



SERVICE & INSTALLATION RULES FOR CONNECTION TO THE ELECTRICITY DISTRIBUTION NETWORK

INCLUDING

APPENDICES

Authorised when accessed at www.actewagl.com.au

(WHEN PRINTED THIS DOCUMENT IS UNCONTROLLED)

Note: User must be connected to the Internet to view linked drawings

SERVICE AND INSTALLATION RULES

CONTENTS

SERVICE AND INSTALLATION RULES..... 2

1 INTRODUCTORY INFORMATION 9

1.1	Standard Customer Contracts.....	9
1.2	Area of the Distribution Network	9
1.3	Application of the Service and Installation Rules	9
1.4	Charges for Supply of Electricity	9
1.5	Network Charges.....	9
1.6	Application for Connection to the Electricity Network	10
1.7	Warning Against Premature Expenditure.....	10
1.8	Necessity for Employing a Licensed Person.....	10
1.9	Compliance with the Wiring Rules	10
1.10	Connection of Installations Following Completion of Wiring Work.....	11
1.11	Connection of Alterations and Additions	11
1.12	Interference and Damage to ActewAGL's Equipment.....	11
1.13	Alternative Connection Arrangements	11
1.14	Correspondence.....	11

2 GENERAL REQUIREMENTS 12

2.1	Scope and Disclaimer	12
2.2	Definitions.....	12
2.3	Exceptional Circumstances.....	13
2.4	Agreement to Pay Charges.....	13
2.5	Failure to Comply With The Service and Installation Rules	13

3 SUPPLY ARRANGEMENTS..... 14

3.1	System of Supply	14
3.2	System Earthing	14
3.3	Prospective Fault Current	14
3.4	Number of Services.....	15
3.5	Special or Additional Services.....	15
3.6	Segregation of Supplies	15
3.7	Temporary Installation.....	15
3.8	Sources of Alternative Supply	15
3.9	ActewAGL's Substations on Customer's Premises.....	16
3.9.1	Method	16
3.9.2	Accommodation.....	16
3.9.3	Extension of High Voltage Mains	16
3.9.4	Location of Main Switchboard	16
3.9.5	Use of Equipment.....	16
3.10	Determination of Number of Phases of Low Voltage Supply	17
3.11	Balancing of the Installation	17
3.11.1	General.....	17
3.11.2	Water Heaters (Instantaneous Type).....	18
3.11.3	Cooking Ranges.....	18

4 PROVISIONS FOR SERVICE EQUIPMENT..... 19

4.1	General Requirements	19
4.2	Connection to the Premises	19
4.2.1	Aerial Service Lines.....	19
4.2.2	Clearance of Service Lines	19
4.2.3	Underground Service Cables	19
4.2.4	Connections to Service Equipment.....	20
4.2.5	Charges Applicable	20
4.3	Facilities for Installation of Meters and other Service Equipment	20
4.3.1	Installations Suitable for Use of the Standard Meter Box Panel	20
4.3.2	Installations Not Suitable for Use of the Standard Meter Box Panel	21
4.3.3	Communications Equipment	21
4.3.4	Alterations and Additions	21
4.4	Location of Service Equipment	22
4.5	Accessibility of Service Equipment	23
4.5.1	Metering Equipment and Service Fuses	23
4.5.2	Point of Attachment.....	23
4.6	Spacing Between Meters and Current Carrying Conductors.....	24
4.6.1	Multi-Core Cables and Bunched Single-Core Cables.....	24
4.6.2	Spaced Single-Core Cables, Busways or Busbars	24
4.6.3	Shielding.....	24
4.6.4	Special Cases	25
4.7	Fixing to Wall Structure	25
4.8	Protection of ActewAGL's Equipment	25
4.9	Load Control Equipment	25

5 CUSTOMER'S INSTALLATIONS 26

5.1	Facilities Associated with Metering	26
5.1.1	General.....	26
5.1.2	Protection of Meters Against Short Circuit	26
5.1.3	Connections and Links	26
5.1.4	Sealing	26
5.1.5	Labelling.....	26
5.2	Limitations on Connection and Operation of Equipment.....	27
5.2.1	Interference with Supply to Other Customers	27
5.2.1.1	General Equipment	27
5.2.1.2	Motors	29
5.2.1.3	Equipment Requiring Special Consideration	29
5.2.1.4	Conditional Approval.....	29
5.3	Customers Installations	30
5.3.1	Consumers Mains	30
5.3.2	Main Switchboards and Meter Panels.....	30
5.4	Earthing	30
5.5	Connection to Alternative Supply Sources.....	30
5.6	Power Factor	30
5.6.1	General.....	30
5.6.2	Luminous Discharge Tubes and Fluorescent Lighting Units (Other than Single Dwelling Domestic Installations)	31
5.7	High Voltage Installations.....	31

APPENDIX A1 CUSTOMER SUPPLY PROCEDURES..... 32

1.	SCOPE.....	32
2.	ENQUIRIES	32
3.	APPLICATION TO CONNECT TO THE NETWORK AND NOTIFICATION OF WIRING	32
4.	PROVISION TO BE MADE FOR SERVICE EQUIPMENT.....	33
5.	CONNECTION TO THE NETWORK	33
6.	SERVICING APPOINTMENTS.....	33
7.	WORK OUTSIDE NORMAL WORKING HOURS	33

8.	SEPARATION OF SUPPLY	34
9.	INSTALLATION DEFECT FEE	34

APPENDIX A2 DOMESTIC ELECTRICAL INSTALLATIONS 35

1	SCOPE.....	35
2	COMPONENT PARTS OF A DOMESTIC INSTALLATION	35
2.1	Overhead Service.....	35
2.2	Underground Service	35
2.3	Point of Attachment.....	35
2.4	Consumers Terminals	36
2.5	Consumers Mains	36
2.6	Main Switchboard and Meter Panel	36
3	WORK ON CUSTOMER INSTALLATIONS.....	36

APPENDIX A3 PROVISION FOR SERVICE EQUIPMENT IN SINGLE DOMESTIC AND SMALL INSTALLATIONS..... 37

1	SCOPE.....	37
2	GENERAL REQUIREMENTS.....	37
3	CONNECTION TO THE PREMISES	37
3.1	Aerial Service Lines.....	37
3.2	Underground Service Cables	37
3.3	Connections at Service Equipment.....	37
4	FACILITIES FOR INSTALLATION OF METERS AND OTHER EQUIPMENT	38
4.1	Standard Panel and Meter Box	38
4.2	Wiring	39
4.3	Fixings	39
4.4	Protection from Weather etc.	39
4.5	Accessibility.....	39
5	SEALING OF CUSTOMER'S EQUIPMENT	39
6	SMALL INSTALLATIONS OTHER THAN SINGLE DOMESTIC	39
7	DRAWINGS	39

APPENDIX A4 PROVISION FOR SERVICE EQUIPMENT IN MULTIPLE OCCUPANCY INSTALLATIONS 40

1	SCOPE.....	40
2	GENERAL REQUIREMENTS.....	40
3	CONNECTION TO THE PREMISES	40
3.1	Aerial Service Lines.....	40
3.2	Underground Service Cables	40
4	SERVICE FUSES AND NEUTRAL BAR	41
4.1	Installation	41
4.2	Accessibility and Protection	41
4.3	Connections at Service Fuses and Neutral Bars	41
4.3.2	General.....	41
4.3.2	Services not exceeding 100A Rating	42
4.3.3	Services exceeding 100A Rating	42
5	METERS	42
5.1	Installation	42
5.2	Grouping.....	42
5.3	Accessibility.....	43
5.4	Protection from Weather, Mechanical Damage and Corrosive Atmospheres	43
5.5	Mounting Provisions	43
5.6	Wiring	43
5.7	Protection Against Short Circuit	43
5.7.1	Services not exceeding 100A.....	43
5.7.2	Services exceeding 100A.....	44

5.7.3	Sub-mains to separate occupancies	44
6	SEALING OF UNMETERED EQUIPMENT	44
7	SPACING BETWEEN METERS & CURRENT CARRYING CONDUCTORS	44
8	LABELLING	44
9	DRAWINGS	44

APPENDIX A5 OFF PEAK SUPPLY 45

1	SCOPE	45
2	CONDITIONS FOR CONNECTION TO THE ELECTRICITY NETWORK	45
3	SUPPLEMENTARY INFORMATION	45
3.1	Definitions	45
3.1.1	Storage Water Heater	45
3.1.2	Thermal Storage Space Heater	45
4	CONTROL OF OFF PEAK INSTALLATIONS	45
5	OTHER HEATING SOURCES	45
6	SWIMMING POOLS AND SPA POOLS	46
7	REPLACEMENT OF WATER HEATERS	46
8	CHANGE-OVER SWITCHING	46
9	REQUIREMENTS FOR INSTALLATION OF A CONTACTOR AND MINIMUM SIZE OF CONDUCTORS	46
10	CALCULATION OF MAXIMUM DEMAND FOR OFF-PEAK CHARGES IN A DOMESTIC INSTALLATION	46
11	DRAWINGS	47

APPENDIX A6 CURRENT TRANSFORMER METERING 48

1	SCOPE	48
2	GENERAL	48
3	FACILITIES REQUIRED FOR INSTALLATION OF METERS	48
3.1	CT Metering Panel	48
3.2	Location and Access Requirements	48
4	FACILITIES REQUIRED FOR INSTALLATION OF CURRENT TRANSFORMERS	49
4.1	General	49
4.2	Circuit Location	49
4.3	Location and Access Requirements	49
4.4	Safety Screen	49
4.5	Doors	50
4.6	Identification	50
4.7	Locking	50
4.8	Mountings	50
4.9	Primary Conductors	50
5	FACILITIES REQUIRED FOR THE CONNECTION OF METERING EQUIPMENT	51
5.1	General	51
5.2	Identification of conductors	51
5.3	Current Circuit Wiring	51
5.4	Potential Circuit Wiring	51
5.5	Protective Enclosure	52
5.6	Earthing Connection	52
6	FURTHER INFORMATION	52
7	DRAWINGS	52

APPENDIX A7 TEMPORARY INSTALLATIONS 53

1	SCOPE	53
2	GENERAL	53
2.1	Warning Against Premature Expenditure	53
2.2	Connection of Temporary Installations	53
3	TEMPORARY INSTALLATION ARRANGEMENTS	54
3.1	Customers Installations	54

3.2	Earthing	54
3.3	Mounting of Switchboards	54
4	METHOD OF CONNECTION	54
4.1	Overhead Connection	54
4.2	Underground Connection for Domestic Installations.....	54
4.3	Underground Connection for Commercial Installations	55
5	SHOWS, CARNIVALS AND TENTS	55
6	DRAWINGS	55

APPENDIX A8 UNDERGROUND SUPPLY TO SINGLE DOMESTIC AND SMALL INSTALLATIONS..... 56

1	SCOPE.....	56
2	GENERAL	56
3	INSTALLATION OF CONDUIT FOR SERVICE CABLE	56
3.1	Type and Size	56
3.2	Laying of Conduit	56
3.3	Bend Limitations	57
3.4	Joints	57
3.5	Draw Wire.....	57
3.6	Drainage of Conduit	57
3.7	Sealing	58
3.8	Trench Inspections.....	58
4	PROVISION FOR OTHER SERVICES	58
5	DRAWINGS	58

APPENDIX A9 UNDERGROUND SUPPLY TO INSTALLATIONS WITH DEMANDS EXCEEDING 100 AMPS PER PHASE 59

1	SCOPE.....	59
2	GENERAL	59
3	INSTALLATION OF CONDUIT FOR SERVICE CABLE	59
3.1	Type and Size	59
3.2	Laying of Conduit	60
3.3	Bend Limitations	60
3.4	Joints	60
3.5	Draw Wire.....	60
3.6	Drainage of Conduit	60
3.7	Sealing	61
3.8	Termination of Conduit.....	61
4	INSTALLATION OF A SERVICE CABLE TO A POINT OF ENTRY CUBICLE.....	61
4.1	General.....	61
4.2	Point of Entry Cubicle.....	61
5	CONSUMERS MAINS	61
5.1	Copper Conductor.....	61
5.2	Aluminium Conductor	62
5.3	Mineral Insulated Metal Sheathed Cable	62
6	PROVISION FOR OTHER SERVICES	62
7	DRAWINGS	62

APPENDIX A10 DUAL OCCUPANCY OF RESIDENTIAL LEASES .. 63

1	SCOPE.....	63
2	GENERAL	63
3	SINGLE SERVICE	63
4	SEPARATE SERVICES.....	63
5	CONNECTION TO THE PREMISES	64
6	METERING	64
7	DRAWINGS	64

APPENDIX A11 SMALL SCALE PARALLEL CUSTOMER GENERATION VIA INVERTERS 65

1	SCOPE.....	65
2	GENERAL.....	65
3	APPROVALS	65
4	METERING	66
5	WIRING.....	66
6	CONNECTION TO THE INSTALLATION.....	66
7	PROTECTION	67
7.1	Islanding	67
7.2	Active Protection (Anti Islanding)	67
7.3	Passive Protection.....	67
7.4	Security of Protection Settings	68
7.5	Isolation Time	68
7.6	Disconnection.....	68
7.7	Automatic Reconnection	68
8	FUNCTIONAL IN-SERVICE TESTING OF INVERTER PROTECTION SYSTEMS	69
8.1	Installation Testing	69
8.2	Re-verification Testing.....	69
8.3	Recommended Anti-Islanding Test Procedure	69
9	LABELLING	70
10	DRAWINGS.....	71

APPENDIX A12 INSTALLATION OF POWER FACTOR CORRECTION CAPACITORS AT CUSTOMERS INSTALLATIONS .. 72

1	SCOPE.....	72
2	BACKGROUND	72
3	ActewAGL REQUIREMENTS	72
3.1	Power Factor	72
3.2	Compliance with Relevant standards.....	72
3.3	Switching Steps.....	73
3.4	Resonance Mitigation.....	73
3.5	Fault Isolation	73
3.6	Switchgear.....	73
3.7	Isolation	73
3.8	Discharge of Capacitors.....	73
3.9	Avoidance of Back Generation.....	74
3.10	Star Point Earthing	74
4	APPROVALS	74

APPENDIX A 13 SHORT TIME CONNECTION OF GENERATORS IN PARALLEL WITH THE ActewAGL LV NETWORK 76

1	SCOPE.....	76
2	GENERAL.....	76
3	APPROVALS	76
4	ActewAGL REQUIREMENTS	76
4.1	Documentation	76
4.2	Duration of Parallel Operation.....	76
4.3	Interlocking	77
4.4	Export of Power.....	77
4.5	Transfer Arrangements	77
4.6	Connection Arrangements	77
4.7	Labelling.....	78
5	TESTING AND COMMISSIONING.....	78

INDEX OF DRAWINGS

<u>8911-1211-107</u>	Typical Wiring Diagram for 1 Phase Electronic Meter with Off Peak Load up to 30A
<u>8911-1211-111</u>	Typical Wiring Diagram for 1 or 3 Phase Meters with Off Peak Load greater than 30 Amp
<u>8911-1211-113</u>	Typical Wiring Diagram 3 Phase Off Peak with Boost Switch
<u>8911-1213-101</u>	Diagram of Connections to Current Transformers Kilowatthour Polyhase Meter Test Links & Potential Fuses
<u>8911-2211-101</u>	Standard Switchboard Arrangement Domestic & Off Peak Tariff
<u>8911-2213-101</u>	Specifications for Current Transformers
<u>8911-307</u>	Metering Cubicle for Current Transformer Metering up to 600/5CTs
<u>8911-308</u>	Typical Metering Cubicle for Multi-Installation
<u>8911-312</u>	Typical Standard Meter Box (Minimum Requirements)
<u>8911-313</u>	Meterbox for Installation with 50mm ² Underground Service Cable
<u>8911-321</u>	Permissible Meter Locations Domestic Installations
<u>8911-324</u>	Typical Metering Cubicle for Multi-Installation & Looping of ActewAGL Cable
<u>8912-02</u>	Underground Service Conduit Requirements
<u>8912-03</u>	Typical Underground Service Cable Requirements for Single Domestic or Small Commercial Installation
<u>8912-04</u>	Typical Underground Service Cable Conduit Requirements for Installations Exceeding 100 Amps per Phase
<u>8913-213-06</u>	Wall Mounted Service Cubicle with Modular Feeder Units
<u>8913-22-02</u>	P.O.E. / Fuse Box for Domestic & Small Commercial Customers (16mm ² Underground Services)
<u>8914-201</u>	Temporary Installation Residential Blocks Overhead Supply
<u>8914-202</u>	Temporary Installation Residential Blocks Supply

1 INTRODUCTORY INFORMATION

1.1 Standard Customer Contracts

These Service and Installation Rules are to be read in conjunction with the Electricity Connection and Distribution Standard Customer Contract as published from time to time by ActewAGL. The contract applies to all customers connected to the network, other than customers who have negotiated an electricity connection and distribution contract, and requires compliance with these Service and Installation Rules.

The Electricity Connection and Distribution Standard Customer Contract is available upon request from ActewAGL and can also be downloaded from the ActewAGL website at www.actewagl.com.au

The Electricity Connection and Distribution Standard Customer Contract works in conjunction with either the Electricity Supply Standard Customer Contract or with a negotiated customer contract with an electricity supplier.

1.2 Area of the Distribution Network

The ActewAGL electricity distribution network covers customers within the area proclaimed as the Australian Capital Territory and small adjacent areas in New South Wales.

1.3 Application of the Service and Installation Rules

ActewAGL's Service and Installation Rules apply generally in respect of premises in urban and rural areas. Where the premises are in isolated or undeveloped areas conditions may vary. In such circumstances the customer will be informed when an application to connect to the electricity network is made.

1.4 Charges for Supply of Electricity

Customers whose annual electricity consumption is equal to or greater than 100 MWh are non-franchise customers and are required to enter into a contract with a licensed electricity supplier for the supply of electricity. Customers whose annual electricity consumption is less than 100 MWh may choose either to be supplied by ActewAGL Retail on a regulated franchise tariff or may enter into a contract with a licensed electricity supplier for the supply of electricity. Franchise tariffs are regulated by the Independent Competition and Regulatory Commission and are published by ActewAGL Retail.

1.5 Network Charges

Charges for the use of the electricity network are regulated by the Independent Competition and Regulatory Commission and are published on the ActewAGL website at www.actewagl.com.au. These charges are included in the regulated franchise tariff. For a non-franchise customer the network charges will normally be included by the customer's electricity supplier in the electricity account.

1.6 Application for Connection to the Electricity Network

Formal application for connection of a new installation, or for an addition or alteration, should be lodged as soon as the decision to proceed is made.

ActewAGL requires written notification for all alterations to metering, point of attachment and point of entry locations, uninterruptible power supply installations, motor generator set installations or for any increase in load of more than 2.4 kW.

1.7 Warning Against Premature Expenditure

No expense should be incurred by the prospective customer until formal application has been made and advice received as to the conditions under which ActewAGL would agree to the connection of the load to the network and the provisions to be made by the customer for the installation of ActewAGL's equipment on the premises.

Adequate notice of the customer's requirements should be given, 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.

Matters which may affect the design of a building project, such as the determination of the position of service equipment, the point of attachment for the service line or the point of entry of the underground service cable, and the position of any substation on the premises, should be settled at an early stage.

When contemplating the connection of equipment, particular care should be taken to ascertain ActewAGL's requirements relating to the prevention of interference with the supply to other customers.

1.8 Necessity for Employing a Licensed Person

Legislation requires that all electrical wiring work be carried out by a person licensed as prescribed and, in addition, places restrictions on persons other than licensed electrical contractors from undertaking such work. Therefore, where the customer is responsible for electrical wiring work required under these Service and Installation Rules, a licensed electrical contractor shall act as the agent of the customer. The holder of an appropriate grade of electrician's licence may carry out the installation of wiring in a premise of which the holder is the owner or bona fide occupier.

1.9 Compliance with the Wiring Rules

Legislation requires work carried out on a customer's installation to comply with *AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)*. The Wiring Rules set down the essential requirements for ensuring safety from fire and shock and apply to all electrical installations on customers' premises.

Persons carrying out such work are required to be licensed with BEPCON as electrical contractors and to provide BEPCON with written particulars within 14 days of the completion of this work.

1.10 Connection of Installations Following Completion of Wiring Work

ActewAGL is not an inspecting authority and cannot connect a new installation to the electricity network until that work has been approved for connection by BEPCON or the relevant Inspecting Authority.

Connection of an installation shall not be regarded as implying compliance with any specification or legislation, nor in any way as giving an assurance of quality.

1.11 Connection of Alterations and Additions

Legislation, requires that, except with the permission of BEPCON, a person shall not connect to the electricity network any consumer's installation or any addition or alteration thereto, prior to its inspection by BEPCON.

1.12 Interference and Damage to ActewAGL's Equipment

Legislation prescribes penalties for interfering with, or obstructing access to, ActewAGL's equipment. A customer may be held liable for damage to ActewAGL's equipment installed on the premises.

1.13 Alternative Connection Arrangements

These Service and Installation Rules establish the requirements for connection to the electricity network. Customers can propose alternative arrangements for connection to the network. Any alternative arrangements proposed must be submitted, in writing, to the Manager Strategy and Regulatory at the address shown below.

The Manager Strategy and Regulatory will determine the acceptability of the proposed alternative connection arrangement within 15 business days of receipt of the written proposal.

Any customer dissatisfied with a decision made by the Manager Strategy and Regulatory concerning an alternative connection arrangement should, in the first instance, refer the matter to the General Manager Networks. If the matter remains unresolved, the customer may have the right to request the Essential Services Consumer Council (ESCC) to deal with it.

1.14 Correspondence

Any correspondence with ActewAGL in connection with these Service and Installation Rules should be addressed to:

Manager Strategy and Regulatory
ActewAGL Distribution
Electricity Networks Division
GPO Box 366
Canberra ACT 2601

2 GENERAL REQUIREMENTS

2.1 Scope and Disclaimer

These Service and Installation Rules apply generally in respect of connection of premises in urban and rural areas to the ActewAGL electricity network. Where the premises are in isolated or undeveloped areas conditions may vary. In such circumstances the customer will be informed when an application to connect to the electricity network is made.

Despite the care taken in preparation of this document, ActewAGL does not warrant that it is free of inaccuracy. Users must exercise their professional judgment to ensure safety and should obtain advice from ActewAGL about any entry in the Service and Installation Rules that they believe may be in error. Advice can be obtained by telephoning 13 10 93 or by emailing faultscallcentre@actewagl.com.au

2.2 Definitions

Unless otherwise stated, the terms used in these Service and Installation Rules are as defined in the *AS/NZS 3000 Wiring Rules*. Current and voltage are expressed as the Root Mean Square (RMS) values.

The following definitions shall apply.

"ActewAGL" shall mean ActewAGL Distribution ABN 76 670 568 688, a partnership of ACTEW Distribution Ltd ABN 83 073 025 224 and AGL Gas Company (ACT) Pty Ltd ABN 24 008 552 663

"ActewAGL Office" shall mean:

- (a) For all enquiries and counter transactions:
ActewAGL Electricity Networks Division
Corner Oakden and Anketell Streets
Greenway ACT 2900
- (b) For counter transactions only:
ActewAGL Water Division
12 Hoskins Street
Mitchell ACT 2911

"AS" shall mean Australian Standard

"AS/NZS" shall mean Australian/New Zealand Standard

"BEPCON" shall mean the Building Electrical and Plumbing Control section of the ACT Planning and Land Authority.

"Customer" shall mean the applicant for connection to the network.

"Inspecting Authority" shall mean those responsible for approving installations in areas outside BEPCON's jurisdiction ie; Canberra Airport or premises connected to ActewAGL's network in surrounding New South Wales

"RFS" shall mean Request For Service.

"Service Equipment" shall mean all ActewAGL owned equipment, including all such equipment installed within the premises of the customer.

2.3 Exceptional Circumstances

In a number of Clauses, it is indicated that ActewAGL may waive or modify the stated requirements. Any request in this regard shall be addressed in writing to ActewAGL and no action should be taken before receiving approval in writing.

2.4 Agreement to Pay Charges

Where the customer is required to pay any charge in accordance with these Rules, the customer shall, if requested, sign an agreement written in a form acceptable to ActewAGL before the work is commenced.

2.5 Failure to Comply With The Service and Installation Rules

In the event of the customer failing to comply with the requirements of these Service and Installation Rules, ActewAGL may refuse to connect the customer's installation to the network, or may disconnect the customer's installation. A charge may be made for the reconnection of the installation to the network.

3 SUPPLY ARRANGEMENTS

3.1 System of Supply

The electricity supplied by ActewAGL is in the form of alternating current of approximately sinusoidal waveform at a frequency of 50 Hertz. The nominal supply voltage is 415/240 volts from a 3 phase 4 wire system. In some outlying areas the supply may be a single phase 240 volts 2 wire or 480/240 3 wire system. Supply is also available at high voltage, which is normally 11,000 volts.

ActewAGL may superimpose control voltages on the normal supply voltage.

Note:

AS 60038 Standard voltages, requires the nominal voltage of existing 240/415 V +6%, -6% systems to evolve toward recommended values of 230/400 V, +10%, -6%. There is no transition period stated for the change to the new nominal voltage levels. In common with the rest of the electricity industry in Australia, and consistent with the expectations of manufacturers and importers of electrical goods, ActewAGL is still operating its system at 240/415 V +6%, -6% and will continue to do so until the industry and manufacturers jointly move towards the new voltage levels.

3.2 System Earthing

The neutral conductors of the supply system are solidly earthed. For the purposes of the *AS/NZS 3000 Wiring Rules*, it shall be regarded as the Multiple Earthed Neutral (MEN) System.

3.3 Prospective Fault Current

The installation must be designed to withstand, without damage, the maximum currents, which may occur under fault conditions such as a short circuit.

Unless otherwise advised in writing by ActewAGL, the maximum (3 phase symmetrical) prospective short circuit current, at the customers terminals where supply is at 415/240 volts from street mains, may be taken as: -

- (i) suburban residential areas - 10,000 Amperes
- (ii) multi- residential(four or more units), commercial and industrial areas - 30,000 Amperes

Lower values of prospective short circuit current will apply in installations, which are remote from a substation or supplied from a substation of small capacity.

Higher values of prospective short circuit current (40,000 amperes or greater) may apply where supply is direct from a substation of large capacity. In these cases, and in the case of supply at high voltage, customers will be advised of the value following receipt of an application.

Note:

Consumer's mains in directly metered installations are protected by a service fuse of up to 100A rating. BEPCON requires that consumer's mains be a minimum size of 6 mm² to avoid damage to the insulation under fault conditions.

3.4 Number of Services

Only one service will normally be provided to any one building or to any group of buildings on the one property. However, in some instances ActewAGL may require more than one service to large premises.

3.5 Special or Additional Services

Where exceptional circumstances warrant, ActewAGL may agree to a customer's request for the provision of a special or additional service. If granted, the customer shall pay the full cost involved. These costs may include off site costs.

3.6 Segregation of Supplies

Where more than one service is provided, each shall supply 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 agreed to by ActewAGL. Unless the additional service is provided to supply specific equipment, the whole of the installation in any defined portion of the premises shall be supplied from the same service. The customer shall affix labels at each main switchboard to define the area or equipment it supplies and to indicate the presence and location of other supplies. A label shall further be affixed to each distribution board to indicate the main switchboard from which it is supplied.

Where more than one service is supplied to a customer's main switchboard no bus-section switches shall be installed between sections of the board supplied from the separate services without approval of ActewAGL.

3.7 Temporary Installation

Where permanent network supply is available and subject to the payment of relevant charges, ActewAGL will provide a service to a temporary connection point in situations where supply is required for a limited period.

3.8 Sources of Alternative Supply

Where the customer proposes to install an alternative source of electrical supply such as a standby generator, portable motor generator set, uninterruptible power supply (UPS) or photovoltaic inverter systems for connection to the electrical installation normally supplied from ActewAGL's system, such equipment shall not be installed or connected until notification has been submitted to ActewAGL by way of an RFS form and a drawing showing clearly the connections to be made and methods of operation of the alternative supply.

The approval of ActewAGL shall be obtained before any connections are made.

Reference should be made to Clause 5.5 regarding minimum requirements applicable to the customer's installation.

3.9 ActewAGL's Substations on Customer's Premises

3.9.1 Method

The method of supply to large or isolated installations shall be determined by negotiation between ActewAGL and the customer.

It is sometimes necessary for ActewAGL to install a transformer substation within a customer's premises. Where the maximum demand of the installation may exceed 100KVA or the installation is at an isolated location, inquiries shall be made to ActewAGL to determine whether a substation will be required on the premises.

3.9.2 Accommodation

Sometimes it is necessary for ActewAGL to increase the capacity of its works in order to connect a building or premises to the network. If in the opinion of ActewAGL the connection can best be given by installing transformers, switchgear, and other apparatus on the premises which are to be supplied, ActewAGL shall not be required or compelled to connect that building or premises to the network unless the customer provides, free of cost to ActewAGL, a suitable space and enclosure, approved by ActewAGL, within the building or premises to accommodate the mains, transformers, switchgear, and other equipment which, in the opinion of ActewAGL, are necessary to connect the building or premises to the network.

The space or enclosure provided by the customer shall be for the exclusive use of ActewAGL and no other services or customer owned equipment shall pass through, or be installed in, the space or enclosure. The customer is responsible for the maintenance of the enclosure.

3.9.3 Extension of High Voltage Mains

ActewAGL will supply, install and maintain the high voltage mains determined by ActewAGL to supply ActewAGL's substations on customer's premises. Charges may be made for any such extension or maintenance of such mains. The customer shall provide satisfactory access to the high voltage mains.

3.9.4 Location of Main Switchboard

The main switchboard should be installed as close as possible to the substation

3.9.5 Use of Equipment

ActewAGL may use its equipment installed on the premises to connect to the network any other premises or customer, subject to the requirements of the customer on whose property the substation is located first being met.

3.10 Determination of Number of Phases of Low Voltage Supply

Except where otherwise advised by ActewAGL the number of phases of low voltage supply which will be provided to an installation or separately metered portion of an installation, without incurring a charge in accordance with Clause 4.2.5, shall be as set out in Table 1.

ActewAGL may refuse to provide additional phases merely to supply instantaneous water heaters, 415 volt single phase equipment such as welders, X-ray machines, 3 phase motors rated at 2.0kW or less, or other polyphase equipment if, in the opinion of ActewAGL, 240 volt single phase equipment can satisfactorily perform the required function.

**TABLE 1
NUMBER OF PHASES OF LOW VOLTAGE SUPPLY**

Load Category	Number of Phases
Nominal load not exceeding 100A	1 phase and neutral (2 wire)
Nominal load exceeding 100A	3 phases and neutral (4 wire)
Rating of largest motor exceeds 2.0 kW	

The "nominal load" for the purpose of Table 1 shall be calculated on the assumption that all load will be connected line-to-neutral at 240 volts and shall exclude polyphase instantaneous water heaters. The calculation shall otherwise be in accordance with the method set down in the *AS/NZS 3000 Wiring Rules* for the calculation of maximum demand in mains and sub-mains, except in the case of multiple domestic installations. In this case, the nominal load of the whole installation shall be taken as the sum of the nominal loads for each domestic unit calculated separately.

3.11 Balancing of the Installation

3.11.1 General

The loading of an installation, or separately metered portion of an installation supplied from more than one phase, shall be so arranged that, at the time of maximum demand of the installation, the current in any active supply conductor shall not exceed the current in any other active supply conductor by more than 30 amperes.

Note:

To facilitate balancing, appliances incorporating 240 volt loading should generally be provided with the number of active terminals as set out in Table 2. Where three active terminals are provided, the components of loading should

be arranged so that the loading on any terminal does not exceed that on any other terminal by more than 25 amperes.

TABLE 2
BALANCING OF APPLIANCES

Appliance Rating	Number of Active Terminals
Not exceeding 25 A *	1
Exceeding 25 A but not exceeding 50 A	2 **
Exceeding 50 A	3 **

* Single element in-slab floor heaters up to a nominal 9 kW rating are excluded from these requirements.

** Suitable for connection to different phases.

3.11.2 Water Heaters (Instantaneous Type)

The loading of instantaneous type water heaters shall not exceed 20 amperes in the case of 240 volt single phase units, or 25 amperes per phase in the case of three phase units.

3.11.3 Cooking Ranges

Domestic cooking ranges having a total rating not exceeding 13.5kW may be connected between one phase and neutral. Ranges having a total rating exceeding 13.5kW shall be arranged for connection between three phases and neutral.

4 PROVISIONS FOR SERVICE EQUIPMENT

4.1 General Requirements

The customer shall provide mounting and installation facilities for ActewAGL's service equipment in the positions selected by ActewAGL. The service equipment is supplied and installed by ActewAGL and shall remain its property.

4.2 Connection to the Premises

ActewAGL installs and maintains the connection between its system and the customer's installation. ActewAGL will determine whether the connection will be in the form of aerial service lines or underground service cables. (See also Clause 3.9).

4.2.1 Aerial Service Lines

ActewAGL will determine the route of the service line and the position of the point of attachment to any building or structure. The customer shall provide, install and maintain any support on private land for the service line and shall carry out any work and provide and install any equipment required by ActewAGL on such support, point of attachment or point of connection.

Details of constructional requirements are available on request.

The size of any service post or pole and the design of any bracket, or similar device used to raise the point of attachment, shall be as determined by ActewAGL at the time of marking the service.

ActewAGL will not accept responsibility for damage to the customer's premises resulting from normal tension in the service line or causes beyond ActewAGL's control.

4.2.2 Clearance of Service Lines

The clearance of service lines above ground, to structures, and to trees and other vegetation is required to conform with the Utility Networks (Public Safety) Regulations and with ESAA HB C (b) 1 "Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines". ActewAGL will nominate the point of attachment and any other requirements to ensure that these clearances are achieved.

Such clearances shall not be reduced by any subsequent works on the premises.

4.2.3 Underground Service Cables

ActewAGL will determine the position of entry and depth of the service cable at the property boundary and its route on the property. The customer shall provide, install and maintain a conduit or set of conduits and any associated facilities required by ActewAGL for the installation of the service cable. Details of constructional requirements are available on request.

4.2.4 Connections to Service Equipment

The customer shall install a sufficient length of cable suitable for connection of the consumer's mains to service lines, service fuses and neutral link and shall also install the interconnecting wiring for ActewAGL's metering and control equipment. All conductors shall be stranded copper unless provided with terminating devices approved by ActewAGL.

A person, other than an employee of ActewAGL or an authorised person, shall not make any connection to, or disconnection from, conductors directly connected to ActewAGL's network, or insert a conductor into any item of ActewAGL's service equipment, except as authorised by ActewAGL.

4.2.5 Charges Applicable

The customer shall pay charges as determined by ActewAGL in respect of the installation of service equipment where: -

- (i) An aerial service line is in excess of one span or 22 metres in length, provided that in the case of single domestic premises the first span will be installed without charge.
- (ii) An underground service cable exceeds 8 metres in length from property boundary line most convenient to the ActewAGL network.
- (iii) The service line is terminated at some point other than that selected by ActewAGL involving ActewAGL in greater cost.
- (iv) The number of phases installed is in excess of the number determined in accordance with Clause 3.10 Table 1.
- (v) The point of attachment is relocated due to building alterations.
- (vi) Jointing of an underground service cable is necessary on a customer's property.
- (vii) The service is temporary or additional.

4.3 Facilities for Installation of Meters and other Service Equipment

4.3.1 Installations Suitable for Use of the Standard Meter Box Panel

For single domestic and other nominated installations having a nominal load of up to 100 amperes per phase, the customer shall provide and install a standard hinged pre-drilled panel complying with ActewAGL's standard meter panel as shown in Drawing [8911-2211-101](#). The nominal size of the panel shall be not less than 575mm high x 355mm wide for boxes housing meters only and 575mm high x 565mm wide for boxes housing meters and switchboards. Where a contactor or other associated equipment is necessary the larger panel shall be used.

Other meter boxes which contain meters or meters and switchboard will be accepted if approved by ActewAGL and meet the requirements of the relevant Standards.

The panel shall be mounted either: -

- (i) in a standard meter box complying with Drawing [8911-312](#); or
- (ii) on a suitable surround of steel not less than 1.2mm thick providing a clear space not less than 75mm deep between the rear face of the panel and the surface on which the surround is mounted.

Except where otherwise nominated by ActewAGL's officer, the panel shall be so located that the height of its top edge above the floor or ground beneath the panel: -

- (a) in domestic installations is not more than 2000mm and not less than 1500mm;
- (b) in non domestic installations is not more than 2300mm and not less than 760mm.

When fully extended on its hinge to the 90° open position, a clearance of 200mm shall be maintained between the front face of the panel and any fixed object.

If the panel is enclosed, other than in a standard meter box, a clearance of 175mm shall be provided from the front face of the panel to the door.

4.3.2 Installations Not Suitable for Use of the Standard Meter Box Panel

Where the installation is considered by ActewAGL to be unsuitable for use of the standard meter box panel as described in Clause 4.3.1, the customer shall provide facilities for mounting and connecting ActewAGL's service equipment in accordance with a notification given by ActewAGL. Clause 5.1 details the associated facilities to be incorporated in the customer's installation.

4.3.3 Communications Equipment

Any communications equipment required by the customer in connection with the National Electricity Market shall be segregated from ActewAGL's metering and service equipment. Where the communications equipment needs to be installed on the same hinged panel as ActewAGL's metering and service equipment, it must not encroach upon the space allocated for ActewAGL's equipment.

Communication equipment installations must also observe the requirements of *AS HB100 Coordination of power and telecommunications*

4.3.4 Alterations and Additions

If an alteration or addition to an existing installation makes it necessary to install additional service equipment, the customer shall make provision for its mounting and connection in accordance with ActewAGL's requirements.

Where the additional meters and control devices can be accommodated on an existing meter board, which has been approved by ActewAGL, ActewAGL's

officer will fix such equipment to the board and connect it to suitable wiring installed by the customer.

4.4 Location of Service Equipment

In addition to complying with the requirements for accessibility and protection of ActewAGL's equipment as set out in Clauses 4.5 and 4.8, the service fuses and links shall be located at a position selected by ActewAGL.

In the case of a public building or any premises where a number of occupiers are supplied through the same service, the service fuses must be located in a suitable position in a common use area near a public entrance which is accessible to ActewAGL's officers at all hours without having to obtain a key to the premises.

All meters shall be located at the one metering position which may be the location of the service fuses and links, but consideration will be given to any request for a metering position on each floor of a multi-storey building occupied by separate customers.

Meters shall not be installed in the room where the main switchboard is located but shall be adjacent to the room in an accessible area.

In general, the following locations are considered unsuitable for mounting metering and control equipment: -

- (i) Over stairways, ramps, in narrow passageways or in other confined spaces.
- (ii) Vehicle docks, driveways and factory passageways where the equipment or the person working on it would not be effectively protected.
- (iii) Positions in close proximity to or over machinery or open-type switchgear.
- (iv) Locations which are liable to be affected by fumes, dampness, dust, noise or vibration of such nature as may cause deterioration of equipment or unsatisfactory working conditions.
- (v) Hazardous locations as defined in *AS/NZS 2430 Classification of hazardous areas*.
- (vi) Where the normal ambient temperature exceeds 30°C.
- (vii) Where there is insufficient light.
- (viii) Where the use of a stepladder would be hazardous.

4.5 Accessibility of Service Equipment

4.5.1 Metering Equipment and Service Fuses

Adequate space, generally not less than 1000mm, shall be provided and maintained in front of the metering panel and service fuse panel or cabinet for ActewAGL's officer to read meters and work safely and without difficulty.

Immediate access shall be provided for ActewAGL's officers during normal business hours to all meters and control equipment on customer's premises. This requirement is considered to be complied with where: -

- (a) In a single domestic premises it is not necessary to pass through a door or gate;
- (b) In multiple domestic premises the equipment is accessible only by means of direct external access, unless otherwise approved by ActewAGL;
- (c) In business premises the equipment is located in a lockable portion of such premises which are always open or attended during normal business hours.
- (d) Meters capable of being read remotely are installed to ActewAGL's requirements.

Any elevated floor or platform used to provide access shall be substantial and permanent and, where necessary, shall be fitted with a railing. Access to such elevated positions shall be provided by an approved fixed stairway equipped with a handrail. The design of the platform, railings and handrails shall comply with *AS 1657 Fixed platforms, walkways, stairways and ladders - Design, construction and installation*.

Locking of a meter box is acceptable only if it is done by means of a standard lock, which may be purchased from ActewAGL.

In non-domestic installations standard ActewAGL locks may be used only on doors or gates which give access to a room or enclosure which is used solely for the purpose of housing ActewAGL's and customer's electrical equipment.

The customer shall ensure that access is not subsequently restricted or the location otherwise rendered unsuitable. If this occurs, the customer shall restore satisfactory access or arrange for the relocation or replacement of the meter position at the customer's cost.

4.5.2 Point of Attachment

Unrestricted access must be provided to the point of attachment for aerial service cables and associated equipment and fuses. Structures such as carports or pergolas shall not be erected immediately below the pole end or the point of attachment.

4.6 Spacing Between Meters and Current Carrying Conductors

In order to avoid the adverse effect on meters of external magnetic fields, the customer shall, except as otherwise determined by ActewAGL provide and maintain the following minimum spacings between meters and certain current carrying conductors.

4.6.1 Multi-Core Cables and Bunched Single-Core Cables

Where the separation between all conductors of a circuit is due solely to the solid insulation and sheathing on the conductors, as in multi-core cables or a group of single core cables in flat or bunched formation, there is no special requirements as to spacing.

4.6.2 Spaced Single-Core Cables, Busways or Busbars

Where the separation between conductors of the same circuit exceeds that in Clause 4.6.1 but does not exceed 160mm, the minimum spacing between any point on the meter and any point on the nearest conductor of the circuit shall be in accordance with Table 3. Intermediate points may be obtained by interpolation.

**TABLE 3
SPACED SINGLE-CORE CABLES, BUSWAYS OR BUSBARS**

Current in Conductor Nearest to Meter (Amperes)	Minimum Spacing Between Conductor and Meter (Millimetres)
150	Nil
400	500
600	700
1000	900
1500	1200
2000	1400
3000	1700
4000	2000

4.6.3 Shielding

The spacings determined under Clause 4.6.2 may be reduced by multiplying them by the following factors if the meters or conductors are enclosed in a container made of mild steel of the thickness indicated in Table 4. Where other thicknesses or materials are proposed the factor shall be as determined by ActewAGL.

**TABLE 4
SHIELDING**

Thickness of Mild Steel Plate (Millimetres)	Multiplying Factor
5.0	0.25
2.5	0.50
1.2	0.75

4.6.4 Special Cases

Where the separation between the conductors referred to in Clause 4.6.2 exceeds 160 millimetres, the spacing shall be as determined by ActewAGL.

4.7 Fixing to Wall Structure

Facilities for the mounting of ActewAGL's service equipment and associated surrounds and boxes enclosing them shall be securely fixed to a wall or rigid supporting structure in accordance with the requirements of ActewAGL.

The fastening method used shall be of an approved type, which, with the exception of boxes built into walls, permits easy removal of the service equipment.

4.8 Protection of ActewAGL's Equipment

The customer shall take whatever action is considered by ActewAGL to be necessary to prevent ActewAGL's equipment being affected by weather, mechanical damage, and dusty or corrosive atmospheres or exposed to vandalism.

A durable weatherproof box with hinged door and catch may be used for this purpose provided it is not inferior to the standard meter box shown in Drawing [8911-312](#). If the door is hinged on the top edge, a stay fastened to the box is required for holding it in a fully open position. Doors shall not be glazed. Any clearance notified by ActewAGL shall be maintained around ActewAGL's equipment.

4.9 Load Control Equipment

Where, in accordance with the provisions of any charge published by ActewAGL, electricity is to be supplied only during certain hours, ActewAGL will provide, and install a single pole control device, in accordance with such charge requirements.

Where the controlled load exceeds the capacity of the control device the customer shall be required to supply and install an approved sealable contactor in a position determined by ActewAGL. The contactor will be operated by ActewAGL's control device. The customer shall install the necessary wiring as required by ActewAGL.

5 CUSTOMER'S INSTALLATIONS

5.1 Facilities Associated with Metering

5.1.1 General

In addition to providing and installing a panel or panels equipped and wired in accordance with Clause 4.3, the customer shall arrange the electrical installation in the premises to meet the requirements of Clauses 5.1.2 to 5.1.5 inclusive.

5.1.2 Protection of Meters Against Short Circuit

Where required by ActewAGL for a service rated at more than 100 amperes, the customer shall arrange the installation so that all direct connected meters and associated control devices and the wiring connected to them are on the load side of ActewAGL's service fuses. The rating of such protective device shall not exceed 100 amperes.

5.1.3 Connections and Links

Not more than one cable shall be connected to any one terminal of a meter or control device. Where it is necessary to connect more than one meter to one phase of an unmetered supply main or submain, the customer shall, where required, supply and install links for the purpose. Any such links supplied by the customer shall be of an approved type with covers suitable for sealing.

5.1.4 Sealing

The customer shall make provision in an approved manner for ActewAGL's officer to affix seals to portions of the customer's installation in circumstances where, in the opinion of ActewAGL such seals are necessary to prevent obstruction or diversion of the supply of electricity or to avoid interference with the supply to other customers or for purposes associated with the control and metering of the electricity supply or for any other purposes relating to the agreement with the customer.

In general, provision for sealing is required for all connections on the line side of the meters and certain other connections associated with metering.

5.1.5 Labelling

Where premises are sub-divided into separate occupancies and a separate supply is given to occupiers of individual rooms, suites of rooms, flats, units, etc. an identification number or letter or combination of both shall be assigned and marked on the main entrance door of each occupancy. A durable corresponding marking shall be placed on the distribution board to identify the supply equipment to that portion of the premises.

Where the occupancy consists of a number of separate areas, each shall be marked or some other approved system of identification shall be adopted. A corresponding marking shall also be made for each occupancy on the meter panel adjacent to the position of the corresponding meter and ActewAGL's service equipment.

Where premises are supplied from more than one service, labels shall be provided at each service position 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.

5.2 Limitations on Connection and Operation of Equipment

5.2.1 Interference with Supply to Other Customers

The customer's equipment shall be arranged and operated to prevent undue interference with the supply to other customers.

The two basic types of interference caused by customer's loads are: -

1. Voltage fluctuations (dips and rises), which are caused by the switching of loads such as heater banks, motors, single phase air conditioning units or power factor correction equipment.
2. Voltage waveform distortion (harmonics), which are caused by loads with electronic power supplies.

If, in the opinion of ActewAGL, the customer should use or deal with the electricity supplied in such a way as to cause undue interference to the supply to other customers, the customer causing the interference shall take corrective action. The fact that ActewAGL's officers shall have connected and approved the apparatus or equipment causing the interference shall not exempt the customer from the operation of this clause.

The customer's equipment or groupings of equipment will generally be considered acceptable for connection if it complies with the relevant parts of AS/NZS 61000 *Electromagnetic compatibility (EMC)*. In relation to AS/NZS 61000.3.3 and AS/NZS 61000.3.5, ActewAGL reserves the right not to assign the complete fluctuating load capability, or voltage distortion capacity, of the system to any one customer, in order to reserve capacity for future customers or other existing customers.

Alternatively, equipment complying with the requirements of Clauses 5.2.1.1 or 5.2.1.2 will be considered acceptable for connection. The requirements of these clauses are more stringent than AS/NZS 61000. Therefore equipment which does not comply with these clauses, but which satisfies the requirements of AS/NZS 61000 is acceptable for connection.

5.2.1.1 General Equipment

Equipment, other than motors, having load changes not more than those specified in Table 5 for the frequency of load change indicated is acceptable for connection.

Where a piece of equipment includes a motor which is switched simultaneously with another load component, then the equipment is acceptable if the steady state load changes are within those specified in Table 5 and the motor starting current complies with Clause 5.2.1.2.

TABLE 5
LIMITATIONS ON CONNECTION AND OPERATION OF EQUIPMENT

Voltage of Load Units	Connection of Load	Switching Arrangement	Number of Phases of Supply	Acceptable Changes of Line Current for Indicated Frequency of Change (Amperes)			
				More than 1 / Min	From 12 / hour up to 1 / Min	From 4 / hour up to 12 / hour	Up to 4 / hour
240	Line to Neutral	-	1	Refer to AS/NZS 61000.3.3 and AS/NZS 61000.3.5	13	18	25
		Phases not switched simultaneously	2 or 3		13	18	25
		Phases switched simultaneously	2		13	18	25
			3		21	30	43
					21	30	43
415	Line to Line (no neutral connected)	Phases switched simultaneously	2		21	30	43
			3		21	30	43

5.2.1.2 Motors

Motors having starting currents not more than those specified in Table 6 for the starting frequency indicated are acceptable for connection.

TABLE 6
LIMITATIONS ON CONNECTION AND OPERATION OF MOTORS

Motor Voltage	No of Phases of Supply	Acceptable Starting Current for Starting Frequency (Amperes)			
		More than 1 / Min	From 12 / hour up to 1 / Min	From 4 / hour up to 12 / hour	Up to 4 / hour
240	1	Refer to AS/NZS 61000.3.3 and AS/NZS 61000.3.5	19	29	38
415	3		32	48	64

5.2.1.3 Equipment Requiring Special Consideration

ActewAGL may refuse to permit the connection of equipment in the following categories if they consider that by such connection, the supply to other customers would be adversely affected:

- (a) Equipment which would cause excessive fluctuation of voltage on ActewAGL's system as a result of its large or fluctuating demand, e.g., arc furnaces, welding machines, X-ray units and frequently started large motors. In such cases the customer shall provide any information requested by ActewAGL to determine whether the equipment complies with AS/NZS 61000.3.3 or AS 61000.3.5.
- (b) Equipment which would cause excessive distortion of the wave shape of ActewAGL's system voltage, e.g., rectifiers, frequency converters, load control devices using thyristors or saturable reactors. In such cases the customer shall provide any information requested by ActewAGL to determine whether the equipment complies with AS/NZS 61000.3.2.

5.2.1.4 Conditional Approval

ActewAGL may approve the connection of equipment having a fluctuating load characteristic and/or which causes waveform distortion subject to specified conditions of operation of the equipment. Such conditions may include restrictions on frequency or cycle of operation, time-of-day restrictions, provision of harmonic filters or other auxiliary equipment, or a specified method of connection to the power supply.

Where such approval is granted the customer shall not cause any change to the specified conditions without obtaining the approval of ActewAGL. Any approval previously given shall be void if any of these conditions are changed.

5.3 Customers Installations

5.3.1 Consumers Mains

- (a) Joints in unmetered consumer's mains are not permitted unless approved by ActewAGL.
- (b) The conductors of consumer's mains shall be insulated in different colours for identification purposes. Where necessary, core identification may be achieved by sleeving in accordance with *AS/NZS 3000 Wiring Rules*.

5.3.2 Main Switchboards and Meter Panels

Arrangements shall be made to ensure that live parts on a switchboard or meter panel cannot be touched by unauthorised or unqualified persons. Where the protecting case can be opened or removed without the use of tools, locks, which lock automatically upon closure and require a key to open them, shall be used. Suitable labels warning of the presence of live parts shall be fixed to the front of such doors.

5.4 Earthing

All new installations required to be earthed shall conform to the requirements for the MEN System of Earthing as set down in the *AS/NZS 3000 Wiring Rules*.

5.5 Connection to Alternative Supply Sources

Where, in accordance with Clause 3.8, ActewAGL agrees to the installation of facilities to enable an installation to be disconnected from ActewAGL's system and connected to a private alternative source of supply, such facilities shall be arranged either directly or by suitable interlocking procedures, so that ActewAGL's system, service equipment and metering equipment cannot be energised from such alternative source. A notice shall be fixed on the main switchboard to show that such facilities exist, which sections of the installation they can supply, their point of control and the conditions under which they may be operated.

Particular requirements for the connection of small scale parallel customer generation via inverters, such as photovoltaic installations, are provided at Appendix A11. The requirements for briefly connecting generators to the ActewAGL LV network to permit on-load testing or load transfer are provided at Appendix A13. Requirements and consideration of customer proposals for operation of other generators in parallel with ActewAGL's network will be assessed on a case by case basis.

5.6 Power Factor

5.6.1 General

If the power factor, as determined by ActewAGL, of the supply taken by a customer's installation is such that, in the opinion of ActewAGL, the electricity

network is not or would not be efficiently utilised or the supply to another customer is or would be adversely affected, the customer shall maintain such power factor at a value not less than 0.9.

No condition of operation of power factor correction equipment or variation of inductive load shall at any time cause the power factor of the installation to become leading.

The requirements for the installation of power factor correction capacitors at customers' installations are described in Appendix A12.

5.6.2 Luminous Discharge Tubes and Fluorescent Lighting Units (Other than Single Dwelling Domestic Installations)

The power factor of luminous discharge tube lighting installations, signs, fluorescent lamps, etc. shall not be less than 0.9. Power factor correction is not required in installations with a total uncorrected connected load not exceeding 10 amperes (e.g. twenty 38 watt tubes).

5.7 High Voltage Installations

High voltage equipment shall not be connected to ActewAGL's mains unless approved by ActewAGL with respect to its design, construction, installation and operation.

At the time of applying for connection to the network, ActewAGL will advise the customer of the prospective fault current and the normal range of voltage for which provision should be made.

Relays, current transformers and other protection equipment must have characteristics to suit ActewAGL's existing protection system. ActewAGL will test the customer's equipment for this purpose at the time of the initial installation. A charge may be payable by the customer for this work.

Facilities must be provided for the disconnection and testing of all high voltage and protection circuits.

Suitable means of earthing sections of the installation must be provided so that equipment can be worked on safely.

Customers who intend to install or add to a high voltage installation should submit a proposal to the ActewAGL and await a reply in writing before proceeding with the ordering of equipment.

If the customer purchases or installs any high voltage equipment before the design, construction and method of installation of the equipment have been formally approved, ActewAGL may refuse to connect the whole or any part of the equipment which in the opinion of ActewAGL is not satisfactory.

Every high voltage installation must be regularly maintained in good order, so that it will perform the functions for which it was designed. *AS 2467 Maintenance of electrical switchgear* is relevant in this regard.

APPENDIX A1 CUSTOMER SUPPLY PROCEDURES

1. SCOPE

This document outlines procedures relating to the connection of new installations and alterations/additions to existing installations. These procedures will assist in meeting the reasonable needs of customers, contractors and ActewAGL, and to avoid misunderstandings and delays.

2. ENQUIRIES

Enquiries concerning the various procedures set out in this document should be directed to the staff at ActewAGL's Office, Greenway . This office deals with general enquiries between the hours of 8.30am and 4.00pm Monday to Friday.

Over the counter transactions such as payments, service appointments, submission of Request for Service or Request for Service Marking forms may also be carried out at the ActewAGL Water Division Office, Mitchell. The counter is open between the hour 8.00am to 4.45pm Monday to Friday.

3. APPLICATION TO CONNECT TO THE NETWORK AND NOTIFICATION OF WIRING

New installations which require an underground service will be marked for service location by ActewAGL when certified approved plans are submitted to ActewAGL. A Request for Service (RFS) form must be submitted 15 working days prior to completion of building work to give ActewAGL time to install the underground service cable and/or metering equipment.

A Request for Service Marking form should be lodged as soon as a decision is made to proceed with a new installation which requires a service or where additional load requires an existing service to be upgraded from single phase to three phase or where premises requires a new Point of Attachment.

On new premises where the service cable is already installed, but metering equipment is yet to be installed, a Request for Service form shall be submitted to initiate the metering equipment installation process.

On receipt of the certified approved plans, ActewAGL officers will check whether any special conditions to connect to the network are applicable and initiate work for the reinforcement of the system where necessary. The customer will then be informed of any charges, special conditions and any work which may be necessary for the customer to perform before a connection can be provided.

An application to connect to the network must be made to ActewAGL together with payment of any charges before the connection will be made.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

4. PROVISION TO BE MADE FOR SERVICE EQUIPMENT

Reference should be made to Appendix A3 Provisions for Service Equipment in Single Domestic and Small Installations or Appendix A4 Provisions for Service Equipment in Multiple Installations, or Appendix A5 Off-peak Supply as appropriate, for details of the facilities which must be provided by the customer.

These facilities, in the case of new installations, will include provision by the customer of a panel, with all wiring for the connection of meters and all associated equipment and control equipment.

The provision of the service equipment and the installation of the consumer's mains should be carried out as soon as the building work is sufficiently advanced. ActewAGL must be notified by the submission of a Request for Service form (RFS) to enable the scheduling of the installation of the service equipment.

5. CONNECTION TO THE NETWORK

When the installation is complete and ready for connection, a Certificate of Electrical Safety must be lodged at the office of BEPCON to facilitate an electrical inspection.

ActewAGL will not connect any new installation to the network until BEPCON have authorised connection.

6. SERVICING APPOINTMENTS

In certain circumstances it may be necessary for the contractor to arrange in advance for servicing and metering work to be conducted at an appointed time. Work requiring appointments include re-positioning or replacement of meter boxes, consumer's mains, service mains and conversion to Off-Peak metering.

In such cases, an appointment must be made in advance at either of ActewAGL's offices at Greenway or Mitchell.

It is essential that any such appointment be made only when it is known that all the necessary preliminary matters have been arranged: that is, the service equipment is satisfactory, any charge has been paid and the installation will be completed before the time of the inspection. A Request for Service form shall be submitted at the time of making the appointment, and a Certificate of Electrical Safety must also be submitted to BEPCON.

7. WORK OUTSIDE NORMAL WORKING HOURS

In some circumstances, ActewAGL may agree to a customer's and/or electrical contractor's request to carry out certain work outside normal working hours. Written confirmation by the customer and/or the electrical contractor to pay the cost involved is required in addition to a letter stating that all customers affected are aware of and have agreed to outage times if required. This confirmation must be received by ActewAGL at least three working days prior to the commencement of works.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

8. SEPARATION OF SUPPLY

When a contractor divides an existing installation into separate installations, serving two or more occupancies, the contractor must make an appointment for this work to be carried out.

9. INSTALLATION DEFECT FEE

An Installation Defect fee applies when ActewAGL has to revisit a site, necessitated by obstructed access or non-compliance with the Service and Installation Rules. This fee is approved by the Independent Competition and Regulatory Commission and is published on the ActewAGL website at www.actewagl.com.au

The payment of the Installation Defect fee will be taken as notice that the defect has been rectified.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A2 DOMESTIC ELECTRICAL INSTALLATIONS

1 SCOPE

This publication briefly explains the terms used in describing a typical domestic electrical installation and provides general background information.

2 COMPONENT PARTS OF A DOMESTIC INSTALLATION

2.1 Overhead Service

These are the conductors installed by ActewAGL between its mains and a point of attachment on the customer's premises.

Insulated cables have been used for some years but earlier practice was to use conductors having a covering which does not provide full insulation and additional care is necessary if working near them.

2.2 Underground Service

Where the mains in the street are underground, connection is usually made by an underground cable.

Care should be exercised by customers including obtaining clearances when excavating in the vicinity of buried cables. Cable clearances must be obtained by contacting "Dial Before You Dig" by telephoning 1100. A minimum of two full working days notice is required.

2.3 Point of Attachment

This is the point at which the aerial conductors of the service line are attached to a customer's building, post, pole, or structure. The location is determined by an officer of ActewAGL who also indicates the provisions, which must be, made by the customer to enable ActewAGL to securely anchor the insulators, which it installs to terminate the service line.

The position selected for the point of attachment will depend on such factors as the profile of the terrain, the presence of obstructions and the relative positions of the building and street mains. Typical locations selected by ActewAGL's officer for the point of attachment are the house fascia or gable.

In some cases, it may be necessary to install a service riser bracket at the point of attachment to raise the line sufficiently to maintain minimum safe clearances above the ground or driveway. Service riser brackets are required to be of one of a number of approved types available from trade suppliers.

It is important for the customer's electrical contractor to ensure that the structure supporting the anchor bolts or service riser bracket is adequate in strength to withstand the tension of the service line.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

2.4 Consumers Terminals

These are the junction between the conductors of the service line or underground service cable and those of the consumer's mains. The making of this connection and the carrying out of any work at the consumer's terminals must be carried out by ActewAGL staff.

2.5 Consumers Mains

These are cables, which are installed by a licensed electrical contractor engaged by the customer. They commence at the consumer's terminals, and terminate at the customer's main switchboard.

Refer to Clause 5.3.1 of the Service and Installation Rules for details of the requirements for joints in unmetered consumer's mains and for core identification of consumer's mains.

2.6 Main Switchboard and Meter Panel

ActewAGL generally requires the use of a standard hinged pre-drilled panel, to cater for ActewAGL's service and metering equipment.

Customers are advised to use a panel that complies with ActewAGL's published standard. These panels and associated meter boxes and surrounds are available from trade suppliers.

However, if the residence has a very large electrical installation, the standard panel may not be adequate and a larger panel and separate facilities for the mounting of the service equipment may be required.

The panel is required to be protected from the weather and is generally enclosed in a weatherproof meter box. It is preferred that use be made of a standard meter box which complies with Drawing [8911-312](#). However, other forms of construction are acceptable if they are equivalent to the standard box in all relevant respects.

ActewAGL installs its service equipment and associated equipment on this panel. Adequate space is generally also available for the customer's switchboard equipment necessary to control and protect the submains and final subcircuits.

3 WORK ON CUSTOMER INSTALLATIONS

Legislation requires work carried out on a customer's installation to comply with *AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)*. The Wiring Rules set down the essential requirements for ensuring safety from fire and shock and apply to all electrical installations on customers' premises.

Persons carrying out such work are required to be licensed with BEPCON as electrical contractors and to provide BEPCON with written particulars within 14 days of the completion of this work.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A3 PROVISION FOR SERVICE EQUIPMENT IN SINGLE DOMESTIC AND SMALL INSTALLATIONS

1 SCOPE

This publication sets out provisions for the installation of service equipment in premises, which are suitable for the use of a standard meter panel, in accordance with Clause 4.3.1 of the Service and Installation Rules.

2 GENERAL REQUIREMENTS

The customer shall provide mounting and installation facilities for ActewAGL's service equipment in the positions selected by ActewAGL officer. "Service equipment" as referred to in this publication includes service lines and cables, service fuses, meters, and off-peak load control equipment, but excludes an off-peak contactor required for load switching. This equipment is supplied and installed by ActewAGL and shall remain its property.

3 CONNECTION TO THE PREMISES

3.1 Aerial Service Lines

ActewAGL will determine the route of the service line and the position of the point of attachment to any building or structure. The customer shall provide, install and maintain any support on private land for the service line and shall carry out any work and provide and install any equipment required by ActewAGL on such support, point of attachment, or point of connection. Details of constructional requirements are available on request.

3.2 Underground Service Cables

Underground services are generally installed in areas where the street mains are already underground, or where an overhead installation is not practical. ActewAGL will determine the position of entry for the service cable at the property boundary and its route on the property.

The customer shall provide, install and maintain a conduit or set of conduits and any associated facilities required by ActewAGL for the installation of the service cable. Detailed requirements are set out in Appendix A8 Underground Supply to Single Domestic and Small Installations.

3.3 Connections at Service Equipment

The customer shall install a sufficient length of PVC or elastomer-insulated stranded copper cable of a suitable size and current rating for connection of the consumer's mains to service lines, service fuse(s) and neutral bar.

The customer shall also arrange for the installation of the wiring on the load side of ActewAGL's service equipment and for the ends to be prepared for

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

insertion and connection by ActewAGL. Separate full sized metering neutral cables are required for each meter or control device.

Where service fuses are located on the switchboard, one additional cable connection is permitted to be terminated on the load side at each service fuse to enable supply to be provided to a separately metered portion of the installation such as an off-peak water heater. In other cases an active link shall be provided on the switchboard to enable such connection.

A person, other than an employee of ActewAGL or an authorised person, shall not make any connection to, or disconnection from, conductors directly connected to ActewAGL's network, or insert a conductor into any item of ActewAGL's service equipment, except as authorised by ActewAGL.

4 FACILITIES FOR INSTALLATION OF METERS AND OTHER EQUIPMENT

4.1 Standard Panel and Meter Box

The customer shall provide and install a standard hinged pre-drilled panel complying with Drawing [8911-2211-101](#). The panel shall be complete with wiring for the mounting and connection of ActewAGL's meters and control equipment.

The panel shall be mounted either:

- (i) In a standard meter box complying with Drawing [8911-312](#); or
- (ii) On a suitable surround of steel not less than 1.2mm thick providing at least 75mm of space behind the panel, erected in a location which is suitably protected.

Except where otherwise nominated by ActewAGL, the panel shall be so located that its top edge is not more than 2000mm or less than 1500mm above the floor or ground beneath it. A clearance of 200mm shall be maintained from the front face of the hinged panel to any fixed object with the panel open 90° on its hinges. If the panel is enclosed, other than in the standard meter box, a clearance of 175mm shall be provided from the front face of the panel to the door.

Details of requirements including drilling of the panel for fixing of ActewAGL's equipment and space for the customer's equipment are available from ActewAGL.

Notes:

- 1. Customers are advised to use panels complying with Drawing [8911-2211-101](#). These panels and associated meter boxes and surrounds are available from trade suppliers. No objection will be raised to the presence of redundant holes resulting from the use of a standard pre-drilled panel.
- 2. Other meter boxes which contain meters or meters and switchboard may be used, subject to approval by ActewAGL.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

4.2 Wiring

The wiring and the arrangement of the equipment on the standard panel is required to be in accordance with this publication, and with *AS/NZS 3000 Wiring Rules*.

Where hinged or removable meter panels are used, conductors connected to equipment on the panel shall be provided with sufficient free length to enable the panel to be readily opened for work to be carried out.

4.3 Fixings

Boxes, surrounds and enclosures shall be securely fixed to a wall or rigid supporting structure, which is of a permanent nature.

4.4 Protection from Weather etc.

Specific requirements for the protection of meters and service equipment are detailed at clause 4.8 of the Service and Installation Rules.

4.5 Accessibility

Specific requirements for the location and accessibility of meters and service equipment are detailed at clauses 4.4 and 4.5 of the Service and Installation Rules.

5 SEALING OF CUSTOMER'S EQUIPMENT

The customer shall enclose connections and make provision in an approved manner for ActewAGL's officer to affix seals to facilitate the detection of unauthorised access to connections such as links on the line side of meters and certain other connections associated with metering. In a domestic or small installation this will generally involve the use of an approved sealable link, and, if applicable, a sealable off-peak load contactor and control switch.

6 SMALL INSTALLATIONS OTHER THAN SINGLE DOMESTIC

ActewAGL's Standard Meter Box and panel may be used for any non-domestic installation where agreed to by ActewAGL's officer.

Notwithstanding the requirements of Clause 4.1 the top edge of the panel in a non-domestic installation shall be so located as to be not more than 2300mm or less than 760mm above the floor or ground.

7 DRAWINGS

The following drawings form part of this Appendix: -

<u>8911-2211-101</u>	Standard Switchboard Arrangement Domestic and Off Peak-Tariff
<u>8911-312</u>	Typical Standard Meter Box
<u>8911-321</u>	Permissible Meter Locations - Domestic Installations

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A4 PROVISION FOR SERVICE EQUIPMENT IN MULTIPLE OCCUPANCY INSTALLATIONS

1 SCOPE

This Publication sets out the provisions required for the installation of service equipment in premises where direct connected meters are nominated for metering the whole or any portion of an installation where ActewAGL's standard meter box panel is not adequate. It is applicable to multiple domestic installations and flats, (excluding dual occupancies) groups of small shops, factory units and the like, where metering is grouped.

For loads in excess of approximately 100A per phase it is necessary to use meters which operate in conjunction with current transformers and reference should be made to Appendix A6 Current Transformer Metering for the additional provisions which the customer is required to make.

2 GENERAL REQUIREMENTS

The customer is required to provide mounting and installation facilities for ActewAGL's service equipment in the positions selected by ActewAGL. "Service Equipment" shall mean all equipment installed in a premises by ActewAGL, including service lines, cables and busbars, service fuses, links, meters, current transformers and auxiliary control equipment.

Requirements for the location and mounting of the service equipment will be notified by ActewAGL following the receipt of approved plans. Where the metering work is not of a relatively simple nature it may be necessary for an on site appointment with an ActewAGL officer who will set out provisions to be made for the mounting and connecting of metering equipment.

3 CONNECTION TO THE PREMISES

3.1 Aerial Service Lines

ActewAGL will determine the route of the service line and the position of the point of attachment to any building or structure. The customer shall provide, install and maintain any support on private land for the service line and shall carry out any work and provide and install any equipment required by ActewAGL on such support, point of attachment or point of connection. Details of construction requirements are available on request.

3.2 Underground Service Cables

Underground service cables are generally installed only in areas where the street mains are already underground, or where an overhead installation is not practicable. ActewAGL will determine the position of entry for the service cable at the property boundary and its route on the property. Detailed

**This Appendix forms part of the Service and Installation Rules and is to be read in
conjunction with those rules**

requirements are set out in Appendix A9 Underground Supply to Installations with Demands Exceeding 100 Amperes per Phase.

4 SERVICE FUSES AND NEUTRAL BAR

4.1 Installation

The neutral bar is to be provided and installed by the Contractor.

Where ActewAGL assesses the maximum demand of the installation at 100A per phase or less ActewAGL installs HRC service fuses.

Where ActewAGL assesses the maximum demand of the installation at more than 100A per phase ActewAGL may install the service fuses in a cubicle at a location separate to the meter panel. The customer shall provide and install the cubicle containing mounting facilities for the fuses in an accessible position nominated by ActewAGL. Refer to Drawing [8913-213-06](#)

4.2 Accessibility and Protection

In addition to complying with the requirements for accessibility and protection of ActewAGL's equipment from weather, etc., as set out in Sections 5.3 and 5.4 of this Appendix the service fuses and neutral bar must be located externally at the street access level of the building, which is accessible to ActewAGL's officer, in order to ensure continuity of supply to individual customers. Consideration will be given to other locations only in exceptional circumstances.

4.3 Connections at Service Fuses and Neutral Bars

4.3.2 General

The Customer shall arrange for the installation of a sufficient length of cable for connection of the consumers mains at the consumers terminals and at the line terminal of the service fuses and neutral bar, to permit connection by ActewAGL in a manner which complies with ActewAGL's requirements and *AS/NZS 3000 Wiring Rules*.

The customer shall also arrange for the installation of similar wiring on the load side of ActewAGL's service fuses and neutral bar and for the ends to be prepared ready for connection by ActewAGL's officer.

All wiring, where connected to service equipment and associated meters shall be 0.6/1kV grade PVC or elastomer-insulated, stranded, copper-conductor cable of suitable size and current rating.

Cables of other types, if used, must be jointed or otherwise connected in an approved manner to cable of the required type and size for connection to this equipment.

A person, other than an employee of ActewAGL or an authorised person, shall not make any connection to, or disconnection from, conductors directly

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

connected to ActewAGL's network, or insert a conductor into any item of ActewAGL's service equipment, except as authorised by ActewAGL.

4.3.2 Services not exceeding 100A Rating

Where the assessed maximum demand of the installation is 100A per phase or less, ActewAGL installs HRC service fuses. The maximum conductor size, which can be terminated, directly into service fuses when they are mounted on a panel, which is, surface wired, is 35 mm².

One additional cable may be connected on the load side of each double terminal service fuse to supply a separately metered portion of the installation.

4.3.3 Services exceeding 100A Rating

Where the assessed maximum demand of an installation exceeds 100A per phase, it may be supplied from the low voltage reticulation or direct from a substation.

When approved by ActewAGL, ActewAGL's service fuses may be incorporated in a service fuse cabinet or in the customer's main switchboard. In large installations the service fuses may be located in a substation.

5 METERS

5.1 Installation

ActewAGL provides and installs the meters appropriate for the number of separately metered occupancies in the premises and for the tariffs required. Single phase meters will be installed in new installations for separate occupancies with single phase equipment only and assessed maximum demands not exceeding 100A. For occupancies having three phase equipment and a maximum demand not exceeding 100A per phase direct connected multiphase meters will be utilised. For occupancies exceeding 100A per phase refer to Appendix A6 Current Transformer Metering.

5.2 Grouping

It is preferred, in general, that all meters together with the service fuses and links be located at the one metering position. Consideration will be given to any request for a metering position on each floor of a multi-storey building occupied by separate customers.

Where it is necessary to connect more than one set of meters in multiple occupancy buildings where changes in tenancy may require alterations to the portions of the installation connected to a meter, connecting or paralleling links shall be supplied by the customer. Such links are required to be readily accessible, suitable for sealing by ActewAGL and must comply with ActewAGL's requirements. Links shall not be located on the back of a hinged meter panel.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

5.3 Accessibility

Adequate space is required in front of the meter panel and service fuse panel or cabinet for ActewAGL to read meters and work safely and without difficulty. In this regard the space between any wall on which service equipment is mounted and any other wall or obstruction in front of the panel is generally required to be not less than 1000mm.

ActewAGL requires immediate access during normal business hours to all meters and control equipment on customer's premises. This requirement is not considered to be complied with where it is necessary for an ActewAGL officer to pass through a lockable door or gate in a domestic premises but no objection will be raised to such equipment being located in a lockable portion of business premises which are always attended during normal business hours.

Specific requirements for the location and accessibility of meters and service equipment are detailed at clauses 4.4 and 4.5 of the Service and Installation Rules.

5.4 Protection from Weather, Mechanical Damage and Corrosive Atmospheres

Specific requirements for the protection of meters and service equipment are detailed at clause 4.8 of the Service and Installation Rules.

5.5 Mounting Provisions

ActewAGL will include, in the notification to the applicant for connection to the network, the mounting requirements for grouped meters.

5.6 Wiring

The wiring of meters is required to be in accordance with *AS/NZS 3000 Wiring Rules*. Stranded copper conductor cable of not less than 6mm^2 or not more than 35mm^2 shall be used for the wiring of individual meters.

Factory assembled combinations, will also be accepted, subject to the manufacturer having previously submitted full details and received ActewAGL approval of the system.

5.7 Protection Against Short Circuit

Direct connected meters and control devices must be so located within the customer's installation that they, together with the wiring associated with them, are adequately protected against short circuit.

5.7.1 Services not exceeding 100A

Where conductors of not less than 6mm^2 are used and ActewAGL service fuse does not exceed 100A rating, then the requirement of Clause 5.7 is met.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

5.7.2 Services exceeding 100A

ActewAGL will provide a HRC fuse on the line side of the metering, capable of interrupting any overcurrent up to the prospective short circuit current.

5.7.3 Sub-mains to separate occupancies

ActewAGL providing HRC fuses for connections of the meters will meet the requirement.

The customer must provide over current protection in the form of a circuit breaker located after the meter or control device.

6 SEALING OF UNMETERED EQUIPMENT

In general, the customer is required to suitably enclose and arrange for sealing by ActewAGL of all the equipment installed on the line side of the meters, together with all metering connections.

Adequate segregation is required between portions of a switchboard, which are sealed, and those, which are not.

7 SPACING BETWEEN METERS & CURRENT CARRYING CONDUCTORS

Specific requirements for the spacing between meters and current carrying conductors are detailed at clause 4.6 of the Service and Installation Rules.

8 LABELLING

Where premises are subdivided into multiple occupancies and a separate supply is given to occupiers of individual rooms, suites of rooms, flats, units, etc., an identification number or letter, or combination of both must be assigned and marked on the main entrance door of each occupancy. A durable corresponding marking must be placed on the meter panel and distribution board to identify the supply to that portion of the premises.

Where premises are supplied from more than one service, labels shall be provided at each service position at the main switchboard associated with it, indicating the portion of the installation supplied. The location and conditions of operation of any alternative source of supply must also be indicated.

9 DRAWINGS

The following drawings form part of this Appendix: -

[8911-308](#) Typical Metering Cubicle for Multi-Installations.

[8911-324](#) Metering Cubicle for Multi-Installations and looping of ActewAGL Cables

[8913-213-06](#) Wall Mounted Service Cubicle with Modular Feeder Units

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A5 OFF PEAK SUPPLY

1 SCOPE

This publication sets out the provisions, which an applicant for Off-Peak tariff is required to provide for the connection of ActewAGL's service equipment and metering.

2 CONDITIONS FOR CONNECTION TO THE ELECTRICITY NETWORK

The conditions for connection to the electricity network shall be as set out in the Electricity Network Schedule of Charges and the Electricity Connection and Distribution Standard Customer Contract. These charges and contract are published on the ActewAGL website at www.actewagl.com.au.

3 SUPPLEMENTARY INFORMATION

3.1 Definitions

3.1.1 Storage Water Heater

"Storage Water Heater" shall mean a device in which water is heated and stored in a container and drawn off for use. (The term shall include a water heater incorporating a heat exchanger for transferring heat from the stored water to the water that is drawn off. The water within the exchanger cannot be used). Storage Water Heaters are eligible for connection to Off-Peak.

3.1.2 Thermal Storage Space Heater

"Thermal Storage Space Heater" is a device by means of which energy in the form of heat may be stored in concrete, masonry, metal, liquid or other suitable material for a lengthy period and subsequently liberated to surrounding air. The device may be in the form of an independent unit or it may be incorporated in the building structure, e.g. heating units embedded in a concrete floor. Thermal storage space heaters are eligible for connection to Off-Peak.

4 CONTROL OF OFF PEAK INSTALLATIONS

Any installations that vary from the standard diagram shall be discussed with ActewAGL prior to installation.

5 OTHER HEATING SOURCES

Off-Peak is not available to electrically boosted water heaters where gas, kerosene or other types of fuel are used as the primary source of heating. However, electrically boosted solar storage water heaters will be supplied at Off-Peak under similar conditions to other types of electric storage water heaters. The rated hot water delivery will include the electrically heated and solar sections of the unit.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

6 SWIMMING POOLS AND SPA POOLS

An electrically heated swimming pool or spa pool is classified as a storage water heater and is eligible for connection to Off-Peak subject to minimum volume limitations.

The nominal capacity of the pool shall be taken as the rated hot water delivery in determining eligibility for supply at Off-Peak.

Note:

Spa and turbo tubs that do not have self contained heating elements are not storage water heaters and therefore do not qualify for off peak tariffs.

7 REPLACEMENT OF WATER HEATERS

Water heaters supplied by Off-Peak shall be replaced by heaters of similar or increased volume.

8 CHANGE-OVER SWITCHING

The Electricity Network Schedule of Charges require that single element water heaters and thermal storage heaters supplied at Off-Peak may be given supply only within prescribed hours. A change-over switch which would enable the water heater load, normally supplied at the Off-Peak Charge, be transferred by the customer to the Principal Charge is permissible. The change over switch is to have an "off" position.

9 REQUIREMENTS FOR INSTALLATION OF A CONTACTOR AND MINIMUM SIZE OF CONDUCTORS

Where, in accordance with the provisions of any Charge published by ActewAGL, electricity is to be supplied only during certain hours, ActewAGL will provide and install a single pole control device capable of directly controlling loads supplied under that Charge, up to a rating of 30 amperes.

Where the controlled load exceeds 30 amperes or involves the switching of more than one phase of supply, the customer shall provide and install a contactor arranged so that it is operated by ActewAGL's control device. The contactor shall be of an approved type, be capable of carrying the full connected load, suitable for sealing and shall be installed at the meter position. The customer shall also install the necessary wiring and ensure that the contactor is satisfactorily maintained. All conductors associated with the Off-Peak supplies shall be a minimum 6mm².

10 CALCULATION OF MAXIMUM DEMAND FOR OFF-PEAK CHARGES IN A DOMESTIC INSTALLATION

When calculating the maximum demand for consumer's mains the demand of the off-peak elements shall be taken to be the full load current.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

1. When the calculated maximum demand is less than 100 amps including the off-peak elements, the consumer's mains shall consist of a one phase two wire system.
2. When the calculated maximum demand including the off- peak elements exceeds 100 amps the consumer's mains may consist of a two phase three wire system.

11 DRAWINGS

The following drawings form part of this Appendix: -

<u>8911-1211-107</u>	Typical Wiring Diagram for 1 Phase Electronic Meter with Off Peak load up to 30 amps
<u>8911-1211-111</u>	Typical Wiring Diagram for 1 Phase or 3 Phase Meters with Off Peak load greater than 30 amps
<u>8911-1211-113</u>	Three Phase Off-Peak with Booster Switch
<u>8911-2211-101</u>	Standard Switchboard Arrangement Domestic and Off-Peak Tariffs

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A6 CURRENT TRANSFORMER METERING

1 SCOPE

This publication sets out the facilities the customer is required to provide to accommodate current transformer metering for supply at 415/240 volts.

2 GENERAL

Current transformer metering will generally be used when it is anticipated that the maximum demand of an installation or portion of an installation, which is to be separately metered, will exceed 100A per phase. In addition to providing facilities in accordance with Appendix A4 for ActewAGL's service fuses and for any direct connected meters necessary, the customer shall provide facilities for mounting and connecting the current transformers, meters and associated equipment, in accordance with this publication.

3 FACILITIES REQUIRED FOR INSTALLATION OF METERS

3.1 CT Metering Panel

In respect of each separately metered portion of an installation for which CT metering is necessary the customer shall provide and install a metering enclosure which shall be suitably screened from current carrying conductors as stipulated under Clause 4.6 of the Service and Installation Rules and in general shall not form part of the main switchboard. Details of the enclosures are contained in the drawings referenced in this appendix.

Specific details of all installations are available from the ActewAGL Office, Greenway.

3.2 Location and Access Requirements

The CT metering panel shall be installed by the customer and pre-drilled to accommodate the fixing and connection of ActewAGL's meters and equipment.

ActewAGL will indicate the position required. In general, the panel must be located so that no portion of it is lower than 760mm or higher than 2300mm from the ground or floor level where it is installed.

Protection required for meters and metering equipment is to be in accordance with Clause 4.8 of the Service and Installation Rules.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

4 FACILITIES REQUIRED FOR INSTALLATION OF CURRENT TRANSFORMERS

4.1 General

For installations and separately metered portions of installations requiring the use of current transformers, it is generally required that these current transformers and associated equipment be fixed within the customer's main switchboard.

The customer shall submit drawings for the proposed facilities for metering equipment and, subject to ActewAGL's approval, the CTs and potential circuit fuses will be provided for installation by the customer. The care of this equipment is the responsibility of the customer.

4.2 Circuit Location

The metering equipment will be fixed in a position approved in each instance by ActewAGL, and usually will be connected between the service fuses and the customer's main control gear. In special cases, ActewAGL may agree to connect the metering equipment on the load side of the customer's main control gear. In such cases, all the customer's switch and fuse gear connected on the supply side of the metering equipment shall be of the enclosed type and suitable for sealing, unless permission is given for the exposure of unmetered conductors under specified conditions in an approved location.

4.3 Location and Access Requirements

The location of current transformers, removable busbars, potential circuit fuses and neutral connecting link incorporated in or on a switchboard, shall be such that no part of any of these items is less than 760mm or more than 2300mm from the floor or platform from which access is obtained. They shall be conveniently accessible from outside the switchboard structure. Connections to the CT secondary terminals, potential fuses and metering neutral link shall be not more than 300mm from the plane of the access panel or doorway for cubicle switchboards.

The cubicle or section of the switchboard allocated for the installation of ActewAGL's metering CTs, potential fuses, etc. shall be completely segregated from the customer's portion of the switchboard by means of suitable rigid barriers.

4.4 Safety Screen

In order to reduce the possibility of inadvertent contact of persons or foreign objects with the live busbars, a removable insulated screen is required within the CT enclosure to provide a complete "dead front". In this regard the screen shall extend the full width of the chamber and extend at least 100 mm beyond the consumer's mains termination lugs. The CT secondary terminal covers, potential fuses and where applicable service fuses shall protrude through the screen to enable CT ratio changes and fuse cartridge replacements to be effected without its removal. All CT secondary wiring and the wiring to and from

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

the fuses shall be located behind this screen. The screen shall be equipped with two (2)-insulated handles to permit its safe removal.

4.5 Doors

Doors shall be provided with facilities for easy and safe opening or removal. Doors shall be hinged and capable of opening to a minimum of 90 degrees.

4.6 Identification

The door shall be labelled "ActewAGL CT Metering Section" and clearly identify the associated customers.

4.7 Locking

Locking of the door shall be provided with an approved lock, provided by the customer. (Lockwood type 201.)

4.8 Mountings

The mountings which are to be provided by the customer for the current transformers shall consist of 6mm dia. studs, secured by brazing or equivalent means to a mounting plate or bar, together with nuts. Alternatively, tapped holes at two diagonally opposite corners of a mounting plate and slotted or hexagon-head 6 mm dia. set screws are acceptable, subject to dowels being provided at the other corners to support the current transformers during removal of the set screws.

A pre-drilled baseboard of insulating material shall be provided for the mounting of the potential fuses in an accessible position near the current transformers with which they are associated. The mounting baseboard shall be in approximately the same plane as the safety screen. A clearance of 100mm (min.) to 300mm (max.) shall be provided between it and the enclosure door. The fuses shall be stud connected to its associated busbar on the line side of the current transformers.

Dimensions of current transformers are given in Drawing [8911-2213-101](#), "Specifications of Current Transformers".

4.9 Primary Conductors

The conductors passing through each current transformer shall be in the form of a removable section of copper busbar enclosed within the switchboard to enable alterations or removal of the current transformer.

The surfaces to which these conductors are to be connected shall be either copper or suitably plated copper or copper alloy.

Connection and disconnection shall be by the use of adjustable or socket type spanners.

The size and shape of the busbar shall be selected to suit the openings in the current transformers of the type nominated by ActewAGL.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

The removable section of busbar shall be 300mm (min) to 450mm (max) in length. No wiring is permitted to be connected to the removable section of the busbar or the bolts or fixings which secure it.

5 FACILITIES REQUIRED FOR THE CONNECTION OF METERING EQUIPMENT

5.1 General

Drawing [8911-1213-101](#) shows a typical wiring diagram for CT metering. The customer shall provide and install all wiring necessary between the current transformer position and the meter position for each separately metered portion of the installation. The wiring shall be 0.6/1kV, plastic insulated, stranded copper conductor of cross-sectional area indicated in Clauses 5.3 and 5.4. Each of the insulated conductors shall be visually distinguishable by colour and size.

The conductors shall comprise of single insulated conductors enclosed in conduit. No wiring for purposes other than that described in Clauses 5.2 to 5.6 inclusive shall be contained in the conduit.

Sufficient length to enable connections to be made by ActewAGL's Officer, (1500mm minimum) shall be provided at the meter. Connections in the CT enclosure shall be made by the electrical contractor.

Except where otherwise approved by ActewAGL's Officer, the conduit shall be open to view.

5.2 Identification of conductors

Each of the insulated conductors shall be visually distinguishable by colour and size in accordance with Drawing [8911-1213-101](#).

5.3 Current Circuit Wiring

The cross-sectional area required for the CT current circuit conductors is dependent upon the route length of the wiring between the meter panel and the current transformers and on the transformer characteristics. It shall be not less than $7/0.67 \text{ mm}^2$ as shown in Drawing [8911-1213-101](#).

Where the route length is likely to exceed 10 metres, ActewAGL's approval must be obtained.

5.4 Potential Circuit Wiring

The potential circuit wiring shall be $7/0.50 \text{ mm}^2$. The potential fuses shall be stud connected to the busbar on the line side and close to each current transformer.

A connection facility is to be provided for the metering neutral conductor in an accessible location in close proximity to the current transformer position.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

The connection to a busbar shall be by means of a suitable lug secured by a 6 mm dia. set screw into a tapped hole and be clearly visible from the position of the current transformers. Any alternative proposal for the means of connection of potential circuit wiring and metering neutral conductors as above shall be submitted in writing for ActewAGL approval.

5.5 Protective Enclosure

The form of protective enclosure for the potential and current circuit wiring shall, where practicable, be a surface run rigid PVC conduit without inspection fittings. The conduit shall be adequately supported and in the case of switchboard mounted current transformers, shall continue into the switchboard enclosure to a position adjacent to the base of each current transformer and to the potential fuses.

Where surface run wiring is not practicable, the wiring shall be in heavy duty UPVC conduit laid at a depth of 500mm except where the conduit is encased in concrete.

5.6 Earthing Connection

The customer shall also install a 2.5mm² stranded copper earthing conductor, in accordance with the provisions of *AS/NZS 3000 Wiring Rules*, and connect it to an earthing terminal inside the metal surround of the meter panel and also provide an additional length of 1500mm.

6 FURTHER INFORMATION

Where it is proposed to incorporate ActewAGL's metering current transformers within a customer's switchboard, contact should be made by the switchboard manufacturer with ActewAGL so that the proposed arrangements may be discussed.

7 DRAWINGS

The following drawings form part of this publication: -

<u>8911-1213-101</u>	Diagram of Connections to Current Transformers Kilowatt-hour Polyphase Meter, Test Links and Potential Fuses.
<u>8911-2213-101</u>	Specifications for Current Transformers.
<u>8911-307</u>	Metering Cubicle for Current Transformer Metering up to 600/5 CTs

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A7 TEMPORARY INSTALLATIONS

1 SCOPE

This document outlines procedures relating to the connection of temporary installations. The following procedures will assist in meeting the reasonable needs of customers, contractors and ActewAGL, and avoid misunderstandings and delays.

2 GENERAL

2.1 Warning Against Premature Expenditure

No expense should be incurred by the prospective customer towards the erection of a temporary installation until ActewAGL has indicated, that connection to the network can be made available, and the conditions under which connection to the network is to be given.

Where it is not necessary to extend or augment the electricity network in an area, ActewAGL may install a temporary connection for a limited duration to supply electricity for specific purposes, such as a builder's power switchboard.

Where it is necessary to extend or augment the electricity network to provide connection services, the terms and conditions for connection will be subject to negotiation, upon receipt of a written request for connection to the network. Provision of a temporary connection in these circumstances is conditional upon availability of adequate construction resources.

Where a temporary connection is provided for construction purposes it will normally be disconnected at the time of installation of the permanent service equipment unless prior arrangements have been made by the customer.

2.2 Connection of Temporary Installations

ActewAGL will connect the installation if it complies with the conditions set out hereunder.

Upon the receipt of: -

- (a) An application for connection to the network duly completed and signed by the customer,
- (b) Payment of such charges, for any works required of ActewAGL, as may be determined by ActewAGL and
- (c) An electrical contractor submits a Request for Service form and a statement that a Certificate of Electrical Safety has been submitted by a licensed electrical contractor to BEPCON

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

ActewAGL will check the installation and, if found to comply with the conditions set out herein, will connect the installation.

ActewAGL will not connect to the network temporary installations on large construction sites that have submains supplying site sheds or additional temporary power boxes unless approved by BEPCON.

The connection of the temporary installation by ActewAGL will constitute ActewAGL's initial permission for the temporary installation to remain connected for a period not exceeding twelve months.

3 TEMPORARY INSTALLATION ARRANGEMENTS

3.1 Customers Installations

The customer is responsible for the erection of an approved meter box and meter panel and, where required, an approved pole.

The electrical installation shall be installed in accordance with this Appendix, *AS/NZS 3000 Wiring Rules* and *AS/NZS 3012 Electrical installations - Construction and demolition sites*.

3.2 Earthing

The Multiple Earthed Neutral (M.E.N.) system of earthing shall be used.

3.3 Mounting of Switchboards

Switchboards and meter boxes shall not be mounted on ActewAGL's poles or on poles located outside the building allotment.

4 METHOD OF CONNECTION

4.1 Overhead Connection

ActewAGL will provide an aerial service cable to a point not further than 15 metres (15m) from its pole, see Drawing [8914-201](#)

4.2 Underground Connection for Domestic Installations

ActewAGL will provide an underground service cable to the permanent metering position in a domestic installation. The customer shall provide an underground conduit from the boundary to the meter box, see Drawings [8912-02](#) and [8912-03](#).

The electrical contractor shall install consumer's mains to supply the temporary installation (see Drawing [8914-202](#)) and no additional charge will be made by ActewAGL to reconnect these mains to the permanent metering equipment during normal working hours.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

4.3 Underground Connection for Commercial Installations

ActewAGL will provide an underground service cable to an agreed temporary metering position on a commercial installation. The electrical contractor shall make provision for the installation and termination of the service cable, and the installation of all metering equipment.

Any person carrying out work or other activities under, over or adjacent to any ActewAGL plant which could in any way affect access to, clearances from or the safety of persons near such plant is required to notify ActewAGL and to obtain the necessary approvals.

5 SHOWS, CARNIVALS AND TENTS

Temporary installations for shows, carnivals and tents shall comply with *AS/NZS 3001 Electrical installations - Relocatable premises (including caravans and tents) and their site installations*, *AS/NZS 3002 Electrical installations - Shows and carnivals* and *AS/NZS 3000 Wiring Rules*.

Any person proposing to carry out a temporary electrical installation is required to provide notification to ActewAGL, to obtain the necessary approvals and to pay the applicable fees and charges.

6 DRAWINGS

The following drawings form part of this publication: -

<u>8912-02</u>	Underground Service Conduit Requirements
<u>8912-03</u>	Typical Underground Service Cable Conduit Requirements for a Single Domestic or Small Commercial Installation
<u>8914-201</u>	Temporary Installation Residential Blocks -Overhead Supply
<u>8914-202</u>	Temporary Installation Residential Blocks -Underground Supply

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A8 UNDERGROUND SUPPLY TO SINGLE DOMESTIC AND SMALL INSTALLATIONS

1 SCOPE

This publication sets out ActewAGL's requirements for the provision of underground service cables, consumer's mains and conduit, in single domestic or small installations where the rating of the service does not exceed 100A per phase.

2 GENERAL

Where ActewAGL determines that connection to the network will be made available by means of underground cable or where the customer's request is granted by ActewAGL for provision of underground supply, the customer is required to provide, install and maintain the conduit and associated facilities and the consumers mains where required.

ActewAGL installs and maintains the service cable. A charge is made in certain circumstances in accordance with Clause 4.2.5 of the Service and Installation Rules.

Upon receipt by ActewAGL of the approved plan of the premises, an officer will indicate ActewAGL's requirements, so that conduit can be laid before concrete foundations and the like are installed.

A Request for Service (RFS) form must be submitted 15 working days prior to completion of necessary building work to give ActewAGL time to install the underground service.

3 INSTALLATION OF CONDUIT FOR SERVICE CABLE

3.1 Type and Size

The conduit shall be heavy duty rigid UPVC to *AS/NZS 2053 Conduits and fittings for electrical installations*.

The diameter shall be 50mm minimum, except in special circumstances where a conduit of larger diameter is required by ActewAGL's officer.

3.2 Laying of Conduit

The conduit shall be laid in accordance with the approved plan, in a generally straight line from a position on the boundary alignment to the meter box. The conduit shall be laid at a depth which provides 600mm of cover to finished ground level for 50mm conduits and 850mm of cover for larger conduits. The conduit is not to pass under the building.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

Installation of conduit in rock shall be in accordance with *AS/NZS 3000 Wiring Rules*.

Notes:

1. Generally the meter box is housed in a recess in the wall, as shown in Drawing [8912-02](#). With this arrangement, the conduit may have to pass through a structural footing of the building and rise within the cavity of an external wall.
2. ActewAGL's cables in the nature strip should be treated as "live" and care must be exercised during excavation. (Clearances must be obtained from "Dial Before You Dig" by telephoning 1100 a minimum of two full working days before excavations begin)

3.3 Bend Limitations

Only one bend of 90 degrees or less, having a radius of not less than 450mm, is permitted where the conduit rises to the meter box or other terminating position. No additional bends shall be installed but a minor deviation of the straight line run of the conduit is permissible, i.e. within the flexibility of the conduit without distortion of the walls. If it is found to be impracticable to install the conduit in accordance with these requirements, ActewAGL's advice should be sought.

3.4 Joints

Joining of the conduit shall be by means of sockets or fittings which are installed so that the internal bore of the system is continuous and smooth and presents no obstruction to pulling in the cable. Joints shall be watertight and bonded using an appropriate jointing method.

3.5 Draw Wire

A continuous 2.5mm (minimum) diameter steel draw wire, protruding at least 600mm from each end of the conduit shall be provided.

3.6 Drainage of Conduit

Where the ground level at the street end of the conduit is above the floor level of the building in which the conduit terminates, a drain shall be provided from the conduit to ensure the conduit is drained and water does not enter the switchboard by one of the following methods: -

- (a) Where the conduit rises on the outside of the building, the drain shall be in the form of a 10mm diameter hole in the conduit, arranged to point towards the wall approximately 300mm above ground level so that the entry of water and debris is minimised.
- (b) Where the conduit is not on the outside of the building, a 15mm diameter PVC pipe shall be solvent-welded into the conduit without

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

protruding into the bore. It shall be arranged to discharge to the exterior of the building approximately 300mm above ground level.

3.7 Sealing

Care shall be taken to prevent material from entering the conduit. The conduit shall be sealed at the street end with a plug or cap and soft mastic compound, which can be removed easily.

The conduit end shall be identified by the installation of an appropriate marker peg.

3.8 Trench Inspections

The trench may be backfilled before the installation is inspected.

4 PROVISION FOR OTHER SERVICES

Other services may be located in the same trench as ActewAGL's service cable provided that, with the exception of necessary crossings, they are separated as far as practicable in the trench and not laid over the service cable.

5 DRAWINGS

The following drawings form part of this publication: -

<u>8911-313</u>	Meter Box for Installation with 50 mm ² Underground Service Cable.
<u>8912-02</u>	Underground Service Conduit Requirements.
<u>8912-03</u>	Typical Underground Service Cable Conduit Requirements for a Single Domestic or Small Commercial Installation.
<u>8913-22-02</u>	P.O.E. / Fuse Box for Domestic & Small Commercial Customers (16mm ² Underground Services)

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A9 UNDERGROUND SUPPLY TO INSTALLATIONS WITH DEMANDS EXCEEDING 100 AMPS PER PHASE

1 SCOPE

This publication sets out ActewAGL's requirements for the provision of underground service cables, consumer's mains and conduit where the rating of the service exceeds 100A per phase.

2 GENERAL

Where ActewAGL determines that supply will be made available by means of underground cable or where the customer's request is granted by ActewAGL for provision of underground supply, the customer is required to provide, install and maintain the conduit and associated facilities and the consumers mains where required.

ActewAGL installs and maintains the service cable. A charge is made in certain circumstances in accordance with Clause 4.2.5 of the Service and Installation Rules.

Upon receipt by ActewAGL of the approved plan of the premises, an officer will indicate ActewAGL's requirements, so that conduit can be laid before concrete foundations and the like is installed.

A Request for Service (RFS) form must be submitted 15 working days prior to completion of necessary building works to give ActewAGL time to install the underground service.

3 INSTALLATION OF CONDUIT FOR SERVICE CABLE

3.1 Type and Size

The conduit shall be heavy duty rigid UPVC to *AS/NZS 2053 Conduits and fittings for electrical installations*.

The nominal size of conduits and minimum radius of bends shall be generally in accordance with Table 1. A larger size or a second conduit may be specified by ActewAGL's Officer.

**TABLE 1
MINIMUM RADII FOR CONDUIT BENDS**

Nominal Conduit Size (mm)	Minimum Radius of Bend UPVC (mm)
50	450
100 - 140	1200

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

3.2 Laying of Conduit

The conduit shall be laid in accordance with the approved plan, in a generally straight line from a position on the boundary alignment to the meter box or point of entry cubicle. The conduit shall be laid at a depth which provides 600mm of cover to finished ground level for 50mm conduits and 850mm of cover for larger conduits. The conduit is not to pass under the building.

Installation of conduit in rock shall be in accordance with *AS/NZS 3000 Wiring Rules*.

Notes:

1. Generally the meter box is housed in a recess in the wall, as shown in Drawings [8912-02](#) and [8912-04](#). With this arrangement, the conduit may have to pass through a structural footing of the building and rise within the cavity of an external wall.
2. ActewAGL's supply cables in the nature strip should be treated as "live" and care must be exercised during excavation. (Clearances should be obtained from "Dial Before You Dig" by telephoning 1100 a minimum of two full working days before excavations begin)

3.3 Bend Limitations

Only one bend of 90 degrees or less, having a radius as shown in Table 1 is permitted where the conduit rises to the meter box or other terminating position. No additional bends shall be installed but a minor deviation of the straight line run of the conduit is permissible, i.e. within the flexibility of the conduit without distortion of the walls. If it is found to be impracticable to install the conduit in accordance with these requirements, ActewAGL's advice should be sought.

3.4 Joints

Joining of the conduit shall be by means of sockets or fittings which are installed so that the internal bore of the system is continuous and smooth and presents no obstruction to pulling in the cable. Joints shall be watertight and bonded using an appropriate jointing method.

3.5 Draw Wire

A continuous 2.5mm (minimum) diameter steel draw wire, protruding at least 600mm from each end of the conduit shall be provided.

3.6 Drainage of Conduit

Where the ground level at the street end of the conduit is above the floor level of the building in which the conduit terminates, a drain shall be provided from the conduit to ensure the conduit is drained and water does not enter the switchboard by one of the following methods: -

- (a) Where the conduit rises on the outside of the building, the drain shall be in the form of a 10mm diameter hole in the conduit, arranged to point

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

towards the wall approximately 300mm above ground level so that the entry of water and debris is minimised.

- (b) Where the conduit is not on the outside of the building, a 15mm diameter PVC pipe shall be solvent-welded into the conduit without protruding into the bore. It shall be arranged to discharge to the exterior of the building approximately 300mm above ground level.

3.7 Sealing

Care shall be taken to prevent material from entering the conduit. The conduit shall be sealed at the street end with a plug or cap and soft mastic compound, which can be removed easily.

The conduit end shall be identified by the installation of an appropriate marker peg.

3.8 Termination of Conduit

Conduit shall terminate immediately inside a switchroom, weatherproof switchboard enclosure or the top of the base of a point of entry cubicle as shown on approved plans.

4 INSTALLATION OF A SERVICE CABLE TO A POINT OF ENTRY CUBICLE

4.1 General

Where, in accordance with Clause 2, ActewAGL identifies that it is necessary to install a point of entry cubicle, an approved enclosure (point of entry cubicle) shall be provided by the customer to terminate the service cable and connect the consumer's mains.

4.2 Point of Entry Cubicle

The enclosure shall be installed in a location which has been agreed to by ActewAGL as being suitable and to which a conduit for the installation of the service cable can be laid in accordance with Clause 3. The location must be such that unrestricted access is provided.

Each cable of the consumers mains shall be left extended above the top of the enclosure base for the height of the enclosure to allow termination and connection to the service cable by ActewAGL.

A typical underground service cable termination enclosure is shown in Drawing [8913-213-06](#).

5 CONSUMERS MAINS

5.1 Copper Conductor

The customer shall provide suitable lugs for the copper conductors. ActewAGL will fit the lugs and terminate the conductors to ActewAGL's equipment.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

5.2 Aluminium Conductor

The customer is responsible for terminating aluminium conductors in a manner satisfactory to ActewAGL.

5.3 Mineral Insulated Metal Sheathed Cable

The customer is responsible for terminating MIMS cables in a manner satisfactory to ActewAGL.

6 PROVISION FOR OTHER SERVICES

Other services may be located in the same trench as ActewAGL's service cable provided that, with the exception of necessary crossings, they are separated as far as practicable in the trench and not laid over the service cable.

7 DRAWINGS

The following drawings form part of this publication: -

[8911-307](#) Metering Cubicle for Current Transformer Metering up to 600/5 CTs

[8911-308](#) Metering Cubicle for Multi-Installations.

[8911-313](#) Meter Box for Installation with 50mm² Underground Service

[8911-324](#) Typical Metering Cubicle for Multi-Installation and Looping of ActewAGL Cables

[8912-04](#) Typical Underground Service Cable Conduit Requirements for Installations Exceeding 100Amps per Phase

[8913-213-06](#) Wall Mounted Service Cubicle with Modular Feeder Units

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A10 DUAL OCCUPANCY OF RESIDENTIAL LEASES

1 SCOPE

This publication sets out the provisions for the installation of ActewAGL's electrical services for a dual occupancy residential lease.

Dual Occupancy shall mean, *"two detached dwellings constructed on the one residential block"*.

Dual Occupancy shall not include additional dwellings, which are attached or form part of the existing dwelling or for non-residential structures.

Consideration has been given to two different methods of servicing and metering of dual occupancy dwellings:-

- (1) A single service to each lease, or
- (2) Separate services to each dwelling on the one lease.

The method to be used should be arrived at by mutual agreement between the lessee and ActewAGL and should be determined before the commencement of any work as it may not be possible to provide a second service.

2 GENERAL

Clause 3.4 of ActewAGL's Service and Installation Rules provides for a single service to each residential lease upon which a domestic dwelling is constructed. The service may be either overhead or underground. ActewAGL will determine the appropriate point for the connection of the service.

3 SINGLE SERVICE

Where a single service is provided to a residential lease with more than one dwelling it shall generally be connected to the front or original dwelling.

This method may be particularly appropriate when an underground service is provided from the boundary alignment at the front of the lease or when an overhead service is already provided to the front or original dwelling

4 SEPARATE SERVICES

Separate services for additional dwellings on one lease are not usually provided although Service and Installation Rule Clause 3.5 does permit additional services at the customer's expense and at the discretion of ActewAGL.

Where a separate service is installed to an additional dual occupancy dwelling on the one lease, the cost of the second service is to be borne by the lessee.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

Separate services will not be provided for additional dwellings which form part of the existing residence or for non-residential structures.

5 CONNECTION TO THE PREMISES

In the case of overhead services the customer must provide a suitable bracket for attachment of ActewAGL's aerial service line.

Where ActewAGL cannot provide an overhead service from a pole located at the rear of the block an underground service will be installed. This service may terminate in a service box which may be located on the back wall of the dwelling or at a meter box in an approved location. See Drawing [8911-321](#).

For underground services from the street a conduit is to be installed in accordance with Appendix A8 Underground Supply to Single Domestic and Small Installations, from a point determined by ActewAGL on the front boundary alignment, and terminating in the meter box.

6 METERING

Metering for domestic dwellings is required to be installed in an approved meter box in a suitable position as determined in Appendix A3 Provision for Service Equipment in Single Domestic and Small Installations and Drawing [8911-321](#).

Where only one service has been supplied for more than one dwelling or structure, e.g. a house and flat, or two separate dwellings on the one lease block, the meters shall be grouped at a single meter box, which would normally be installed, on the front or original residence. Both dwellings would be considered to form a single installation in accordance with *AS/NZS 3000 Wiring Rules*, and shall be controlled from a single main switchboard.

Where a separate service has been provided for each dwelling and separate meter boxes are installed, the access provisions for both meter boxes shall be in accordance with the Service and Installation Rules.

7 DRAWINGS

The following drawings form part of this publication: -

[8911-321](#) Permissible Meter Locations Domestic Installations

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A11 SMALL SCALE PARALLEL CUSTOMER GENERATION VIA INVERTERS

1 SCOPE

This publication sets out the provisions for the installation of parallel generation facilities located on a customer's premises that are connected to ActewAGL's LV distribution system via an inverter. This generation source is typically solar photovoltaic (PV), but shall not preclude other approved sources.

These rules apply to single and three-phase generation rated at less than 10 kVA per phase per distribution network connection point. Larger generators will require special negotiation and approval by ActewAGL.

The scope of this document is limited to connection issues. Commercial details, including buy-back rates for exported energy are addressed separately.

2 GENERAL

Generating installations connected to ActewAGL's distribution system must comply with all statutory and regulatory requirements and Standards, including but not limited to:

- *AS/NZS 3000 Wiring Rules*
- *AS 4777 Grid connection of energy systems via inverters*
- *AS/NZS 61000 Electromagnetic compatibility (EMC)*
- ActewAGL's Electricity Connection and Distribution Standard Customer Contract

ActewAGL may disconnect any generating equipment from their distribution system if ActewAGL considers, on reasonable grounds, that:

- the equipment is dangerous to ActewAGL's staff or representatives, or other persons
- the continued operation of the equipment poses a threat to the integrity of ActewAGL's distribution system or other customer's electricity supply
- specified testing is not conducted as described in this document.

All enquiries regarding the installation and connection of alternative sources of low voltage supply must be directed to ActewAGL.

3 APPROVALS

The installation of the inverter and protection equipment must be approved by ActewAGL prior to installation. The customer must provide all appropriate documentation at the time of application for connection, including, but not limited to:

- single line diagram of the complete installation, including the Direct Current (DC) and Alternating Current (AC) sides of the inverter, all earthing

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

arrangements and connection point details. This should also include details of either earthed or floating DC circuitry

- full description of all protection equipment installed, including Type Test information and results verification of compliance with anti-islanding, voltage transients and harmonics as well as details of all settings or ratings
- equipment certification including appropriate test results. This should include evidence acceptable to the Department of Fair Trading in NSW for compliance with minimum safety requirements for electrical equipment categorised as “non-declared electrical articles”.

4 METERING

The customer shall make provision for metering equipment suitable for the purpose of the installation. The metering arrangement will be approved by ActewAGL prior to connection to the network.

Subject to the requirements of the Electricity Metering Code, ActewAGL will supply any standard metering equipment required. The customer shall pay the difference in cost for any non-standard equipment requested by the customer. Non standard metering includes, but is not limited to:

- electronic and/or bi-directional meters
- additional meters

Metering equipment must be installed in a manner and location that meets the requirements of the Service and Installation Rules Clause 4.3, 4.4 and 4.5, Appendix A3, Provision for Service Equipment in Single Domestic and Small Installations and Drawing [8911-321](#).

5 WIRING

All wiring must comply with *AS/NZS 3000 Wiring Rules* and installed to meet the requirements of BEPCON. All earthing arrangements must also meet BEPCON requirements. ActewAGL will not connect the installation to the network without prior approval from BEPCON.

6 CONNECTION TO THE INSTALLATION

All parallel generation sources should be connected to the customer’s electrical installation at a location adjacent to the ActewAGL electricity meter. Any variation to this location must be discussed with ActewAGL and approved prior to installation. The method of connection will depend on the metering arrangement as determined in clause 4.

The generation system must be installed on a dedicated circuit and all circuit cabling must conform to the requirements of BEPCON and be capable of carrying the full rated output of the system.

The customer must install a generator supply main switch at the main switchboard unless approval for an alternative location has been granted by ActewAGL. The customer must include a double-pole DC circuit breaker between the generating unit and the inverter.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

The generator supply main switch and the installation main switch(s) must be lockable or sealable to facilitate safe isolation. Refer to the single line diagram at the end of clause 8.

7 PROTECTION

7.1 Islanding

Islanding is the situation where an inverter maintains a supply to the distribution system during a distribution system supply outage. Such outages may be planned (maintenance) or unplanned (blackouts).

Islanding creates serious safety issues for personnel working on the installation or the distribution system. It also creates quality of supply problems for other customers and the possibility of equipment damage.

All protection equipment associated with a Parallel Generation source must be designed, installed and tested to ensure that islanding cannot occur.

Protection equipment must include both “active” (anti islanding) and “passive” systems.

7.2 Active Protection (Anti Islanding)

Active anti islanding protection must isolate the generation source from ActewAGL’s distribution system in the event of a distribution system supply outage.

Any anti islanding protection must be an approved method such as “frequency drift”. This method locks the inverter to the distribution system frequency as a reference. If distribution system supply is not present, the inverter frequency generator must shift away from the nominal 50Hz, thus tripping the Over / Under frequency protection. It is recommended that the direction of frequency drift be downwards. Alternative methods must be demonstrated to, and accepted by, ActewAGL prior to approval.

Three phase installations shall have protection and monitoring devices in each phase. Protection and monitoring of only one phase, or between two phases is not acceptable.

7.3 Passive Protection

In addition to active protection required under clause 7.2, the customer’s generation installation must have the following minimum protection (in the inverter):

- Over/under frequency
- Over/under voltage
- Over current and short circuit protection.

If the inverter protection is not considered adequate, ActewAGL may require the installation of additional protection. Where required, such backup protection

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

shall be installed in an interconnection protection panel (outside the inverter) and must include:

- Over/under frequency
- Over/under voltage
- circuit breaker

Over/under voltage and frequency protection settings should be negotiated with ActewAGL within the limits specified in AS 4777 and the following Table .

TABLE 1
OVER / UNDER PROTECTION SETTING LIMITS

	Minimum	Maximum
Frequency	48 - 50 Hz	50 - 52 Hz
Voltage	200 V	270 V

Protection devices must be set and calibrated by a recognised calibration laboratory to the satisfaction of ActewAGL. Settings may be either factory set or site programmable.

7.4 Security of Protection Settings

Where the inverter protection system has settings that may be changed via a keypad or switches, adequate security such as a suitable lock or password system must be employed to prevent tampering or unauthorised changing of these settings. All setting changes must have prior approval from ActewAGL.

7.5 Isolation Time

The combination of active and passive protection must operate within two seconds after loss of the distribution system supply under all load conditions. The inverter must remain disconnected from the distribution system until the reconnection conditions of Clause 7.7 have been met.

7.6 Disconnection

Disconnection due to the operation of any of the above protection must be via open contacts that break all active conductors (disconnection by semi-conductor switch alone is not acceptable).

7.7 Automatic Reconnection

Automatic reconnection of the generation system to ActewAGL's distribution system must only occur if the distribution system voltage and frequency are within the protection limits specified in Clause 7.3 and these conditions have been maintained for a minimum of one minute, or as agreed with ActewAGL.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

8 FUNCTIONAL IN-SERVICE TESTING OF INVERTER PROTECTION SYSTEMS

8.1 Installation Testing

The installing contractor must carry out in-service testing of the inverter protection systems at the time of installation using a test method acceptable to ActewAGL. The test results must be recorded and a copy provided to ActewAGL prior to final approval.

8.2 Re-verification Testing

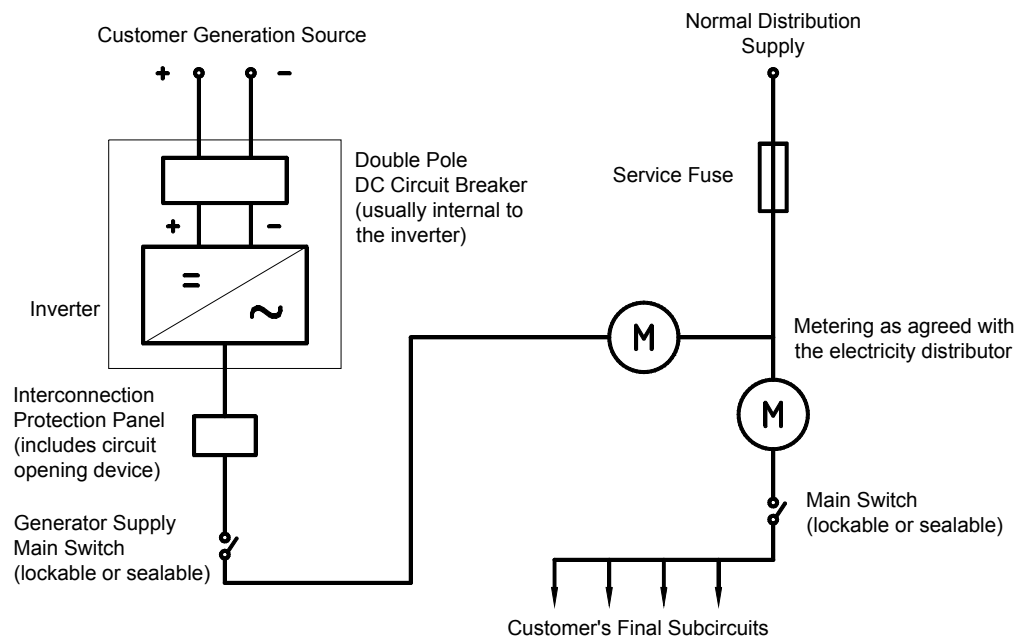
The customer must arrange for a suitably qualified person to conduct in-service testing of the inverter protection systems at regular intervals. Such testing shall be conducted at intervals not exceeding 5 years and the results provided to ActewAGL. Any system not tested within the prescribed time, or that does not meet the requirements of the test procedure shall be immediately removed from service and shall not be reconnected without ActewAGL approval.

8.3 Recommended Anti-Islanding Test Procedure

An approved test procedure is outlined in Appendix B of AS 4777.3. Other test methods may be used with prior ActewAGL approval.

Similar procedures to test backup protection (if installed) should be followed with prior ActewAGL approval.

Typical Single Line Diagram (generation source connected at the main switchboard)



This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

9 LABELLING

The customer must install clear and indelible labelling on all relevant parts of the installation. As a minimum labelling should be placed:

- On the switchboard that has generation facilities connected to it.
- Where approval has been obtained to connect the generation facilities on the customer's side of the connection point; on all switchboards including the main switchboard and distribution board(s) upstream of distribution board where private generation plant is connected.

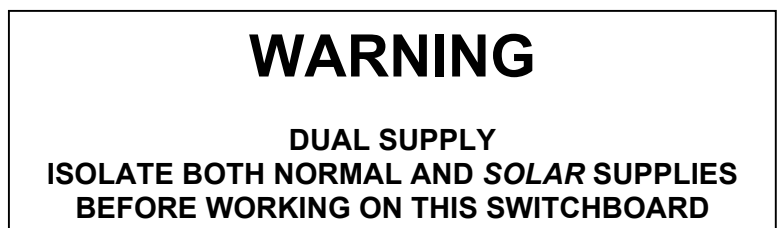
Labels should indicate:

- the existence of an alternative source of supply
- the sections of the electrical installation it can supply
- the point of control
- the conditions under which the alternative source may be operated
- the conditions of connection and suitable operating conditions
- the actual **type** of generation source installed, as particular generation sources have varied electrical characteristics.

Acceptable samples of labels are included below.

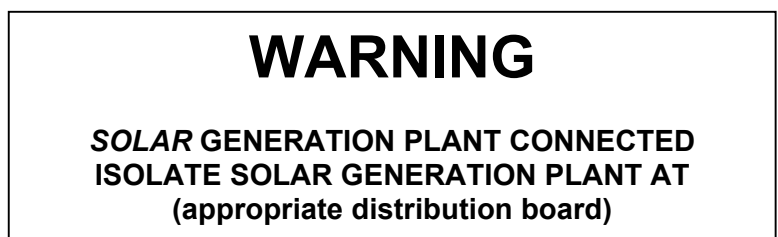
Main switchboard or distribution board where private generation plant is connected.

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



Main switchboard and distribution board(s) upstream of distribution board where private generation plant is connected.

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



NORMAL SUPPLY MAIN SWITCH

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



This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

SOLAR GENERATOR MAIN SWITCH

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

SOLAR SUPPLY MAIN SWITCH

**SOLAR GENERATOR LOCATED IN
(location of *solar* generator)**

10 DRAWINGS

The following drawings form part of this publication: -

[8911-321](#) Permissible Meter Locations Domestic Installations

**This Appendix forms part of the Service and Installation Rules and is to be read in
conjunction with those rules**

APPENDIX A12 INSTALLATION OF POWER FACTOR CORRECTION CAPACITORS AT CUSTOMERS INSTALLATIONS

1 SCOPE

This appendix sets out the requirements for the installation of power factor correction capacitors at customers' installations.

2 BACKGROUND

Customers can gain significant benefits by improving the power factor of their electrical installations. These benefits include reduced electricity costs, increased plant load capacity and utilisation, and better voltage regulation.

Improvement of power factor is usually achieved by the installation of capacitors but unless these are correctly installed, serious problems can arise such as overcompensation, generation of excessive harmonics, and creation of over voltage transients. These problems can affect the quality of the electricity supply, both in the customer's installation and also in the installations of other customers.

3 ActewAGL REQUIREMENTS

The requirements set out below must be observed in order to minimise these and other associated problems. These requirements are intended for application at switchboards or significant individual loads, although some aspects are also relevant to small individual loads.

3.1 Power Factor

Customer power factor at the point of common coupling (PCC) with the ActewAGL network shall be between 0.9 lagging and unity. Leading power factor is not acceptable.

3.2 Compliance with Relevant standards

Compliance is required with the relevant parts of *AS/NZS 61000 Electromagnetic compatibility (EMC)* and the Voltage Tolerance Envelope published by Technical Committee No. 3 of the Information Technology Industry Council of America and shown at Figure 1, with respect to harmonic limits and voltage fluctuation limits during steady state operation and switching conditions. *AS 61000* shall have precedence over the Voltage Tolerance Envelope curve where there is any conflict. Notwithstanding the above, compliance is also required with the ActewAGL Service and Installation Rules; especially with respect to a customer not causing undue interference to another customer, and ActewAGL reserving the right not to assign the complete fluctuating load capability, or voltage distortion capacity, of the system to any one customer, in order to reserve capacity for future customers or other existing customers.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

3.3 Switching Steps

On LV circuits, automatic control of capacitors shall not exceed 50 kVAr steps. On HV circuits the allowable step size will depend on compliance with the above Standards.

3.4 Resonance Mitigation

Appropriate measures shall be employed to avoid resonance with the network and to limit in-rush currents. These measures could include, for example, de-tuning reactors and resistors. The impedance values of this equipment shall be provided with sufficient adjustment capability (for example, $\pm 20\%$) to cater for future ActewAGL network impedance changes that may arise from transformer tap changes, network feeder changes, etc.

3.5 Fault Isolation

Protection schemes that rapidly detect and isolate faults in the power factor correction installation so as not to adversely impact on the network shall be included. Phase voltage imbalance protection across the capacitors shall also be provided.

3.6 Switchgear

Switchgear used for capacitor bank fault breaking/making, switching and isolation has a more onerous duty cycle than that used on general circuits, and must be suitably rated for capacitive currents, fault levels, and possible associated over voltages. All power factor correction equipment shall comply with relevant Australian Standards with an appropriate allowance for over voltages and over currents due to harmonics, resonance and power factor.

Switching and fault isolation equipment shall operate on all phases simultaneously.

3.7 Isolation

Isolation of the capacitor bank via fuse links or the power factor controller that operates capacitor contactors is not acceptable.

3.8 Discharge of Capacitors

All capacitors shall be self discharging (not via fuses), and shall be provided with independent means of direct capacitor discharge and with earthing facilities. Prominent labels advising workers of the correct application method and discharge time duration to avoid electrical hazard shall be provided.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

3.9 Avoidance of Back Generation

Power factor correction installations shall be designed to prevent motor self excitation to ensure that back generation into ActewAGL's network does not occur.

3.10 Star Point Earthing

Capacitor banks that are Wye connected shall have the star point unearthed to avoid triplen harmonic current flow, and to avoid de-sensitisation of earth fault protection schemes. ActewAGL may consider alternative connection arrangements the customer may propose.

4 APPROVALS

Power factor correction proposals submitted to ActewAGL shall include a Single Line Diagram, calculations and other documentation to demonstrate compliance with these requirements. The information submitted shall include:

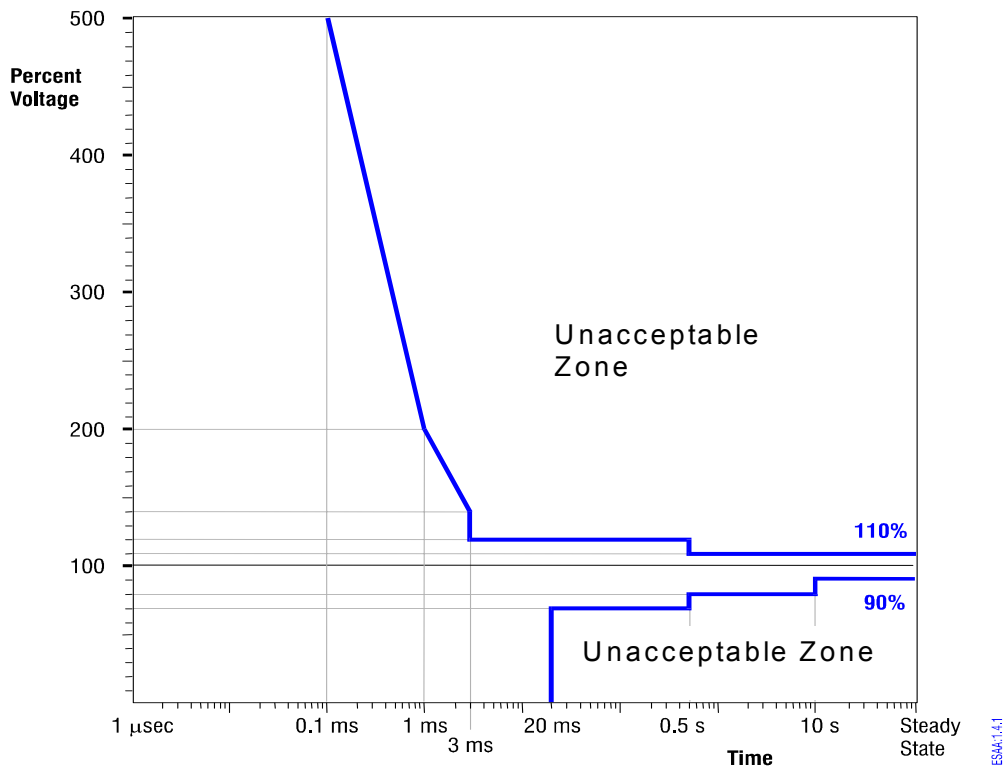
- equipment ratings
- capacitor switching step sizes
- harmonic current and voltage content at the PCC
- natural resonant frequency of the installation
- magnitude and duration of inrush currents and transient voltages during switching
- details of protective devices

Acceptance by ActewAGL of an installation proposal is only in relation to connection to the ActewAGL network. Any installation approvals required by BEPCON shall be the responsibility of the person submitting the proposal.

Upon request, ActewAGL will advise network fault levels at the customer's PCC to facilitate installation calculations.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

**FIGURE 1
THE VOLTAGE TOLERANCE ENVELOPE**



The **Voltage Tolerance Envelope** (supersedes CBEMA curve) published by Technical Committee No. 3 of the Information Technology Industry Council of America

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

APPENDIX A 13 SHORT TIME CONNECTION OF GENERATORS IN PARALLEL WITH THE ActewAGL LV NETWORK

1 SCOPE

This publication sets out the provisions for permitting generators to be briefly connected to ActewAGL's LV distribution system where export of power is not intended.

2 GENERAL

Customers with generators may need to operate them briefly in parallel with the ActewAGL supply to permit generator load testing or for load transfer reasons, without incurring loss of supply to the load. ActewAGL is prepared to accept momentary parallel operation of a generator with ActewAGL's LV supply for these purposes provided the requirements in Clause 4 are met.

3 APPROVALS

Customers cannot connect generators to ActewAGL's network until ActewAGL has given written approval.

Acceptance by ActewAGL of an installation proposal is only in relation to connection to the ActewAGL network. Any installation approvals required by BEPCON shall be the responsibility of the person submitting the proposal.

4 ActewAGL REQUIREMENTS

These requirements are to protect and limit interference to ActewAGL's network and other customers, and are not intended to indicate the requirements necessary for adequately protecting the generator installation. It should also be noted that ActewAGL employs auto-reclosing on its 11 kV feeders and reclosing may occur at any time without warning. This may result in automatic re-connection of ActewAGL supply that is not synchronised with the generator, and thus the design should cater for this auto reclosing possibility.

4.1 Documentation

A complete legible detailed schematic and relevant documentation (including generator size, and protection settings relevant to network interface aspects) of the proposal shall be submitted for approval (Incomplete free hand illegible sketches are not satisfactory).

4.2 Duration of Parallel Operation

The time duration for operating in parallel with ActewAGL's network shall be less than 8 seconds. (Through consultation with ActewAGL, parallel operation for substantially longer periods or continuously may be acceptable but this would require the installation of additional protection equipment that may significantly increase costs).

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

4.3 Interlocking

Positive mechanical and electrical designs shall be incorporated to ensure that the generator is not operated in parallel with the ActewAGL supply for longer than the allowed time limit.

4.4 Export of Power

Power shall not be exported to the ActewAGL network. (Through consultation with ActewAGL, parallel operation involving the export of power may be acceptable but this would require the installation of additional protection equipment that may significantly increase costs).

4.5 Transfer Arrangements

A control system designed to ensure bumpless transfer shall be provided. The control system shall comply with the relevant parts of AS/NZS 61000 *Electromagnetic compatibility (EMC)* in regard to voltage surges, flicker and harmonics.

4.6 Connection Arrangements

The following equipment shall be provided for connection and disconnection of the generator in parallel with the ActewAGL supply:

- 4.6.1 Synchronisation equipment for generator connection to the ActewAGL supply.
- 4.6.2 Independent main and backup generator overcurrent and earth fault protection relays (with compensation for under voltage field excitation weakening) that respectively trip different circuit breakers. This requirement is to ensure that sources of power supply are isolated in the event of faults.
- 4.6.3 Independent main and backup timers that respectively trip different circuit breakers to limit parallel operation time.
- 4.6.4 Over and under voltage protection (264 V / 3 sec. & 207 V / 3 sec. at the main switchboard).
- 4.6.5 Over and under frequency protection (53 Hz / 5 sec. & 47 Hz / 5 sec at the main switchboard).
- 4.6.6 Voltage unbalance protection (7% difference between the highest and lowest phase to neutral or phase to phase voltage, for 5 sec. at the main switchboard – this could be approximately equivalent to a 2% negative sequence voltage unbalance as per IEC definition).
- 4.6.7 Phase vector shift/surge protection.
- 4.6.8 All protection devices shall be three phase sensing.
- 4.6.9 The DC control & protection supply battery shall be alarmed for low voltage, and preferably duplicated. A low DC voltage, fail safe generator tripping logic design shall be employed.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules

- 4.6.10 Neutral Displacement Voltage (NDV) protection for generators/transformers with delta windings, to detect earth faults.
- 4.6.11 Generator interface circuit breaker (the paralleling point) shall be certified by manufacturer as suitable for this duty/application. ACB's may be required as MCCB's are generally not suitable.

4.7 Labelling

The main switchboard shall be provided with a notice in accordance with the requirements of Clause 5.5 of the ActewAGL Service and Installation Rules.

5 TESTING AND COMMISSIONING

ActewAGL reserves the right to witness commissioning tests to verify compliance with the above requirements, and may require reimbursement for associated attendance costs.

Upon commissioning, ActewAGL must be supplied with certified test results verifying compliance with the above requirements.

The protection and control schemes associated with the works are required to be tested for correct operation at least every 3 years. The customer must keep records of maintenance tests, and make them available upon request. The customer must agree, in writing, to comply with these requirements.

This Appendix forms part of the Service and Installation Rules and is to be read in conjunction with those rules