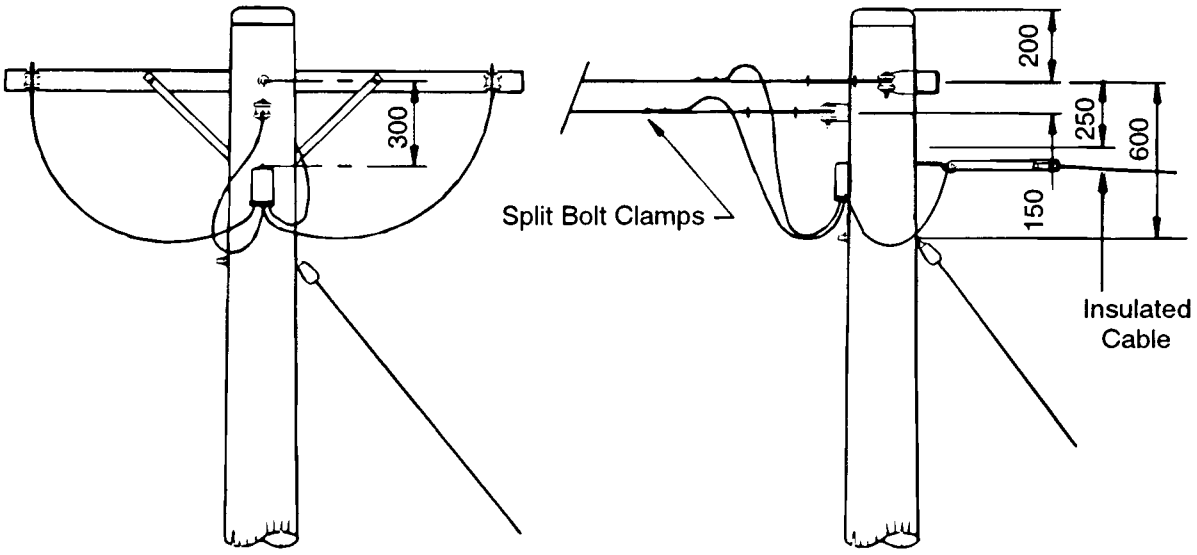
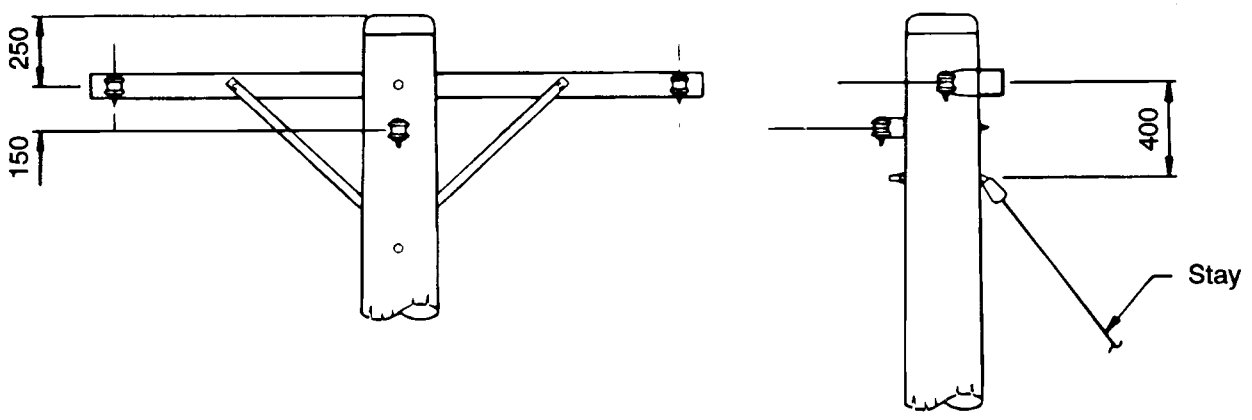
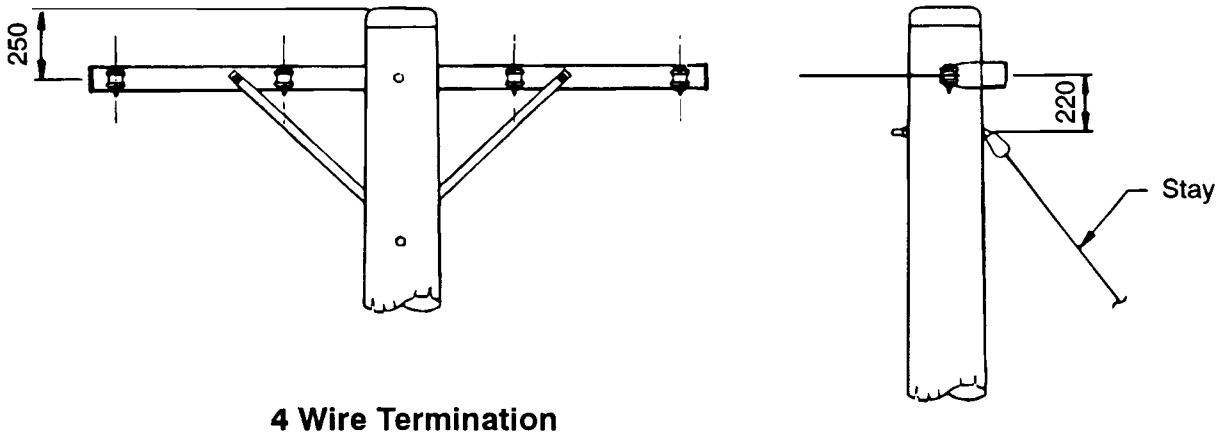


Figure B9 Cable to Open Wire Structure. (Where open wire conductors are terminated and multicore cable is used in the last span to a building or structure)



3 Wire Termination



4 Wire Termination

Figure B10 Open Wire Termination Structures
(Where conductors are terminated)

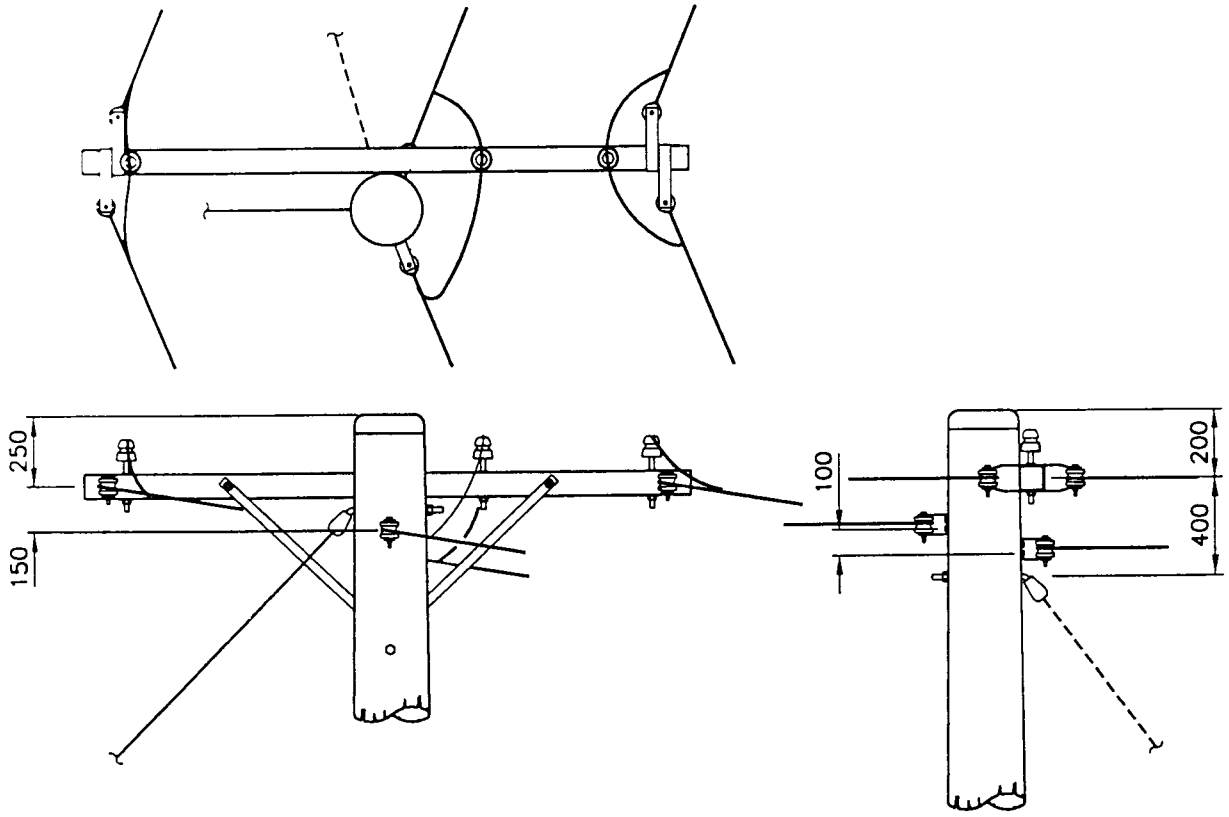
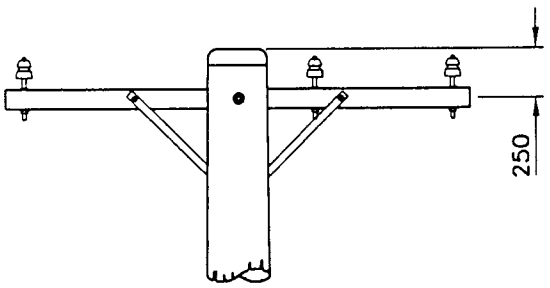
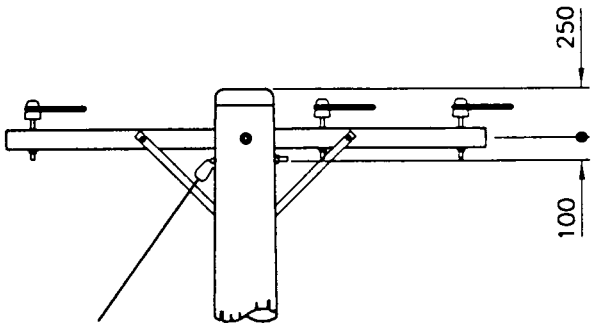


Figure B11 Open Wire Strain Structures
(Where conductors are strained)



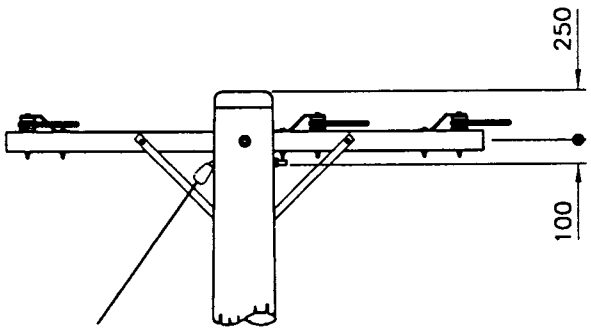
0° - 5° Deviation

Figure B12 Open Wire Intermediate Structures
(Where the line changes direction from 0° to 5°)



5° - 15° Deviation

Figure B13 Open Wire Angle Type 1 Structures
(Where the line changes direction by more than 5° but not more than 15°)



15° - 45° Deviation

Figure B14 Open Wire Angle Type 2 Structures
(Where the line changes direction by more than 15° but not more than 45°)

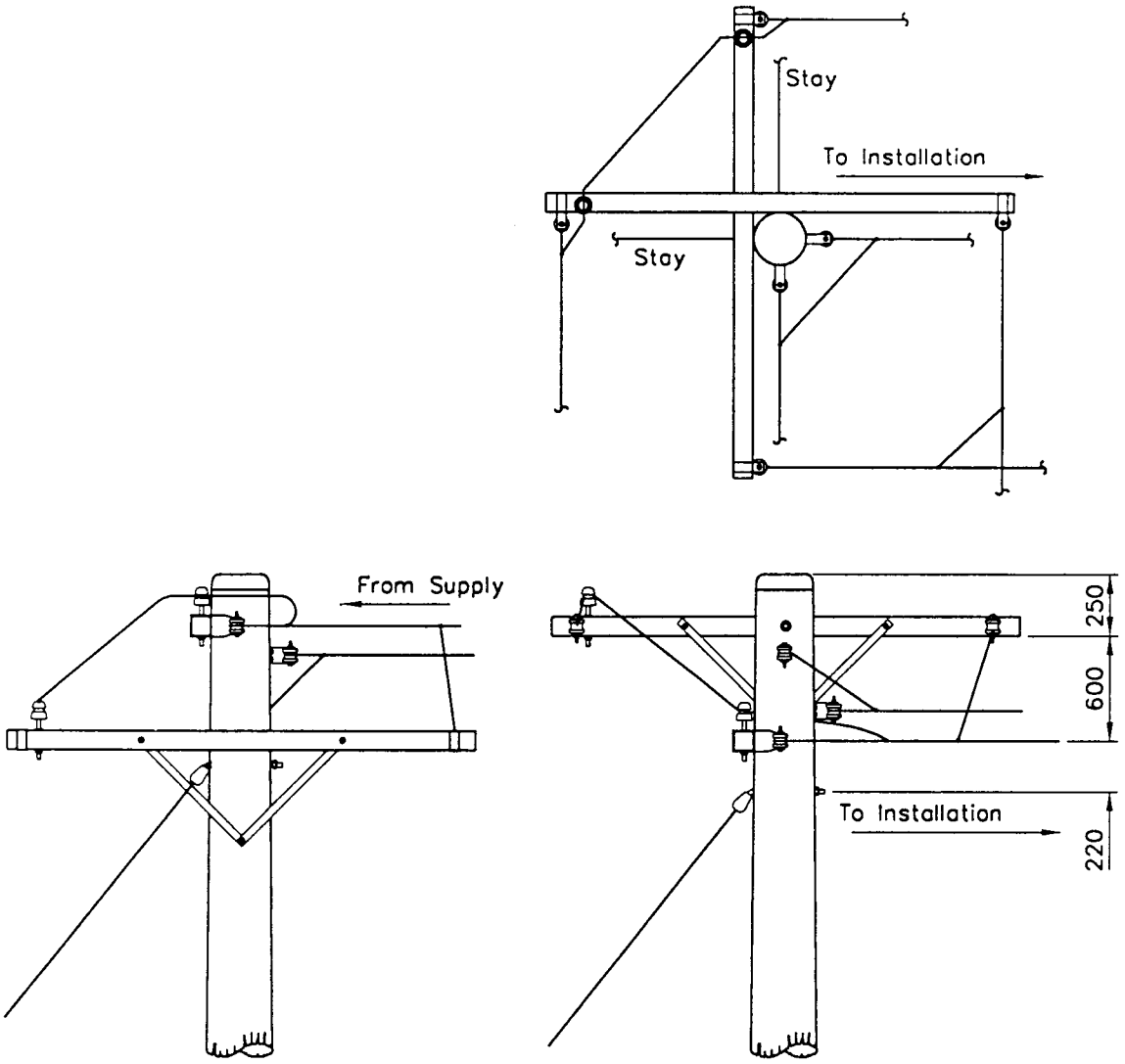


Figure B15 Open Wire Anchor Structures (Where the line changes direction by more than 45°)

Note: In other cases, where the line changes direction, crossarms shall be erected in the bisect of the angle of deviation (i.e. one half of the angle of deviation shall occur on each side of the crossarm).

B3.10 Open Wire Aerial Conductors

B3.10.1 Conductor General

The following general conditions apply to open wire aerial conductors:

- Aluminium conductor is not permitted for new or replacement work;
- Un-insulated (bare) conductors shall not be used for new work;
- Terminating spans must be insulated conductors.

B3.10.2 Conductor Specification

Bare Conductors shall be hard drawn stranded copper complying with AS 1746.

Insulated Conductors shall be either–

- PVC insulated and sheathed cables having the sheath coloured black and comply with AS 3147; or
- insulated cables having insulation coloured black and comply with AS 3198; or
- weatherproof elastomeric insulated cables complying with AS 3116.

B3.10.3 Conductor Handling

Conductors shall at all times be handled with care to ensure that no damage is done which might ultimately result in overheating and breaking of the conductor in service.

Wherever possible, the conductors should be laid out from the back of a vehicle, but where this cannot be done, care should be taken to ensure that the conductor is not dragged over rough surfaces and that no severe kinking takes place. Cables should not be "flaked" off drums.

B3.10.4 Conductor Straining

Bare - For straining bare conductors a rope snotter or any other suitable straining device should be used.

It is desirable that running sheaves be used during stringing to avoid abrasion to the conductor.

Insulated - A rope snotter shall be used when straining insulated conductor as shown in Figure B8.

B3.10.5 Conductor Sagging

Standard Conductors (see Clause B3.10.2) shall be sagged to 1.1 m.

Spans must be designed so that after sagging, the conductors shall satisfy the clearance requirements as specified in Clauses B3.6.1 to B3.6.7 inclusive.

Conductor Clearance from Ground - For the purpose of this Clause, the term "ground" shall include any unroofed elevated area accessible for traffic or resort such as a terrace, sun deck, landing, platform or bridge.

The clearances of conductors from ground at an ambient temperature of 50°C shall not be less than that shown in Table B3. An allowance of 0.2 m shall be made for variation in sag from 15°C to 50°C.

B3.10.6 Conductor Terminations

Except when otherwise specified by the Responsible Officer, conductors shall be mechanically terminated (on the appropriate structure - see Clause B3.9) in the following situation:

- At the first and last poles of the line;
- At poles where uplift of the conductors is unavoidable;
- At any other point as may be specified by the Responsible Officer.

A typical arrangement for conductor termination is shown in Figure B16.

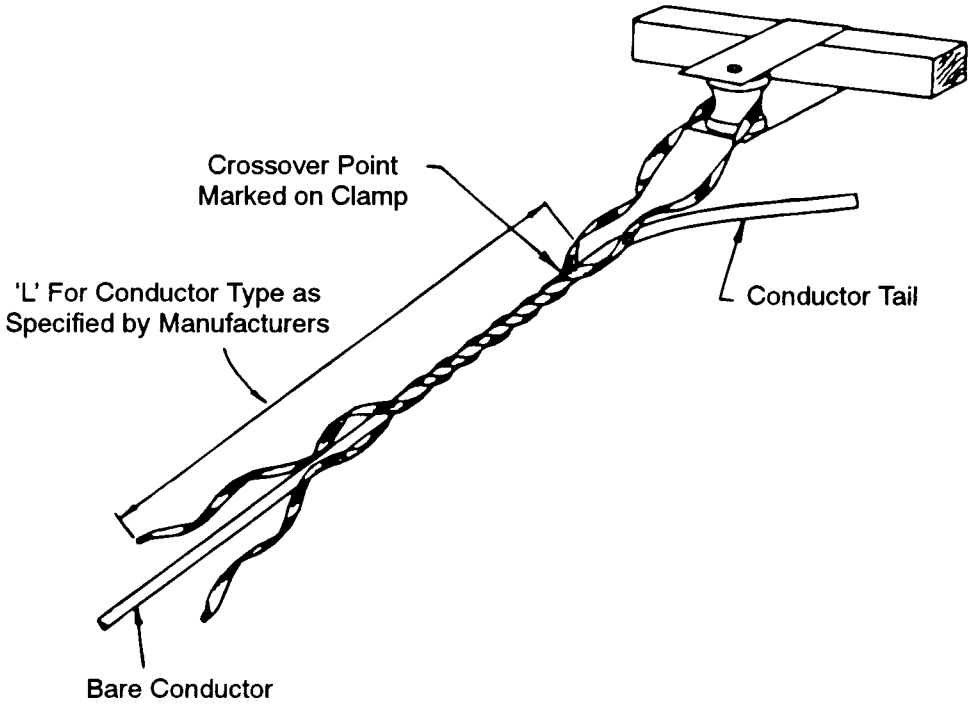


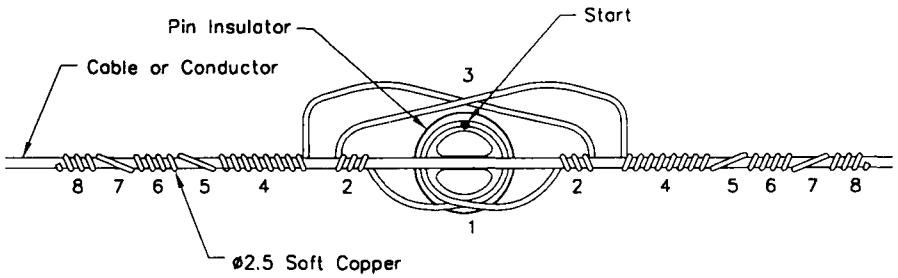
Figure B16 Helical Type Termination Detail

B3.10.7 Mid-Span Joints

Joints in conductors in tension shall be made to the satisfaction of the Responsible Officer.

B3.10.8 Conductor Ties

Conductors shall be tied to insulators as shown in Figures B17 and B18 using 2.5 mm diameter Soft Copper tie wire.

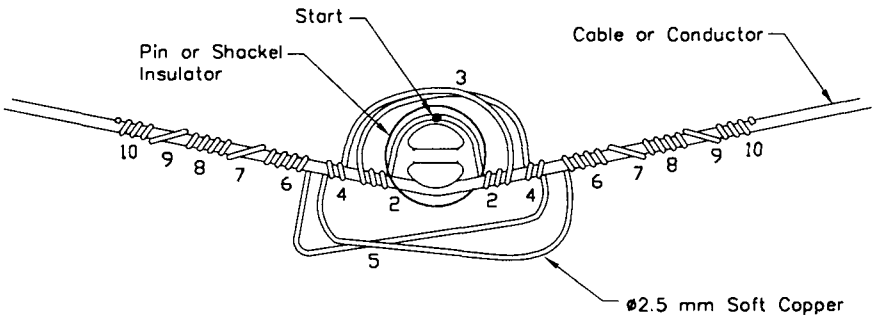


Sequence of Operation

Halve tie, and work with middle of tie at back of insulator

1. Take 1 turn around insulator, passing ends of tie in front of insulator and under conductor on each side of insulator.
2. Take 3 close turns around conductor on each side.
3. Pass ends of tie behind insulator and under conductor on each side. Then around conductor on each side of insulator.Take.
4. 8 Close turns.
5. 1 Open turn.
6. 5 Close turns.
7. 1 Open turn.
8. 3 Close turns.

Figure B17 Tie for Pin Insulator for Maximum Line Deviation - 5°



Sequence of Operation

Halve tie, and work with middle of tie at back of insulator

1. Bring ends of tie around insulator and under conductor on each side.
2. Take 2 close turns around conductor on each side
3. Pass ends of tie around back of insulator and under conductor on each side.
4. Take 2 close turns around conductor on each side.
5. Pass ends of tie in front of insulator and under conductor on each side, Then around conductor on each side of insulator. Take.
6. 4 Close turns
7. 1 open turn
8. 5 Close turns
9. 1 Open turn
10. 3 Close turns

Figure B18 Tie for Shackle Insulator or Pin Insulator for Line Deviation Allowed to Specified Limit

B3.11 Insulators

Insulators shall be of glazed porcelain or annealed glass or of any other material as may be from time to time approved by the DistCo. Porcelain and glass insulators shall comply with the requirements of AS 3608.

Two types of insulators will be required for Open-Wire private construction – pin insulators and shackle insulators.

Insulators shall be fitted to crossarms and poles as shown in Figure B19. Pin Insulators should only be used at intermediate poles where either :–

- there is no deviation of the line: or
- the deviation of the line is not greater than 15°.

Shackle insulators shall be used at all termination poles and at all poles where the deviation of the line is greater than 15°.

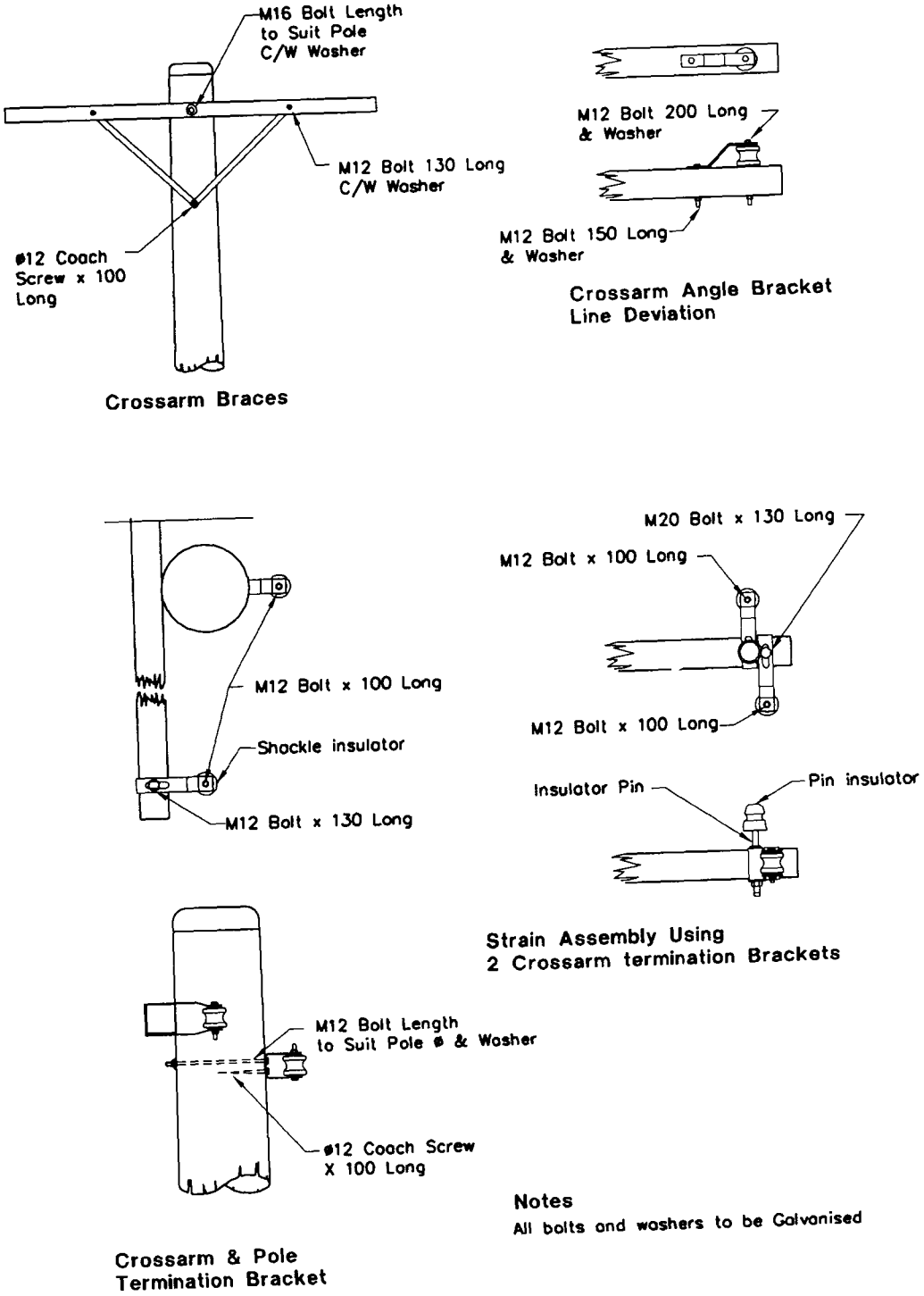


Figure B19 Typical Hardware Installations

B3.11 Insulators

Insulators shall be of glazed porcelain or annealed glass or of any other material as may be from time to time approved by the DistCo. Porcelain and glass insulators shall comply with the requirements of AS 3608.

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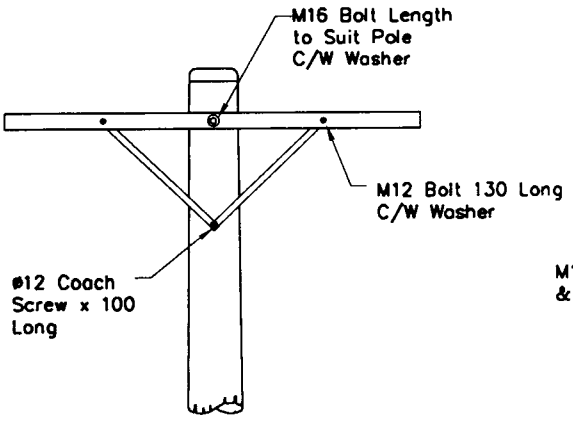
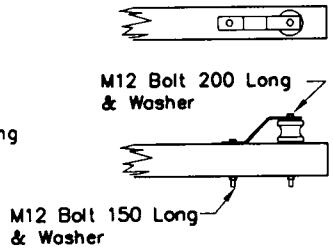
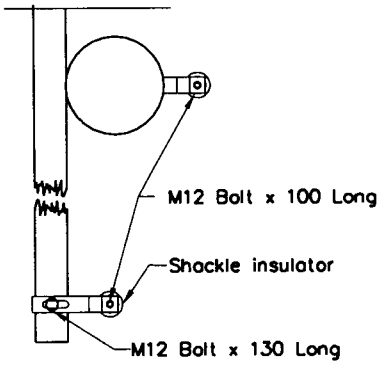
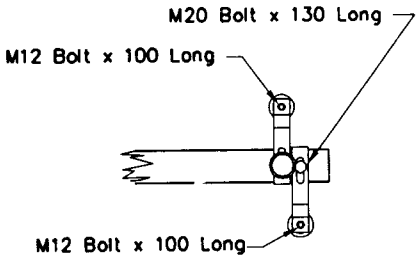


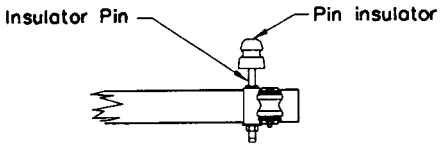
Crossarm Braces



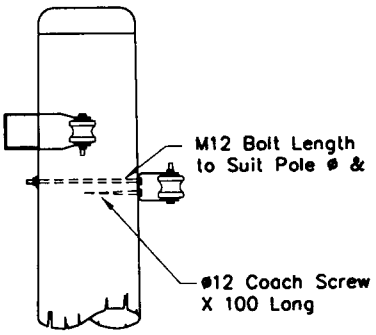
Crossarm Angle Bracket
Line Deviation







Strain Assembly Using
2 Crossarm termination Brackets



Crossarm & Pole
Termination Bracket

Notes

All bolts and washers to be Galvanised

Figure B19 Typical Hardware Installations

B3.12 Crossarms

B3.12.1 Type

Crossarms may be of suitable hardwood, steel or other suitable material. However, where steel or other conductive crossarms are used, they shall be installed in accordance with the Wiring Regulations paying particular attention to earthing requirements.

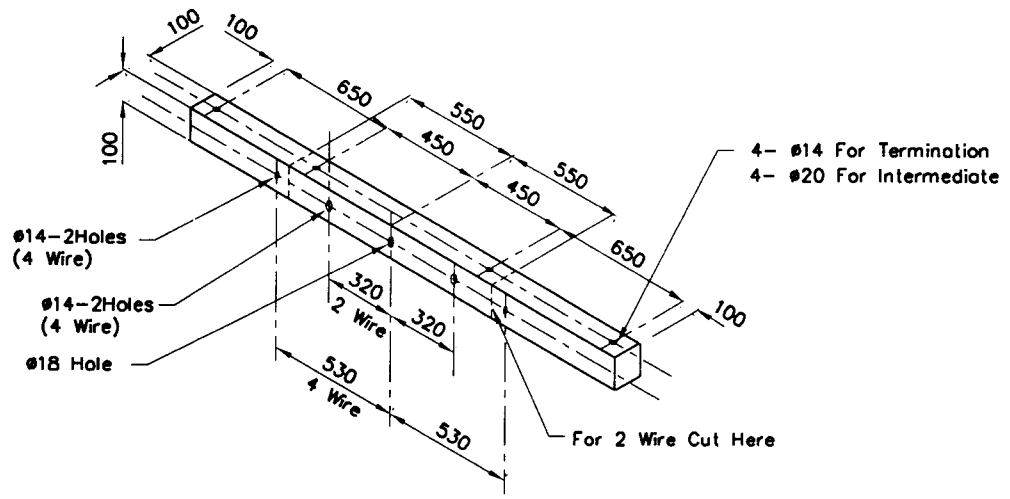
Hardwood crossarms shall have dimensions as shown in Figures B20 and B21. They shall be equipped with two suitable braces and all ferrous metals shall be galvanised or otherwise suitably protected against corrosion.

Crossarms, other than of hardwood, shall be of suitable durability and of at least equivalent strength to hardwood crossarms.

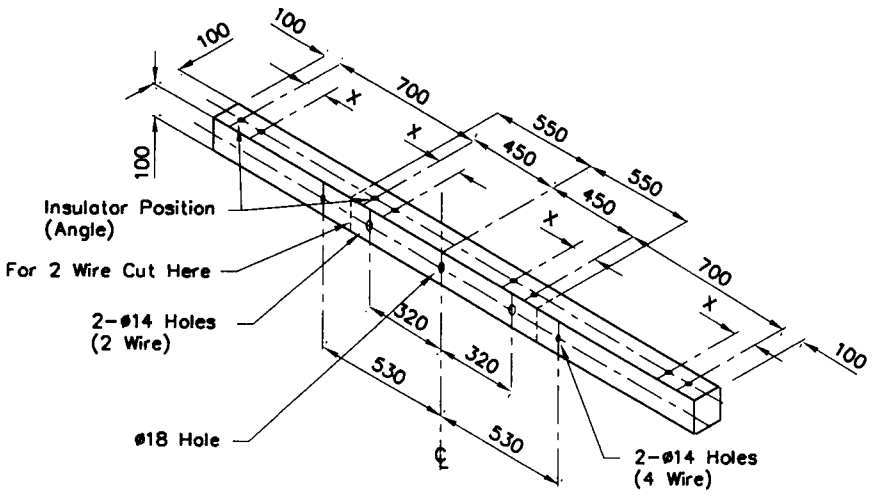
B3.12.2 Construction

Crossarms shall be drilled to provide a minimum of 600 mm spacing between conductors under all conditions of sag and sway. Figures B20 and B21 show suitable drillings for hardwood crossarms.

Crossarms shall be fitted to all poles as shown in Figures B9 to B15. Before fitting, a joggle or scarf shall be cut to a depth of about 20 mm into the true wood of the pole, and this joggle and all associated hardware shall be liberally coated with Timber Preservative Compound or a suitable class of chassis grease before fitting.



Termination or intermediate - 0° to 15° Deviation



Strain or Angle-15° to 45° Deviation.

X For Angle = 180

X For Strain = 50

Figure B20 2 or 4 Wire Crossarm Detail

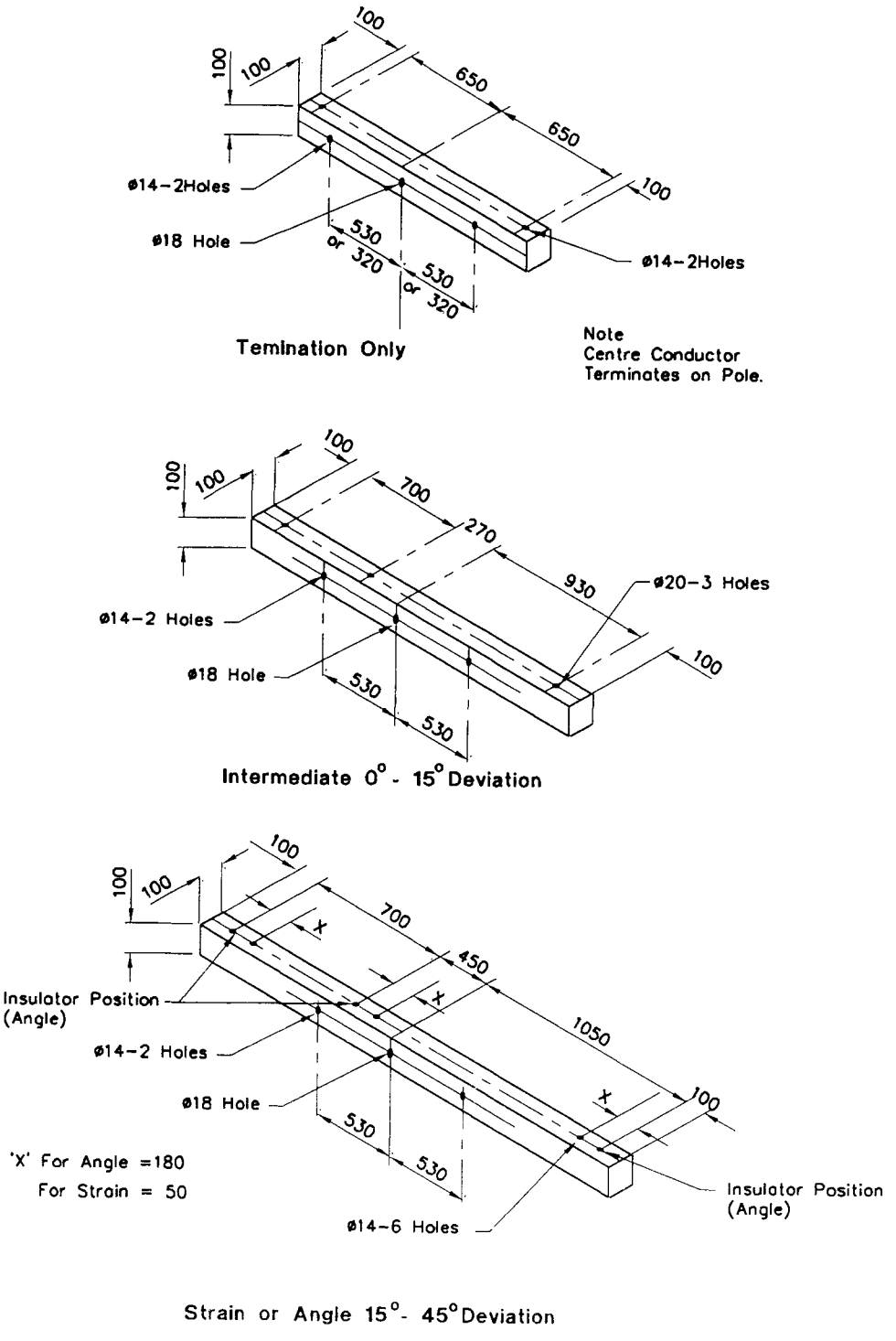


Figure B21 3 Wire Crossarm Detail

Polarity Testing Guide for Supply to Electrical Installations

Reference may be made to AS 3017 "Electrical Installations – Testing Guidelines"

Important

The LEM in charge is responsible to ensure that all supply connections and polarities are correct after carrying out wiring work in any installation

The installation must meet the minimum insulation resistance required by the Wiring Regulations before applying the following tests:

Polarity **MUST NOT** be determined by using the earthing system or water pipes of an installation – ***an Independent Earth must be used.***

Note: If supply polarity is reversed on the supply side of an M.E.N. connection, a test at a G.P.O. (only) would not reveal the reversed polarity because the neutral and earth conductors would both be "alive". For this reason ***an Independent Earth Spike must be used.***

Object of Tests	**Notes**
1. To prove correct supply polarity. 2. To prove neutral conductors are continuous and connected to the supply neutral at all points.	For electrical safety – to ensure neutral bars, earth wires, water pipes and appliance frames do not become "alive".
Neutral Identification Identify all neutral connections by marking clearly.	Mark connections of neutrals on junction boxes, crossarms, bars, links etc.
Equipment Required Flexible single core insulated conductor. Independent Earth Spike. Voltage Indicator (suitable neon tube tester).	(of adequate length) (May be a 150 mm long non-insulated screwdriver) The only voltage indicators used for polarity testing should be those which do not pass a dangerous value of current.
Method of Use Push the independent earth spike as far into the ground as it will go. Connect the flexible insulated conductor to the independent earth spike and to the voltage indicator.	Keep the independent earth spike **at least 2m** clear of water pipes and earthing conductors/ electrodes.

Conduct Tests as Follows:	
Take adequate precautions to prevent electric shock. Have persons stand clear of metallic parts and appliances during tests. Prove the tester on a live active to ensure it is working.	To avoid persons receiving a shock if an incorrect connection has been made. A defective tester would not indicate a live conductor.
To prove all conductors are isolated from the supply. Test from independent earth spike to all conductors and test between conductors on load side of isolation point. **NO VOLTS - CORRECT**	To prove all poles are isolated from the supply.
To restore supply after wiring work/repairs. **At (each) Switchboard:** Prepare the supply conductors for testing by placing the (main) switch/es in the **OPEN** position. Disconnect the incoming neutral and (main) earth from the neutral bar or link. Ensure that neutral and earth ***do not*** touch bars or each other.	Remove circuit fuses or open MCB[s] to isolate load.
Visually check all connections before closing the supply.	The L.E.M. in charge should visually check neutral markings and that all connections are correct ***before*** making conductors alive.
Close the supply and - ***At each switchboard*** 1 Test from independent earth to line side active/s. **240 VOLTS - CORRECT** 2 Test from independent earth to incoming neutral. **NO VOLTS - CORRECT** 3 Test from independent earth to main earth. **NO VOLTS - CORRECT** 4 Test from active/s to incoming neutral. **240 VOLTS - CORRECT** **Check** polyphase supply between actives. **415 or 480 VOLTS - CORRECT**	
With the supply (main) switch/es in the **OPEN** position, reconnect incoming neutral to bar.	To avoid the neutral bar being activated via load in installation.
CLOSE incoming supply and apply a load using equipment which does not require earthing. ***-correct operation of equipment OK***	To prove that neutral is continuous and not an open circuit.

Ensure Main Switch/es are **OPEN** and **CONNECT MAIN EARTH TO NEUTRAL BAR (WHERE REQUIRED).** Test from independent earth to neutral bar. **NO VOLTS - CORRECT**	M.E.N. connections must be made at Main switchboard and any distribution board where the neutral sub-main is used as an earth bonding conductor
Close Main Switch/es and **CHECK** direction of rotation of three -phase equipment if any.	To avoid damage to machinery.

SUMMARY

PURPOSE

1. **To prove correct polarity.**
2. **To prove neutral conductors are continuous and connected to neutral of the supply.**

1. **VISUALLY CHECK** the neutral connections and markings are correct.
2. **TEST** from an independent earth spike to an active.

   240 VOLTS - CORRECT
3. **TEST** from an independent earth spike to a neutral.

   NO VOLTS - CORRECT
4. **TEST** from an independent earth to a main earth.

   NO VOLTS - CORRECT
5. **TEST** between active/s and neutral

   240 VOLTS - CORRECT

Carry out the above tests at (each) switchboard and on the supply conductors.

6. **PROVE** neutral/s can carry load current
7. Restore all connections and TEST from an independent earth to a M.E.N. connection.

   NO VOLTS - CORRECT

NOTE:

Always use an independent earth spike for these tests.

Quality of Supply

The Quality of Supply is affected by the presence of power disturbances. The allowable limits for power disturbances in your electricity supply and those generated by your equipment are specified by the Australian Standard 2279.1, .2, .3 & .4.

Typical causes of power disturbances may include or be caused by any of the following:

- Non Linear Load Control (e.g. variable speed motors)
- Gas discharge lighting
- Welders and arc furnaces
- Load switching
- Motor starting
- Faulty circuit connection
- Incorrect earthing practice
- Poor power factor
- Excessive voltage drop in circuit wiring

Solutions which could be introduced to reduce or eliminate power disturbances from within a customer's installation are:-

- Line filters and surge suppressors
- Isolation transformers
- Voltage regulators
- Power conditioners
- Un-interruptable power supplies (UPS)

Note:

Before implementing any such solutions, it is necessary to identify the type, frequency, magnitude and source of power disturbance.

Australian Standards

List of Australian Standards called up in the Service and Installation Rules -

AS 1026 - Impregnated paper insulated cables for electricity supply at working voltages up to and including 33 kV

AS 1033 - High voltage fuses (for rated voltages exceeding 1000 V)

AS 1074 - Steel tubes and tubulars for ordinary service

AS 1104 - Informative symbols for use on electrical and electronic equipment

AS 1243 - Voltage transformers for measurement and protection

AS 1329 - Methods for the analysis of zinc and zinc alloys

AS 1359 - Rotating electrical machines - General requirements

AS 1397 - Steel sheet and strip - Hot-dipped zinc-coated or aluminium/zinc coated

AS 1429.1 - Electric cables - Polymeric insulated

AS 1554 - Structural steel welding (known as the SAA Structural Steel Welding Code)

AS 1554.1 - Welding of steel structures

AS 1650 - Hot-dipped galvanized coatings on ferrous articles

AS 1675 - Current transformers - Measurement and protection

AS 1746 - Conductors - Bare overhead - Hard - drawn copper

AS 1795 - Sheets and boards for electrical purposes

AS 1824 - Insulation co-ordination (phase to earth and phase to phase, above 1 kV)

AS 1939 - Degrees of protection provided by enclosures for electrical equipment (IP Code)

AS 1977 - Flexible insulating sleeving for electrical purposes

AS 2005 - Low voltage fuses - Fuses with enclosed fuse-links

AS 2006 - High voltage a.c. switchgear and control gear - circuit breakers for rated voltages above 1000 V

AS 2053 - Non-metallic conduits and fittings

AS 2067 - Switchgear assemblies and ancillary equipment for alternating voltages above 1 kV

AS 2086 - High Voltage a.c. switchgear and control gear - metal enclosed - rated voltages above 1 kV up to and including 72.5 kV

AS 2209 - Timber Poles for overhead lines

AS 2279 - Disturbances in mains supply networks

AS 2374 - Power transformers

AS 2430 - Classification of Hazardous Areas

AS 2481 - All-or-nothing electrical relays (instantaneous and timing relays).

AS 3000 - Electrical installations - Buildings, structures and premises (known as the SAA Wiring Rules)

AS 3001 - Electrical installations - Movable premises (including caravans) and their site installations

AS 3010 - Electrical installations - Supply by generating set

AS 3012 - Electrical installations - Construction and demolition sites

AS 3017 - Electrical installations - Testing Guidelines

AS 3100 - Approval and test specification - General requirements for electrical equipment

AS 3116 - Approval and test specification - Electric cables - Elastomer insulated - For working voltages up to and including 0.6/1 kV

AS 3147 - Approval and test specification - Electric cables - Thermoplastic insulated for working voltages up to and including 0.6/1 kV

AS 3155 - Approval and test specification - Neutral screened cables for working voltages of 0.6/1 kV

AS 3187 - Approval and test specification - Mineral Insulated Metal Sheathed cables

AS 3198 - Approval and test specification - Electric cables - XLPE insulated - For working voltages up to and including 0.6/1 kV

AS 3560 - Electric cables - XLPE insulated - Aerial bundled - For working voltages up to and including 0.6/ 1kV

AS 3600 - Concrete structures

AS 3608 - Insulators - Porcelain and glass, pin and shackle type - Voltages not exceeding 1000 V a.c.

AS 3609 - Insulators - Porcelain stay type - Voltages greater than 1000 V a.c.

Note:—The Australian Standards referred to above shall be taken to be the latest revision, including amendments at the time of carrying out the installation.