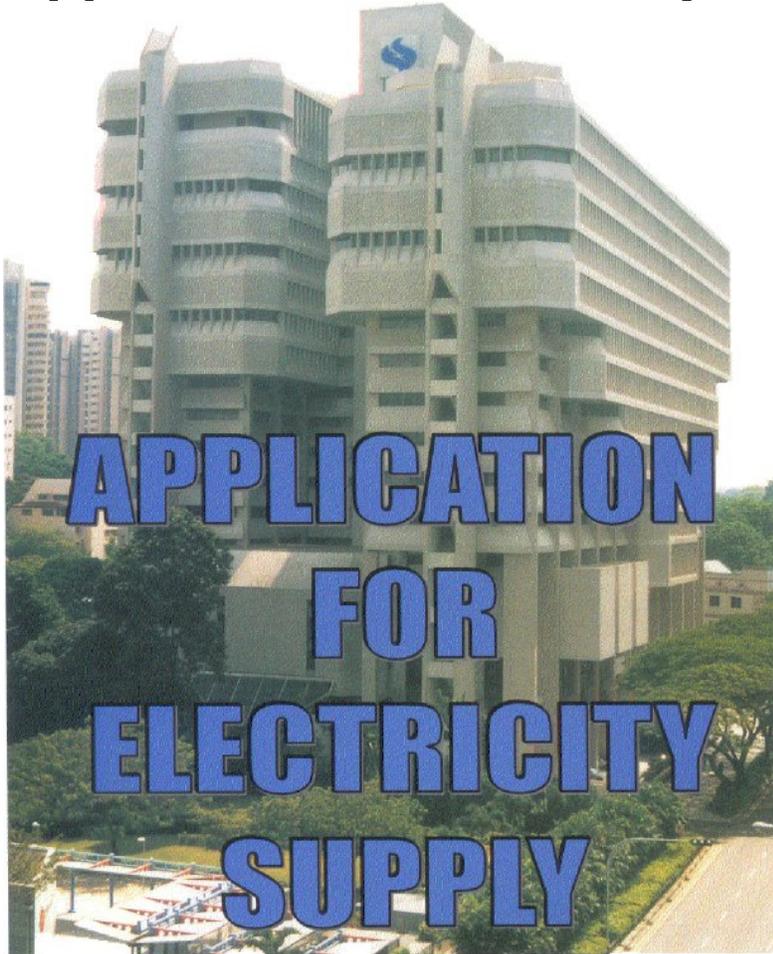


June 1999

**Handbook on
Application for Electricity Supply**



Procedures and requirements highlighted in this handbook are correct at the time of printing. Any changes that may be arise subsequently will be reflected in the next edition.

Power Supply



981-04-1785-3

Important Contact Numbers

		Tel No	Fax No
POWER SUPPLY LTD			
General Enquiry on Application For Electricity Supply		8238282	8238289
Terms and Conditions of Supply			
Asst. Manager (Contracts)		8238285	8238239
Clearance of Single Line Drawings			
Manager (Installation)		2777033	2777044
Enquiry		2777064	
Opening of Utilities Accounts			
Enquiry		1800-2356841	8238219
POWERGRID LTD			
Clearance of substation plans & Substation consultation unit	(East zone)	8238555	8238564
	(West zone)	8238556	8238564
Manager (Distribution Planning)		8238550	8238564
Enquiry		8238561	
Substation Consultation Unit		8238555 8238556	8238564
Installation of Meters			
Manager (Meter)		2777000	2777008
Enquiry		2777005	

Table of Contents

Foreword

This handbook has been written to guide licensed electrical workers and contractors in the application and provision of electricity supply. Customers/developers who wish to apply for electricity supply need to appoint a licensed electrical worker who will assess their electricity demand and submit the application together with plans to Power Supply Ltd on their behalf. Whilst the procedures and requirements given in this handbook are primarily to assist licensed electrical workers and contractors, customers/developers may also find the information provided useful to them.

The provision of electricity supply to any new development involves the joint effort of Power Supply Ltd, PowerGrid Ltd, customers/developers and their agents such as architects, licensed electrical workers and contractors.

Power Supply and PowerGrid will make every effort to process the applications and implement the electricity supply schemes expeditiously. Customers/developers and their agents can help us to achieve timely connection of electricity supply by early submission of applications and plans, signing of agreements on schedule and timely payment of service connection charges and initial deposits.

I am confident that electricity supply will be made available in good time to meet customers' requirements, when customers/developers, their licensed electrical workers and contractors abide by the procedures and the requirements given in this handbook.

ONG KENG KIAT
MANAGING DIRECTOR

POWER SUPPLY LTD

1. General Information

1.1 Introduction

1.1.1

Power Supply Ltd ("PSL") and PowerGrid Ltd ("Grid") are subsidiaries of Singapore Power Ltd. PSL is the supplier of electricity. It receives requests for electricity supply, offers terms and conditions of supply, arranges for supply connections and bills customers for consumption. Grid develops, operates and maintains transmission and distribution facilities.

1.1.2

The supply of electricity and electrical installation practice are governed by the Public Utilities Act and its subsidiary legislation.

1.2 Supply Voltages And Supply Frequency

1.2.1

Depending upon a customer's load requirements, electricity supply will be provided as follows:-

- i. 230V, 50 Hz, Single phase, up to maximum of 23 kVA.
- ii. 400V, 50 Hz, 3 phase, 4 wire.
- iii. 22,000V, 50 Hz, 3 phase, 3 wire, for supply with minimum Contracted Capacity of 1,700 kW.
- iv. 66,000V, 50 Hz, 3 phase, 3 wire for supply with minimum Contracted Capacity of 25,500 kW.
- v. 230,000V, 50 Hz, 3 phase, 3 wire for supply with minimum Contracted Capacity of 85,000 kW.

Customers would have to make their own arrangements for the necessary transformation should different voltages and frequency is required for their operations.

1.2.2

The voltage of supply is maintained as far as possible within $\pm 6\%$.

1.3 Submission Of Application

1.3.1 Domestic Premises

- A. For premises where the electricity meter has already been installed by Grid and no extension and/or rewiring work is required, the customer need only open an account with PSL. Electricity supply will be turned-on on the 4th working day from the date of opening of account.
- B. For premises where there is no electricity meter or where extension and/or rewiring work is required, the customer has to engage a licensed electrical contractor and submit an application for electricity supply through the contractor. Detailed procedure is given in Section 2.

1.3.2 Non-domestic Premises

- A. For premises where the supply capacity does not exceed 45 kVA and where the electricity meter has already been installed and no extension and/or rewiring work is required, the customer need only to open an account with PSL. Electricity supply will be turned-on on the 4th working day from the date of opening of account.
- B. For all other cases, the customer has to engage a licensed electrical worker of the appropriate grade and submit an application for electricity supply through the licensed electrical worker. Detailed procedure is given in Section 2.

1.4 Service Connection

Wherever Grid's existing network permits, supply will be provided from its low voltage mains to a customer requiring supply at 230V/400V. This is usually possible for a supply requirement not exceeding 45 kVA. Where the supply requirement of a customer exceeds the capacity which can be supplied from the low voltage mains or where the supply is required at high tension, Grid will have to install additional equipment to cater for the customer's requirement. In such cases, the customer will have to provide, at his own expense, electrical equipment room(s) to house the Grid's equipment as a substation.

1.5 Service Connection Charge

1.5.1

A service connection charge, which depends on the supply capacity, is to be paid by the customer requesting the supply. However, developers of private housing and industrial estates, who are required to provide and install at their own expense all low voltage mains and service cables within their developments, are not required to pay service connection charges.

1.5.2

For more details on service connection charges please refer to Section 3 on Terms and Conditions of Supply.

1.6 Temporary Supply

PSL may consider giving electricity supply to construction sites on a temporary basis. Special terms and conditions will apply in such cases.

1.7 Meter

1.7.1

All meters required for measuring a customer's electricity consumption and demand (where applicable) will be provided and maintained by Grid at its own expense. The customer must provide meter boards, compartments, kiosks, etc as Grid may require for the installation of its metering equipment.

1.7.2

The customer must notify PSL immediately if any of Grid's metering equipment is damaged; he must pay for the cost of repairing or replacing the equipment unless such damage is not caused by him in any way whatsoever.

1.7.3

If a meter is found to be faulty, Grid will repair or replace the faulty meter. The quantity of electricity consumed during the period when the meter is faulty will be estimated by PSL.

1.8 Master And Sub-Metering Scheme

A master and sub-metering scheme is applicable for multi-tenanted premises. Under this scheme, the electricity supply is metered at the intake point and each tenant's supply is also separately metered and billed under the appropriate tariff. The owner/ developer/landlord shall be billed for the difference in the consumption between that metered at the intake point and the summated consumption of the tenants. Where the owner/ developer/ landlord takes supply at high tension and is responsible for stepping down the supply to 230V/400V for distribution to tenants, then a rebate of 2½% on the summated consumption of the tenants will be given to him.

1.9 Tariffs

1.9.1

The types of tariffs presently available are as follows: -

- a) Low Tension
- b) High Tension
- c) Extra High Tension
- d) Ultra High Tension

1.9.2

Tariffs are subject to change. Changes in tariff will be published by PSL from time to time. Informations on the latest electricity tariffs are also available from website at <http://www.cansupply.com.sg>.

1.10 Payment For Electricity Supplied

The customer shall pay to PSL for electricity consumption as ascertained by meters, at such rates of electricity tariff of the appropriate category as fixed by PSL from time to time. Payment for electricity supplied must be made within 10 days of the date of the bill.

1.11 Deposit

The customer shall maintain a deposit for his account with PSL.

1.12 Termination Of Account

The customer must give 4 working days' notice to terminate an account.

2. Application Procedure Details

2.1 Introduction

Procedures for applications for electricity supply are classified into the following categories: -

A. Developed Properties

- i. Non-domestic premises (supply capacity not exceeding 45 kVA) and domestic premises where the electrical installations are provided and pre-tested or previously tested and energised.
- ii. Non-domestic premises (supply capacity not exceeding 45 kVA) and domestic premises requiring an extension and/or rewiring of the electrical installation.
- iii. Non-domestic premises (supply capacity exceeding 45 kVA) in multi-tenanted developments.
- iv. Non-domestic premises (supply capacity exceeding 45 kVA) with direct service connection from Grid's low voltage mains.

B. New Developments

- i. Private housing and industrial estates requiring substations and low voltage distribution network.
- ii. All other developments.

C. Temporary Supply

2.2 Application Procedures

The steps involved in the application of supply for each category are listed below.

2.2.1 Supply to Developed Properties

- i. Non-domestic premises (supply capacity not exceeding 45 kVA) and domestic premises where the electrical installations are provided and pre-tested or previously tested and energised.

This category includes all new HDB apartments and dwelling units in some private residential developments where electrical installations are provided and tested in advance. It also includes non-domestic premises (supply capacity not exceeding 45 kVA) and domestic premises where the existing electrical installations and service connections are intact and only the supply is required to be reconnected.

For this category, the customer needs only to open an account with PSL for electricity supply (see [Note 4](#)). The customer will be given an appointment date for turn-on of supply. This appointment date is normally the 4th working day from the date the account is opened. For the reason of electrical safety, the customer or his representative must be present at the premises for the turn-on of electricity supply.

- ii. Non-domestic premises (supply capacity not exceeding 45 kVA) and domestic premises requiring rewiring/extension of the electrical installation.

This category is further classified into 2 sub-categories and the steps for each respective sub-category are given below.

Non-domestic premises in multi-tenanted developments and HDB/private apartments

1. Customer to open an account with PSL (see [Note 4](#)) if he has not already done so.
2. Customer to engage a licensed electrical contractor.

3. Customer to submit an application (see [Note 2](#)) to PSL through the licensed electrical worker of the contractor together with a letter of consent from the landlord/management corporation/HDB (see [Note 3](#)). The licensed electrical contractor can also book an appointment for testing the electrical installation at the time of submission of the application and in the meantime proceed to carry out the rewiring/extension work. (See [Note 9](#) for the authorised small installation tester scheme)
4. Supply will be turned-on on the scheduled test date if the electrical installation is safe to receive electricity supply. The licensed electrical worker must be present during the test.

Non-domestic premises and domestic premises with direct service connection from Grid's mains

1. Customer to open an account with PSL if he has not already done so (see [Note 4](#)).
2. Customer to engage a licensed electrical contractor.
3. Customer to submit an application (see [Note 2](#)) to PSL through the licensed electrical worker of the contractor.
4. If the existing service connection is adequate, the customer will be advised of the approval of the proposed rewiring/extension within 14 days. If the existing service connection is inadequate and needs to be replaced, steps as listed under Supply To New Developments 2.2.2(ii) are then to be followed.
5. Upon approval of the application, the contractor may proceed to book an appointment for testing the electrical installation and carry out the rewiring/extension work. (see [Note 9](#) for the authorised small installation tester scheme)
6. The electrical installation with rewiring/extension will be allowed to be connected to the supply line on the scheduled test date if the electrical installation is safe to receive electricity supply. The licensed electrical worker must be present during the test.

iii. Non-domestic premises (supply capacity exceeding 45 kVA) in multi-tenanted developments

1. Customer to submit an application for supply/extension to PSL through a licensed electrical worker of the appropriate grade (see [Notes 1 & 2](#)). A letter of consent from the landlord/management corporation is to be enclosed (see [Note 3](#)).
2. The licensed electrical worker to submit single-line drawings of the electrical installation to PSL for clearance (see [Section 5](#)).
3. Upon approval of the application, the proposed work shall be carried out by a licensed electrical contractor.
4. Customer to open an account with PSL (see [Note 4](#)) and apply for a Licence to use or operate an electrical installation from EMA (see [Note 8](#)).
5. Upon completion of work, the licensed electrical worker is to submit a Certificate of Fitness for Turn-on (Form C) and make arrangements with PSL for an appointment to inspect the electrical installation and turn-on the supply (see [Section 5](#)).

iv. Non-domestic premises (supply capacity exceeding 45 kVA) with direct service connection from Grid's mains

1. Customer to submit an application for supply/extension to PSL through a licensed electrical worker of the appropriate grade (see [Notes 1 & 2](#)).
2. If the existing service connection is adequate, the customer will be advised of the approval of the proposed rewiring/ extension within 14 days. If the existing service connection is inadequate and needs to be replaced, steps as listed under Supply To New Developments 2.2.2(ii) are then to be followed.
3. The licensed electrical worker to submit single-line drawings of the electrical installation to PSL for clearance (see [Section 5](#)).
4. Upon approval of the application, the proposed work shall be carried out by a licensed electrical contractor.
5. Customer to open an account with PSL (see [Note 4](#)) and apply for a Licence to use or operate an electrical installation from EMA (see [Note 8](#)).

6. Upon completion of work, the licensed electrical worker is to submit a Certificate of Fitness for Turn-On (Form C) and make arrangements with PSL for an appointment to inspect the electrical installation and turn-on the supply (see [Section 5](#)).

2.2.2 Supply to New Developments

i. Private housing and industrial estate developments requiring substations and low voltage distribution network

For this category, the developer is required to provide substation(s) to Grid's requirements. The developer shall be responsible for the provision and installation of the low voltage distribution network and the laying of final service cables to the various intake points in the development. The procedure to be followed is as follows:-

1. Developer to submit an application to PSL through a licensed electrical worker (see [Notes 1 and 2](#)).
2. The developer will be advised of the substation requirements within 14 days.
3. The licensed electrical worker shall submit substation design plans to the Distribution Planning Section of Grid for endorsement and make arrangements for the approved substation design to be incorporated in the architectural plan for submission to the Building & Construction Authority for approval.
4. The licensed electrical worker is to design the low voltage network to Grid's guidelines and submit drawings to the Distribution Planning Section for approval. In the case of landed housing estate development, the licensed electrical worker shall liaise with the civil engineer in-charge of the development to obtain approval from the National Parks Board for the siting of overground distribution boxes in planting islands for the distribution of electricity supply.
5. The developer will be advised of the terms and conditions of supply once the electrification scheme is finalised.
6. Upon acceptance of terms and conditions of supply by the developer, Grid will organise work to give supply by the target date desired by the applicant where possible.
7. Upon completion of the substation building, the licensed electrical worker is to handover the substation to Grid (see [Note 6](#)).
8. In the meantime, applicant's contractor shall lay the low voltage underground distribution and service cables. The licensed electrical worker is to liaise with the project officer of Grid for inspection of equipment, cables, materials and work.
9. Upon completion, the licensed electrical worker is to test the underground low voltage network and service cables, and makes arrangements to handover the network to Grid for operation and maintenance.
10. Where applicable, the licensed electrical worker is to submit single-line drawings of the electrical installation to PSL for clearance (see [Section 5](#)).
11. The licensed electrical contractor can proceed to carry out work on the electrical installations in the premises. Where applicable, he must also collect metering current transformers from Meter Section, Grid (see [Note 7](#)).
12. Where applicable, the licensed electrical worker or contractor shall make arrangements for testing of the intake switchboards by engaging an authorised high voltage testing engineer (see [Section 5](#)).
13. For housing developments, the licensed electrical worker shall test the electrical installation in each dwelling unit.
14. Where applicable, the developer is to open an account with PSL (see [Note 4](#)) and apply for a Licence to use or operate an electrical installation from EMA (see [Note 8](#)) for the landlord's supply.
15. Upon completion of the electrical installation, the licensed electrical worker is to submit a Certificate of Fitness for Turn-on (Form C) and make arrangements with PSL for an appointment to inspect the electrical installation and turn-on the landlord's supply (see [Section 5](#)).
16. For turn-on of supply to the tenants, procedures as described under categories 2.2.1(i), (ii) and (iii) as appropriate are to be followed.

ii. All other developments

This category is further classified into 3 sub-categories and the steps for each sub-category are given below.

Supply capacity not exceeding 45 kVA at 230/400V

1. Customer to engage a licensed electrical contractor and submit an application to PSL through the licensed electrical worker of the contractor (see [Note 2](#)).
2. The customer will be advised of the amount payable for the service connection and the conditions of supply normally within 14 days.
3. Upon payment of the service connection charge by the customer, Grid will organise work to effect the supply connection.
4. In the meantime, the licensed electrical contractor may proceed to carry out work on the electrical installation.
5. Customer to open an account with PSL (see [Note 4](#)).
6. Upon completion of electrical installation work and service connection, the electrical contractor is to book an appointment with PSL for testing the electrical installation.
7. On the appointment date, an electricity meter will be installed and supply will be turned on if the electrical installation is safe to receive electricity supply. The licensed electrical worker must be present during the test.

Supply capacity exceeding 45 kVA at 230/400V

1. Customer to submit an application to PSL through a licensed electrical worker of the appropriate grade (see [Notes 1](#) and [2](#)).
2. The customer will be advised of the amount payable for the service connection and the conditions of supply normally within 14 days if direct supply can be provided from the existing network facilities. If a sub-station is required to be provided, the applicant will be similarly advised of the requirement within 14 days. The intervening steps pertaining to the provision of a substation are described later in this section.
3. Upon acceptance of the terms and conditions of supply including the payment of the service connection charge by the applicant, Grid will organise work to effect the supply connection.
4. The licensed electrical worker is to submit single-line drawings of the electrical installation to PSL for clearance (see [Section 5](#)).
5. In the meantime, the licensed electrical contractor can proceed to carry out work on the electrical installation. He must also collect metering current transformers from Meter Section of Grid (see [Note 7](#)) if supply capacity exceeds 75 kVA.
6. The licensed electrical worker or contractor shall make arrangements for testing the customer's switchboard and equipment by engaging an authorised high voltage testing engineer (see [Section 5](#)).
7. Applicant to open an account with PSL (see [Note 4](#)) and apply for a Licence to use or operate an electrical installation from EMA (see [Note 8](#)).
8. Upon completion of electrical installation work and service connection, the licensed electrical worker is to submit a Certificate of Fitness for Turn-on (Form C) and make arrangements with PSL for an appointment to inspect the electrical installation and turn-on the supply (see [Section 5](#)).
9. On the appointment date, electricity supply will be turned-on subject to the completion of the foregoing events and the electrical installation being safe to receive electricity supply and complying with connection requirements of Grid. The licensed electrical worker must be present during the turn-on.

Supply at High Tension

1. Customer to submit an application through a licensed electrical worker (see [Notes 1](#) and [2](#)).
2. The customer will be advised of the substation requirements within 14 days. The intervening steps pertaining to the provision of substation are described later in this Section. Once Grid's electrification scheme is finalised, the customer will be advised of the terms and conditions of supply and the amount payable for the service connection.

3. Upon acceptance of terms and conditions of supply including the payment of relevant charges by the applicant, Grid will organise work to effect the supply connection.
4. The licensed electrical worker is to submit single-line drawings of the electrical installation to PSL for clearance (see [Section 5](#)).
5. In the meantime, the licensed electrical contractor can proceed to carry out work on the electrical installation. He must also provide the HT metering panel and make arrangements for the testing of metering current transformers/ voltage transformers and installation of meters by Meter Section of Grid.
6. The licensed electrical worker or contractor shall make arrangements for testing the customer's switchboard and equipment by engaging an authorised high voltage testing engineer (see [Section 5](#)).
7. Customer to open an account with PSL (see [Note 4](#)) and apply for a Licence to use or operate an electrical installation from EMA (see [Note 8](#)).
8. Upon completion of electrical installation work and service connection, the licensed electrical worker is to submit a Certificate of Fitness for Turn-on (Form C) and make arrangements with PSL for an appointment to inspect the electrical installation and turn-on the supply (see [Section 5](#)).
9. On the appointment date, electricity supply will be turned on subject to completion of the foregoing events and the electrical installation being safe to receive electricity supply and complying with connection requirements of Grid. The licensed electrical worker must be present during the turn-on.

2.2.3 Temporary Supply

For temporary electrification schemes to construction worksites and other premises, the application procedure is similar to that for Supply To New Developments described under category 2.2.2(ii). However, as a temporary supply electrical installation is required to be licensed regardless of the approved load, the necessary steps to follow for any supply capacity are as those described for supply capacity exceeding 45 kVA.

2.3 Procedures Relating to the Provision of a Substation

2.3.1

Where a substation is required in a new development, the substation requirements will be forwarded to the customer together with the reply letter acknowledging the application.

2.3.2

The licensed electrical worker shall submit substation design plans for endorsement by the Distribution Planning Section of Grid and make arrangements for the approved substation design to be incorporated in the architectural plans for submission to the Building & Construction Authority for approval.

2.3.3

The customer will be advised of the terms and conditions of supply once Grid's electrification scheme is finalised.

2.3.4

Upon completion of the substation building, the licensed electrical worker is to handover the substation to Customer Projects Section of Grid (see [Note 6](#)).

2.4 Lead Time for Application of Supply

The timely provision of electricity supply to a development involves the joint effort of PSL, Grid, the customer and his agents such as the licensed electrical worker and contractor. While PSL and Grid will make every effort to engineer and implement the electricity supply scheme, it is at the same time

essential for the new customers and their agents to play their part such as the early submission of applications and plans, the acceptance of terms and conditions of supply including making the necessary payments and the compliance of the necessary requirements.

As a guide for the customer and his agents, the normal lead-time for the various events are listed next page. Depending on the progress and completion time of precedent events, the actual completion dates of events leading to the turn-on of supply may need to be reviewed and adjusted.

NORMAL LEAD TIME TO DATE FOR TURNING-ON SUPPLY

	Installation with existing Service Connection not exceeding 45 kVA		Non-domestic Installation with Existing Service Connection exceeding 45 kVA	New Supply Connection from Grid's Low Voltage Mains	New Supply Connection from New Substation
	Pre-tested Installation or Reconnection	Testing # Required			
Submission of application to PSL	NA	14 days*	4 weeks	3 months	6 months
Submission of substation plans to Grid	NA	NA	NA	NA	6 months
Acceptance of terms and conditions of supply including payment of service connection charges to PSL	NA	NA	NA	4 - 6 weeks**	11 weeks*
Handover of substation to Grid	NA	NA	NA	NA	10 weeks*
Submission of customer's electrical installation single-line drawings to PSL	NA	NA	4 weeks++	8 weeks++	8 weeks++
Opening of account with PSL	4 days	14 days	14 days	14 days	14 days
Arrangements to test customer's installation (not exceeding 45 kVA) by PSL	NA	14 days	NA	14 days*	NA
Application to EMA for Licence to use or operate an electrical installation	NA	NA	14 days	14 days	14 days
Submission of Form C and request for turn-on of supply by PSL	NA	NA	7 days	7 days	7 days

* These are critical events. Failure to adhere to the Schedule may result in delay in the turn on of supply.

** For supply connection by underground cable, Grid will have to seek road opening approval from the relevant authorities before cable work can commence. The approval process usually takes about 3 weeks. Depending on the length of cable to be installed, supply will normally be available 4 to 6 weeks from the date customer's premises is ready to receive the service cable.

+ Electricity supply will normally be available within 10 weeks of handing over of substation. The lead time required to submit an application for supply is provided as a guide to customers and may vary from case to case depending on the customer's building programme.

++ The lead time for these events serves as a guide. However, these events must be cleared before turn-on of supply can be effected.

These installations may be tested by authorised small installation testers if the extent of the electrical extension work falls within the Authorised Small Installation Tester Scheme (See [Note 9](#)).

2.5 Notes To Be Read In Conjunction With Application Procedure

Note 1 - Licensed Electrical Worker

Under the Electrical Workers & Contractors Licensing Regulations, 1997, the design and installation of an electrical installation may be undertaken by the following categories of Licensed Electrical Workers:-

Electrical Workers	Supply Capacity of installation	Voltage
Electrician	Not exceeding 45 kVA	Not exceeding 1000 Volts
Electrical Technician	Design: Not exceeding 150 kVA Install: Not exceeding 500 kVA	Not exceeding 1000 Volts
Electrical Engineer	No limit	No limit

Customer should appoint a Licensed Electrical Worker appropriate to the capacity and voltage of his proposed installation. He should inform PSL immediately of any change of Electrical Worker during the course of the project.

Note 2 - Submission Of Application

Application is to be made through a Licensed Electrical Worker of appropriate grade as indicated in [Note 1](#) using form CS/1 (sample is shown in [Appendix 1](#)).

An application involving new service connection or change in intake position shall be submitted with 2 copies of Architect's site plan (1: 1000 scale) and plan showing the desired service connection position to facilitate the processing of the application. For an application involving new service connection to landed residential property development, a copy of the plan duly endorsed by the National Parks Board showing planting islands reserved for the installation of overground distribution boxes shall also be submitted with the application. (Such plan may be obtained from the civil engineer in-charge of the development.)

Application for supply shall only be submitted for **firm** projects approved by the Competent Authorities where appropriate. For projects which are under conception/ planning stage, licensed electrical workers or architects may make a pre-application consultation using form CS/2 (sample is shown in [Appendix 2](#)).

Applications may be sent by post or submitted in person at PSL's Customer Services Centre, Upper First Storey, 111, Somerset Road #01-10, Singapore Power Building, Singapore 238164.

Note 3 - Letter Of Consent From The Landlord/ Management Corporation

For supply connections not made directly from Grid's installation or mains, the customer must seek consent from the Landlord/management Corporation from whose electrical installation the supply connection is made. This is to ensure that the landlord's/ management corporation's electrical installation and the existing service connection/supply capacity are adequately sized to cater for any increase in load consequent to the application. Form CS/3 ([Appendix 3](#)) must be used for this purpose.

Part I of the form is to be completed by the Licensed Electrical Worker in charge of the operation and maintenance of the electrical installation of the building. The Electrical Installation Licence number of the building must be quoted.

The Landlord/management Corporation of the building or the relevant Town Council shall give their consent in Part II of the form. The landlord's/ management corporation's account number must be stated. This is particularly important for buildings with "master and submetering" scheme as it will help to ensure that the new tenant's consumption is taken into consideration for deduction from the landlord's/management corporation's PSL utility bill.

In the case of HDB premises, HDB's endorsement is required. For HDB apartments, endorsement is to be made on Form CS/1. For HDB non-residential properties maintained by Town Councils, Form CS/3H ([Appendix 4](#)) must be used.

Note 4 - Opening An Account

Before supply to an installation can be turned on, the customer must open an account with PSL. An application to open an account for electricity supply can be made either personally, through the post or Internet. A sample of the Agreement card and GIRO Form to be completed are shown in [Appendix 6](#) and [Appendix 7](#) respectively.

Application in person can be made at PSL's Customer Services Centre, Upper First Storey, 111 Somerset Road #01-10, Singapore Power Building or at PSL's Application counter at the Sales Section, HDB at HDB Centre, Jalan Bukit Merah. Application through the post should be addressed to:-

Senior Manager (Customer Services)
Power Supply Ltd
P O Box 341 Orchard Post Office
Singapore 912312

The following documents must be shown at the time of application in person:-

- a) Identity Card/Passport of owner/tenant/authorised signatory*.
- b) *Copy of Business/ Company Registration Certificate.
- c) Documentary proof of occupation of premises, eg rent receipt or sales letter from HDB confirming the purchase of the premises.
- d) Bank account book to effect GIRO deduction from the account.

*applicable for account in company's/organisation's name.

For applications submitted through the post, copies of the abovementioned documents must be enclosed.

An initial deposit is payable on opening an account. Customers may call the Customer Enquiry Auto-Link (U-Link) at 1800-7380038 to enquire on the deposit amount required for domestic premises.

For domestic premises, the deposits are as follows:-

Type of Premises	Deposit	
	GIRO Customers	Non-GIRO Customers
HDB 1/ 2 rooms	S\$ 40	S\$ 60
HDB 3/ 4/ 5 rooms	S\$ 70	S\$ 100
HDB Executive/ HUDC/ Terrace	S\$ 100	S\$ 150
Private Apts/ Semi-Detached/ Condo	S\$ 150	S\$ 250
Bungalow/ Pent-house/ Town-house	S\$ 250	S\$ 400

The deposit for non-domestic premises varies according to the electricity load required, the estimated water consumption, the floor area and type of operations. For enquiry on the amount of deposit required, customers can call 1800-2356841.

Note 5 - Acceptance Of Terms And Conditions Of Supply

Acceptance of the terms and conditions of supply by the applicant constitutes a key event in the process. The supply agreement, if applicable, will be prepared by PSL and forwarded to the customer for signature. The applicant is advised to execute the supply agreement and return it to PSL expeditiously. The Grid will commence work only after the customer accepts the terms and conditions of supply, executes the supply agreement and makes payment of relevant charges. Thus any delay in the acceptance of the terms and conditions of supply will result in delay in the turn-on of supply.

Note 6 - Handover Of Completed Substation Building

The hand-over of substation building to Grid for installation of equipment is a key event, which determines the earliest date when supply can be made available.

One week prior to the intended handover of substation, the licensed electrical worker shall submit a request via Form CS/4 ([Appendix 5](#)) to Manager (Customer Projects), Grid. Before this is done, the licensed electrical worker shall ensure that the customer/developer has accepted the terms and conditions of supply including the payment of necessary charges.

It must be emphasized that Grid would only take over a substation building when it is completed in accordance with plans and specifications approved by Grid and the Competent Authority. It is particularly important that the access to the substation must be clear and passable for transportation of heavy equipment.

Floor frames are needed for some types of switchgear. Prior to the final rendering of switchroom floor, the licensed electrical worker is to notify the project engineer-in-charge to make arrangements for the floor frame to be installed if it is necessary.

Note 7 - Installation Of Current Transformer Operated Meters

For supply capacity exceeding 75 kVA, current transformer operated meters are required. The licensed electrical contractor is required to provide a pre-wired metering panel on the customer's intake switchboard complete with Meter Section Grid approved type test block, 6A 10 kA MCB and pilot lamps with wiring to current transformers and bus-bars.

On the day the contractor arranges with PSL for a date to turn-on supply, he should on the same day bring the letter of appointment for turn-on to Meter Section, Grid to arrange for the fixing of meters.

On the appointed day of meter fixing, the Licensed Electrical Contractor or his representative must be present to install the metering current transformers brought to site by Meter Section Grid and provide a 230V 13A supply for testing of the meters.

Note 8 - Procedure For Application For A Licence To Use Or Operate An Electrical Installation Licence

(i) General

Under The Public Utilities Act and The Public Utilities (Licensed Electrical & Supply Installations)(Exemption) Notification, electrical installations in non-domestic premises, residential buildings and condominiums with an approved load greater than 45 kVA are required to be licensed. In addition, certain premises classified as engaging in dangerous trades, are also required to be licensed even though they may have approved electrical loads not exceeding 45 kVA.

Application forms for electrical installation licences are available at Energy Market Authority, 111 Somerset Road, #11-06, Singapore Power Building or via the EMA web at <http://www.ema.gov.sg>.

(ii) Conditions for the issue of the licence

Conditions for the issue of the electrical installation licences are governed by The Public Utilities (Licences To Use Or Operate Electrical Or Supply Installations) Regulations.

The minimum grade of Licensed Electrical Worker required to take charge of the electrical or supply installation is determined by the total approved load:-

Grade of Electrical Workers	Total Approved Load
Electrician	Not Exceeding 45 kVA
Electrical Technician	Not Exceeding 500 kVA
Electrical Engineer	No Limit

(iii) Submission of Application Forms

The relevant application forms are to be completed and submitted with the necessary licence fees through the Licensed Electrical Worker in charge of the electrical installation to EMA, no later than 2 weeks before the date of the turn-on of the electricity supply.

The validity of the licence is for a period of 12 calendar months.

Note 9 - Authorised Small Installation Tester (ASIT) Scheme

Under the above scheme, EMA authorises licensed electrical workers of contractors to test and certify electrical extension work. This scheme is applicable where:-

- a) the extension work does not involve changing the incoming service, service cutout/MCB or the meter;
- b) the extension/rewiring work has a maximum of twenty lighting points, twenty 13 Amp socket outlets, one 15 Amp power point and one heater point.

If the contractor's licensed electrical worker is so authorised by EMA, he can test and certify the extension/rewiring work if it meets the above criteria.

3. Terms and Conditions of Supply

3.1 Supply at Low Voltage

3.1.1

Customers/Developers taking supply at 230V/400V are required to pay a standard service connection charge. The service connection charge, which depends on the supply capacity, is classified into two categories, namely: -

- A. Where the service connection is given directly from Grid's existing installation or low voltage mains.
- B. Where the customer/developer is required to provide a substation.

3.1.2

The standard service connection charges for various supply capacities under each category are given in the table below. The charges given in the table are subject to revision from time to time. These charges are not applicable for supply on offshore islands and other developments as determined by Grid.

TABLE I : STANDARD CONNECTION CHARGES FOR DEVELOPMENTS GIVEN SUPPLY DIRECTLY FROM GRID'S EXISTING INSTALLATION OR LOW VOLTAGE MAINS

Capacity in kVA	Standard Connection Charge (\$)
Up to 15 (existing premises)	1,600
Up to 15 (new premises)	1,900
16 - 23 (single phase)	2,800
16 – 45	5,300
46 – 75	8,800
76 – 140	16,700
141 – 180	22,000
181 – 230	28,700
231 – 280	34,400

TABLE II : STANDARD CONNECTION CHARGES FOR DEVELOPMENTS REQUIRING A SUBSTATION

Capacity in kVA	*Standard Connection Charge (\$)
Up to 230	6,700
231 – 280	8,500
281 – 460	12,600
461 – 560	17,700
561 - 1,000	26,000
1,001 - 2,000	42,000

* Subject to a maximum service cable length of 15 metres. For longer lengths, additional charge is payable for each additional metre at prevailing rate.

3.1.3

For private housing and industrial estate developments where substations are required, developers will have to provide and install, at their own expense, all low voltage mains within the development and hand them over to Grid for maintenance. No service connection charges are payable in such cases.

3.2 Supply at High/ Extra High/ Ultra High Voltage

3.2.1

Customers taking supply at High Voltage (22 kV)/ Extra High Voltage (66 kV)/ Ultra High Voltage (230 kV) are required to enter into a supply agreement with PSL and to pay a service connection charge.

3.2.2

The supply agreement will, inter alia, state the contract supply capacity of the customer i.e. his "Contracted Capacity" which is deemed to be the requirements for a period of five years. Customers shall not reduce their Contracted Capacity until the expiration of the 5-year period. Furthermore, customer who terminate the supply agreement during the 5-year period will be required to pay PSL, the Contracted Capacity Charge for the unexpired portion of the 5-year period.

3.2.3

Customers shall pay to PSL, charges calculated from tariffs based on Contracted Capacity Charges, Usage Charge, Uncontracted Capacity Charge and Reactive Power Charges.

3.2.3.1

The contracted Capacity Charge payable by the customers to PSL is based on kW Contracted Capacity. The Contracted Capacity Charges is calculated based on the following:-

Contracted Capacity Charge = Customer's Contracted Capacity x Contracted Capacity Rate
(which "Contracted Capacity Rate" is published by PSL from time to time)

3.2.3.2

The Usage Charge payable by the customers to PSL is based on kilowatt-hours of electricity supplied. The Usage Charge is calculated based on the following:-

For Peak Period

Usage Charge = Kilowatt-hours consumed during the Peak Period x Peak Period Rate

For Off-Peak Period

Usage Charge = Kilowatt-hours consumed during the Off-Peak Period x Off-Peak Period Rate
(which "Peak Period", "Off-Peak Period", "Peak Period Rate", "Off-Peak Period Rate" are published by PSL from time to time.)

3.2.3.3

The Uncontracted Capacity Charge, which is based on the customer's excess kW demand, shall be payable, if in any month the customer's actual kW maximum demand exceeds its Contracted Capacity. The Uncontracted Capacity Charge is calculated based on the following:

Uncontracted Capacity Charge = (kW maximum demand - Contracted Capacity) x Uncontracted Capacity Rate

(which "Uncontracted Capacity Rate" is published by PSL from time to time)

3.2.3.4

The reactive Power Charge which is based on the customer's excess kVArh, shall be payable, if in any the customer's kVArh consumption exceeds 62% of its kWh consumption. The Reactive Power Charge is calculated based on the following:

Reactive Power Charge = (kVArh - 62% of kWh) x Reactive Power Rate

(Which "Reactive Power Rate" is published by PSL from time to time)

3.2.4

In the case of high/extra high voltage supply to multi tenanted buildings, the landlord will have to enter into a supply agreement only for the network capacity required for his own load, i.e. supply for common services, etc.

3.2.5

The service connection charge for customers taking supply at high/extra high voltage will be computed based on the cost of service cables and their associated equipment for connection from Grid's system to the customer's intake point.

3.3 Temporary Supply

3.3.1

Special terms and conditions of supply will be offered for temporary supply to construction worksites.

3.3.2

For these cases, customers will be required to pay outright for the cables and installation costs. They shall also pay rental charges for equipment used to effect the supply.

3.3.3

Temporary supply is normally granted for a period of 24 months. Extensions on a 24-monthly basis will be considered on the merits of each case.

3.3.4

For temporary supply at high voltage, the payable charges will be stipulated in Section 3.2.3.

3.4 Supply on Off-shore Islands

Special terms and conditions of supply will be offered on a case by case basis.

3.5 Access to Grid's Equipment

All customers shall give PSL's and Grid's officers and agents unrestricted access at all times to their premises to inspect, remove, maintain or install any cable or service equipment of Grid.

3.6 Customers' Equipment

All customers shall at their own cost, supply, install and maintain, to Grid's satisfaction, the entire electrical installation within their premises.

4. Grid's Substation Requirements

4.1 General

4.1.1

Where an application for supply of electricity necessitates the provision of a substation, the site shall be provided and substation constructed by the applicant at his own cost.

4.1.2

The substation structure may be an independent building or form part of a larger building. It shall be located at the 1st storey level and must be readily accessible from the public road.

4.1.3

The customer shall grant Grid, its officers and agents an irrevocable licence at all times to have full and unrestricted use of the substation and have free access thereto.

4.1.4

Grid may utilise the substation and site in such manner as it deems fit. Subject to the applicant's requirement being fully provided for, Grid shall be at liberty to use the substation for the purpose of supplying other customers or for the improvement of the supply network.

4.1.5

The site and design of a substation to be provided by the applicant shall be approved by Grid and the competent authority before it is constructed.

4.2 Types and Layout of Substations

4.2.1

The type of substation required will depend on the customer's load requirement. Typical layout plans and details for substations of the independent building type are given in Appendices 8.1 to 12.

4.2.2

As a guide, the types of substations applicable for the various load requirements are as follows: -

Load Requirement	Primary Distribution Voltage	Type of rooms	Drawings Applicable/Substation size
Up to 1,000 kVA at 400/230V	6.6kV		Appendices 8.1 to 8.4
	22kV	Switchroom Transformer	7.6M x 6.2M x 5.6M 4.0M x 4.5M x 3.6M
Up to 2,000 kVA at 400/230V	22kV		Appendices 9.1 to 9.5
Up to 5,000 kVA at 22kV	22kV	Switchroom	6.9M x 6.2M x 5.6M

4.2.3

As the dimensions of Grid's equipment may vary from time to time, the Licensed Electrical worker shall obtain the actual substation requirements from the Manager (Distribution Planning), Grid at the time of application.

4.2.4

Subject to the layout and access being suitable, the applicant may incorporate the substation as part of his main building. The typical layout plans shown in this handbook depict only the functional requirements. The applicant is encouraged to introduce suitable architectural treatment to harmonise the substation structure with the rest of the development aesthetically. The functional requirements of the substation structure, however, must be complied with. For example, the minimum clear height of the cable chamber and switchroom must be 1.5m and 3.1m respectively even if the substation is integrated into a multi-storey building.

4.3 Submission of Substation Site and Design Plans

4.3.1 General

Where a substation is required, the substation space requirements are communicated to the Licensed Electrical Worker within 14 days from date of request for supply. Before construction of the substation, the Licensed Electrical Worker shall submit 3 sets of plans showing the location of the proposed substation in relation to the rest of the development and detailed layout plans for the substation. Two sets of plans will be endorsed and returned to the Licensed Electrical Worker.

All plans/drawings to be submitted must be on appropriate A1 or A2 size paper and endorsed by the Licensed Electrical Worker responsible for the planning, design and supervision of the installation. To facilitate processing, PSL's Application Reference Number must be indicated in all submissions which shall be accompanied by a checklist as shown in [Appendix 13](#) (Form CS/5).

In the case of re-submission of plans, all amendments (addition/deletion/revision) made must be highlighted in the new set of drawings and listed out in covering letters.

All plans are to be drawn to scale and dimensions used shall be in metric units.

4.3.2 Substation Site Plans

These plans should show the location of the proposed substation(s) in relation to the surrounding area and should include the following:

- (i) The proposed Grid substation(s);
- (ii) The customer's switchroom(s);
- (iii) The proposed Grid's incoming cable and customer's service cable routes;
- (iv) The orientation of other buildings within the development site;
- (v) The proposed driveway to the substation entrance (to be shaded in red);
- (vi) The existing and proposed drains; and
- (vii) North-East Gridlines or 2 NE survey coordinates.

4.3.3 Substation Design/Layout Plans

These drawings must include the Plan, Front, Rear and Side Elevations of the substation and at least 2 cross-sections showing the surrounding roads, cable chamber, switchroom beams and clear height, switchroom floor openings, transformer plinths and other pertinent details. If the substation is part of a larger building, details of immediately adjoining upper floor, basement as well as adjacent space all around the substation shall be depicted.

The detailed requirements for the design of the substation are listed in [Appendix 14](#). Unless explicit waiver is granted, these requirements are to be incorporated in the architectural plans.

It is the responsibility of the Licensed Electrical Worker in charge to ensure that all the requirements as endorsed on the drawings are incorporated in the architectural and structural plans before construction work of the substation begins.

The electrical installation of the substation must be tested and certified fit by the Licensed Electrical Worker before the substation is handed over to Grid.

5. Customer's Installation Requirements

5.1 General

Two copies of single line drawings of customer's electrical installation must be submitted to Power Supply Ltd (PSL) for clearance for approved loads above 45 kVA. All drawings submitted are to be accompanied with a covering letter quoting PSL's Application Number.

5.2 Single-line Drawings

5.2.1

The electrical installation single-line drawings shall carry a title block showing the description and location of the project, name and address of the developer/owner and be endorsed by the licensed electrical worker responsible for the design, installation and supervision of the customer's installation.

5.2.2

The requirements to be indicated on the customer's single-line drawings are listed in [Appendix 15](#). A completed checklist as shown in [Appendix 16](#) (Form CS/14) shall be submitted together with the single-line drawings.

5.2.3

It is the responsibility of the licensed electrical worker to ensure that the whole installation is compatible with Grid's system and complies fully with all relevant regulations, the Singapore Standard CP5 and other regulatory requirements.

5.3 Short-Time Withstand Current Ratings Of Switchgear

5.3.1

For electrical installations taking electricity supply directly from Grid's network, customer's main supply incoming switchgear shall comply with the following short-time withstand current ratings:

- (i) For supply at 66kV - 40 kA for 3 sec
- (ii) For supply at 22kV - 25 kA for 3 sec
- (iii) For supply at 6.6kV - 20 kA for 3 sec
- (iv) For supply at low voltage

Single phase 230V

1. 6kA for supply capacity up to 15 kVA.
2. 9kA for supply capacity more than 15 kVA and up to 23 kVA.

Three phase 400V

1. 9kA for supply capacity up to 75 kVA.
2. 25kA, 3 sec for supply capacity more than 75 kVA and up to 180 kVA.
3. 36kA, 3 sec for supply capacity more than 180 kVA.

(Note: The 3-second duration not applicable to switchgear incorporating direct acting tripping devices).

5.3.2

For electrical installations taking electricity supply from landlord's or management corporation's electrical installations, the licensed electrical worker in-charge shall ensure that customer's main supply incoming switchgear is capable of withstanding the prospective short circuit current at the connection point.

5.4 Protection Requirements

The protection requirements for customer's HV or LV main incoming switchgear taking electricity supplies from Grid's system are shown in Appendices 17 and 18. For electrical installations taking electricity supply from landlord's or management corporation's electrical installations, advice on protection requirements must be sought from the licensed electrical worker responsible for the respective licensed electrical installation.

Every low voltage electrical installation of supply capacity exceeding 75 kVA shall be provided with short circuit protection in the form of direct acting trip element at the incoming switchgear as follows:-

Approved load	Direct Acting Trip Setting
Above 1500A	Up to 4500A
$400A < \text{Approved Load} \leq 1500A$	Up to 3200A
$260A < \text{Approved Load} \leq 400A$	Up to 2400A
$200A < \text{Approved Load} \leq 260A$	Up to 2000A
200A and below	Up to 1200A

Alternatively, a backup HRC fuse may be used in place of direct acting trip.

5.5 Testing Of Customer's Equipment

Customer's incoming switchboard and earthing system, where applicable, must be tested before turn-on of supply. Testing on High/Low Voltage equipment shall be performed by high voltage testing engineers authorised by EMA for this purpose.

5.6 Certificate Of Fitness For Turn-On

5.6.1

Form C

After the installation has passed all necessary tests to his satisfaction, the licensed electrical worker is required to certify the fitness of the installation. The certification shall be made in the standard Form C ([Appendix 19](#)) which is to be submitted to PSL before arrangements can be made for supply turn-on.

5.6.2

The licensed electrical worker is also required to certify the earthing system installed for customer's electrical installation using standard form CS/11 ([Appendix 20](#)).

5.7 Licence to Use or Operate an Electrical Installation

5.7.1

For electricity supply to a non-domestic, residential buildings and condominiums with an approved load greater than 45 kVA, the customer shall obtain a licence from EMA to use or operate the electrical installation (see [Note 8](#) of section 2).

5.7.2

It must be noted that PSL cannot turn on the electricity supply until such a licence is issued to the customer.

5.8 Requirements for Turn-on of Electricity Supplies

It is requirement that no electricity shall be supplied to any electrical installation unless:

- (i) The electrical installation is tested by the electricity supplier or an appointed licensed electrical worker authorised by EMA;
- (ii) The results of the test are approved by the electricity supplier; and
- (iii) Where the electrical installation is not exempted from the provision of the Public Utilities Act, a statement of turn-on of electricity is issued by the electricity supplier in respect of the electrical installation.

5.8.1 Pre-requisites for turn-on

- (i) Single line drawings where applicable and other relevant documents have been submitted and formal clearance has been given by Installation Section, PSL.
- (ii) Metering requirements, where applicable, have been submitted and formal clearance has been given by Meter Section, Grid.
- (iii) Customer's main incoming switchgear, protection system and earthing systems have been successfully tested by an authorised high voltage-testing engineer.
- (iv) Revenue meter has been installed by Grid.
- (v) Service cables to the installation are ready to be energised.
- (vi) FORM C - 'Certificate of fitness for Turn-On' duly endorsed by the licensed electrical worker in charge of the design, installation and supervision of the electrical installation is submitted to PSL.
- (vii) An utilities account has been opened with PSL.
- (viii) Licence to use or operate the electrical installation where applicable, has been obtained from EMA.

5.8.2 Turn-on Appointment

- (i) Appointment for turn-on of electricity supply to electrical installation of supply capacity greater than 45 kVA can be made by one of the following arrangement: -
The LEW or his representative shall submit the Form C, Form CS/11 (if applicable) and other relevant documents to Installation Section of PSL in person for making an appointment to turn-on electricity supply; or
The LEW can fax an 'Application for appointment for electricity supply turn-on by fax' ([Appendix 21](#)) to Installation Section of PSL.
- (ii) Turning-on supply involves several parties. The officer of the Installation Section, PSL will co-ordinate with the Customer Project Section, Grid for the energisation of the service cables for supply taken directly from Grid's network. The electrical worker will be responsible for arranging the energisation of the supply line with the relevant party responsible where supply is taken via landlord's switchboard such as in HDB, JTC or other private multi-tenanted buildings.
- (iii) An appointment for supply turn-on will be given within 7 days from the date of request.
- (iv) The licensed electrical worker in charge of the design, installation and supervision of work has to arrange for the LEW in charge of the operation of the installation and the owner of the installation to be present during the turn-on.
- (v) Upon successful turn-on of electricity supply to the installation, all parties are required to endorse on the form entitled 'Statement of Turn-On of electricity' ([Appendix 22](#)).

6. Metering Requirements

6.1 General

6.1.1

Grid will determine the location where the supply line terminates in the premises based on ease of accessibility to PSL's and Grid's officers.

6.1.2

The developer/customer must provide and maintain the meter boards at their own expense for installation of meters. However, meters will be supplied and maintained by Grid.

6.1.3

Meters can be mounted on any of the following types of meter board:

- (i) Teak board or any hard wood board chemically treated against attacks by termites. Plywood should not be used. The meter board shall be at least 20 mm thick and rigidly fixed by a minimum of 4 fixing screws.
- (ii) Metal panel with nylon inserts accurately positioned to accommodate the meter.
- (iii) Glass reinforced polyester (GRP) base fitted with nylon inserts accurately positioned to accommodate the meter.

If item (ii) or (iii) is provided, Manager (Meter), Grid has to be consulted on the locations of the nylon inserts.

6.1.4

The Licensed Electrical Worker/ Licensed Electrical Contractor must ensure that all the metering requirements are complied with, and must submit at the planning stage, all relevant drawings on meter locations, meter board size, meter rooms, meter compartments/riser ducts/ cupboard, etc to Manager (Meter), Grid for approval. Sample units of each approved type of meter compartments/riser ducts/ cupboards and meter boards shall be provided for final inspection and approval by Manager (Meter), Grid before meters are installed.

6.1.5

If the doors of centralised meter rooms, meter gate posts, meter compartments/ riser ducts/ cupboards, etc are to be locked, they shall be fitted with locksets which can be opened with any one of the following master keys:

- (i) Abloy master key code reference MK 911047
- (ii) Chubb (Union) master key code reference G1HBG
- (iii) Yale master key code reference PUB/MK48

The doors of meter rooms/compartments shall be able to be opened from the inside of the meter rooms/compartments without the need to use a key or other devices/tools.

6.1.6

All access doors to meter rooms / compartments/ riser ducts/cupboards, etc shall not have less than 600 mm (width) clear access opening. These doors shall be fitted with door knobs or handles.

6.1.7

Any security access systems installed in any premises shall not impede access by PSL and Grid personnel to the meter locations.

6.2 Location Of Meter

6.2.1 General

- (i) The service board accommodating Grid's service MCBs and meters shall be located near the termination of the service line. The meter/service position shall be easily accessible to PSL and Grid personnel at all times for purposes of maintenance and reading of meters.
- (ii) It shall be installed in a safe Location where the meters will not be damaged or be a cause of danger to personnel (viz, in a clean and dry location, not exposed to weather, mechanical injury, vibrations, extremes of temperature or dampness).
- (iii) The height of the meter on the meterboard shall be between 1.0 and 1.8 metres above ground level and the depth of the compartment for installation of meters shall be between 200 and 300 mm.

It is advisable to house the service board in an approved box of non-combustible high impact material to give added protection to the metering equipment and safety to personnel.

6.2.2 Grouping of Meters

Meters shall be installed outside each tenant unit for ease of meter reading, maintenance, etc. Where this is not possible for practical reasons, meters may be grouped together in easily accessible centralised meter rooms or meter compartments/ riser ducts/ cupboards in multi-tenanted premises (eg residential, office, shopping or industrial high rise building/complex).

6.2.3 Meters in Meter Compartments/ Riser Ducts/Cupboards

- (i) Meters are to be grouped on the same floor as the tenant units.
- (ii) There may be more than one group metering location each floor.
- (iii) There shall be adequate lighting in the group meter location to facilitate meter reading and meter installation/ maintenance.
- (iv) Meter boards in meter compartments/ riser ducts/cupboards shall be such that meters can be mounted facing the doors.
- (v) All meter compartments/riser ducts/ cupboards where meters are installed shall be clearly and permanently labelled. Tenant unit numbers on permanent labels must be fixed adjacent to their respective meters.
- (vi) Meter compartments/ riser ducts/ cupboards housing the meters must have clear glass windows provided on the doors, if these are locked, for ease of meter reading. The window for each meter must not be less than 200 mm (W) x 300 mm (H) x 6 mm (thickness) and must be correctly positioned in front of where the meter is to be installed. Plastic windows and UV resistant polycarbonate are not acceptable. Full glass door is not acceptable.

6.2.4 Meters in Centralised Meter Rooms

- (i) The height of the meter board or panel shall be such that meters can be mounted with the highest row not exceeding 1.8 metres above floor level and the lowest row not less than 1 metre above floor level.
- (ii) There shall be standing space of at least 700 mm in front of the meter panel. However, if the meters are mounted on a free-standing panel, a clearance of 700 mm all round the panel is required.
- (iii) The meter board or panel shall be rigidly and vertically mounted. The doors of the panel must be hinged.
- (iv) The meter room shall not be used as a storeroom.

6.2.5 Meters Installed in Landed Properties

- (i) The meters and service cables shall be installed in a weatherproof compartment located at the gate post or perimeter wall where applicable for supply capacity up to 100 Amperes 3 phase. The technical requirements for this compartment are as given in Appendices 23 and 24.
- (ii) If there is no gate post or fencing around the perimeter of the landed properties, meters shall be installed inside a splash proof meter box/compartment which is protected from the weather

and easily accessible to PSL's and Grid's officers. Meters shall not be installed inside the house for supply capacity of up to 100 Amperes 3 phase.

6.3 Meter/Service Board Specifications (Single-Phase And Three Phase Services, Not Exceeding 100 Amperes Per Phase)

The meter/service board for Grid's service MCBs and meters shall be as specified in section 6.1.3 and in accordance with the drawings in Appendices 25, 26 and 27.

6.4 Wiring, Layout Of Meters, Mcbs, Etc In Centralised Meter Rooms, Meter Compartments/Riser Ducts/ Cupboards

6.4.1

All wiring leading in and out of the group meter location shall comply with SS CP5. Landlord's wiring shall be segregated from tenant's wiring.

6.4.2

Meters are to be mounted together with their associated service MCBs/ neutral connectors such that each meter can be visually identified with its associated service MCBs. Each meter position must be clearly labelled according to the tenant unit number. There should be a space of 70mm between vertically mounted meters.

6.4.3

Meters are to be mounted in neat vertical columns and/or horizontal rows.

6.4.4

Service MCBs shall be sealable. MCBs shall be clearly labelled according to the tenant units served. The labelling shall also correspond to the labels used for the meters.

6.4.5

All wiring on the meter boards from service MCBs/ neutral connectors to the meters and from the meters to customer's main switches shall be neatly run on the surface either horizontally and/or vertically.

6.5 Submission Of Layout Plans

The layout of the meter room(s), meter compartment(s)/riser duct(s)/ cupboard(s) together with the Electrical Single Line and meter board drawings and plans of the units served, shall be submitted at the planning stage by the Licensed Electrical Worker for the approval of Manager (Meter), Grid.

6.6 Meters For 3-Phase Low Voltage Supply (Exceeding 100 Amperes Per Phase)

6.6.1

Meters for supplies exceeding 100 amperes per phase are operated from metering current transformers and are to be fixed on a pre-wired metering panel on the customer's main switchboard. However, where the length of the connecting leads is not excessive, the pre-wired metering panel may, with the prior approval of Manager (Meter), Grid be wall-mounted away from the main switchboard or in a separate meter room. The pre-wired metering panel complete with Meter Section Grid approved type test block, 6A (10kA) MCB and pilot lamps with wiring to current transformers and busbars shall be provided by the customer. Drawings of the meter panel can be collected from Meter Section Grid, St James District Office, Keppel Road.

6.6.2 Meter Panel Compartment Specifications

The specifications for the meter panel compartment shall be as follows:

- (i) Shall be mild steel of at least 1.6 mm thick or other materials subject to approval by Manager (Meter), Grid.
- (ii) The meter panel shall be detachable and of a size as given in [Appendix 28](#).
- (iii) Shall have a minimum depth of 100 mm between cover and base.
- (iv) Shall have opening(s) with appropriate bushing for the meter wires.
- (v) The cover shall have at least 3 hinges and be able to swing or open out at least 90°.
- (vi) Facilities for sealing shall be provided. Methods of sealing are illustrated in the drawings in [Appendix 29](#).

6.6.3 Meter Installation Requirements

- (i) The switchboard must be complete and securely mounted in its final position before meters can be installed.
- (ii) The top of the meter panel shall not exceed 2.0 metre from the ground.
- (iii) A 50 mm x 50 mm trunking of metal or other approved material between the switchboard and the meter panel shall be provided if the latter is installed away from the customer's main switchboard.
- (iv) A 6.0-mm tap-hole plus screw/washer on each busbar shall be provided to facilitate connection of the voltage supply to the meter voltage coils.
- (v) If the meter panel is away from the customer's main switchboard, a sealable 3-pole ganged MCB of 6 amperes 10kA rating shall be provided on the front of the switchboard panel near to the metering CT enclosure for the protection of the meter voltage wiring. The MCB must be appropriately labelled.
- (vi) Mounting of metering current transformers shall be as follows: -
 1. Current transformers shall be mounted on jumpers for easy installation.
 2. Bakelite clamps shall be provided to secure the meter current transformers in position.
 3. Adequate insulation between the metering current transformers and the busbar must be provided.
 4. The contractor shall install the metering current transformers and meter voltage connection point after the incoming supply main protection current transformers.
- (vii) A rigid enclosure of mild steel plate of thickness not less than 1.6 mm shall be provided solely for housing Grid's metering current transformers and voltage tap off point. Such enclosure shall be provided with facilities for sealing. A typical construction of the enclosure is shown in [Appendix 30](#).

6.7 High Voltage Metering

6.7.1 General Requirements

- (i) The customer is required to provide, install and maintain at his own expense, current transformers, voltage transformers, a pre-wired metering panel with test blocks, MCBs, pilot lamps and accessories, to Grid's requirements at his receiving high voltage switchboard. Drawings of the metering panel can be obtained from Meter Section, Grid, St James District Office, Keppel Road.

All metering current and voltage transformers shall be used solely for Grid's revenue metering circuits. No other apparatus of the customer is permitted to be connected to such metering current and voltage transformers. A voltmeter may be allowed to be connected via a 100 mA fuse (sealable) subject to approval by the Manager (Meter), Grid.
- (ii) The customer shall also provide a metering kiosk to be located close to where the metering current and voltage transformers are installed such that the route length of the wiring from the current and voltage transformers to the metering kiosk does not exceed 9 meters. Where this cannot be complied with because of site constraints, the Licensed Electrical Worker shall consult the Manager (Meter), Grid concerning the type and size of pilot cables to be provided and installed by the customer.

The requirements for the kiosk are given in Appendices 31, 32.1 and 32.2. The access to the metering kiosk shall be from outside the high voltage switchroom and shall be fitted with any one of the Grid's approved master lock series as specified in section 6.1.5.

- (iii) The customer shall provide an appropriate metering panel of size as given in [Appendix 33](#) and shall install a 50 mm x 50 mm trunking of metal or other approved material between the customer's high voltage switchboard and the metering panel together with the required type and size of pilot cables.
- (iv) Facilities for sealing connections of all metering wire termination at customer's high voltage switchboard shall be provided.
- (v) A schematic and wiring diagram of the particular customer's switchgear must be supplied to facilitate metering equipment installation.

6.7.2 Specifications for metering current transformers

- (i) The customer shall provide 3 metering current transformers of 30VA burden for 66 kV supply or 2 metering current transformers of 15 VA burden for 22 kV or 6.6 kV supply and of accuracy class 0.5 complying with SS 318:1987 for each of his receiving switchgear. The current transformers are to be installed on the red and blue phases of the busbars in the case of supply at 22kV or 6.6 kV. The current transformer ratio shall be determined by Grid based on the customer's load requirement.
- (ii) The rated short-time current rating shall not be less than 40 kA 3 seconds, 25 kA 3 seconds or 20 kA 3 seconds for supply at 66 kV, 22 kV or 6.6 kV respectively.

6.7.3 Specifications for Voltage Transformers

- (i) For each of the customer's receiving switchgear, one of the following appropriate voltage transformers shall be provided:
 1. One unit three phase 6.6 kV/110V, 22 kV/110 V or 66 kV/110 V voltage transformer of 100VA burden per phase, connected star-star with the yellow phase terminal of the secondary winding earthed, or
 2. Three units single phase,

$$\frac{6.6kV}{\sqrt{3}} \Big/ \frac{110V}{\sqrt{3}} \quad \text{or} \quad \frac{22kV}{\sqrt{3}} \Big/ \frac{110V}{\sqrt{3}} \quad \text{or} \quad \frac{66kV}{\sqrt{3}} \Big/ \frac{110V}{\sqrt{3}}$$

Voltage transformers of 100VA burden per phase, connected star-star with the yellow phase terminal of the secondary winding earthed, or

3. Two units single phase 6.6kV/110V, 22kV/110V voltage transformers of 180 VA burden per phase, 'V' connected with the yellow phase terminal of the secondary winding earthed.

Voltage transformers shall be of accuracy class 1.0 complying with BS 3941:1975.

- (ii) The secondary wiring of the voltage transformer shall terminate in a sealable miniature circuit breaker incorporated in the switchgear panel. The miniature circuit breaker shall be rated at 6A, 110V, 50Hz with breaking capacity not less than 6kA and the terminals of the miniature circuit breaker shall be able to accept cables of cross section up to 6 mm².
- (iii) Adequate stock of spare high-voltage fuses must be kept by the customer for those voltage transformers fitted with fuses.
- (iv) All metering current transformers and voltage transformers together with their manufacturers' test certificates must be submitted for testing and approval by Meter Section, Grid at least 2 weeks before supply is required.

6.8 Master and Sub-metering Scheme

All multi-tenanted premises will be metered under Master and sub-metering arrangement. The supply of electricity to each individual unit within the premises shall be metered individually under their respective sub-meter whereas the landlord or the owner of the premises will be metered under the master-meter. The landlord or owner shall pay the amount of electricity representing the difference

between the amount of electricity supplied and registered by the master meter and the aggregate of the amount of electricity supplied to the occupants of the individual units within the premises.

6.9 Metering Requirements

6.9.1 Low Tension Consumers

- (i) Single Consumer-more than 70 kVA
 1. Provision of pre-wired CT metering panels installed on switchboard complete with Grid approved test block, MCB and indicating lights with wiring to the CTs and busbar.
 2. Request for appointment to fix meters only after arrangements have been made with Installation Section, PSL, for the intake switchboard to be inspected and turned-on.
 3. Upon production of 'Electricity Supply Turn-on' letter issued by Installation Section, PSL. Meter Section, Grid, will fix meter installation appointment date and bring CTs to site for LEC to install in customer switchboard.
- (ii) Multi-tenanted Buildings
 1. Submission of floor plans of building showing the locations of metering kiosks, meter room, meter compartments/riser ducts/ cupboards.
 2. Submission of dimensioned metering layout showing the plan, front and side elevations of the meter boards / rooms/ compartments/ riser ducts, cupboards, etc.
 3. Arrangements for sample units of each approved type of meter compartments/ riser ducts/ cupboards and meter boards to be inspected and approved by Meter Section before meters are installed.
- (iii) Landed Housing Development
 1. Submission of site plans of building showing the locations of meter compartments at gate pillars/posts.
 2. Submission of dimensioned metering layout showing the plan, front and side elevations of the meter compartments in the gate pillars/ posts.
 3. Arrangement for sample units of each approved type of meter compartments and meter boards to be inspected and approved by Meter Section, Grid, before meters are installed.

6.9.2 High Tension Consumers

- (i) The revenue metering equipment will be installed at the consumer's end of the supply connection. The consumer shall provide suitable metering kiosk at his intake station, metering CTs and PTs for each service cable at his intake switchboard. The metering CTs shall be of class 0.5, 15 VA, ratio based on declared demand as shown on (vi).
- (ii) The metering CTs and VTs are to be used solely for revenue metering purposes. The CTs and VTs are to be sent together with the manufacturer's test certificates to Meter Section, Grid for testing and approval at least 2 weeks prior to target date of supply. For 66kV supply, LEW will have to make special arrangement with Meter Section, Grid.
- (iii) The VTs after re-installation onto consumer's switchgear are required to be tested and phased out and test report as per [Appendix 34](#) submitted to Meter Section Grid for approval before installation of meters.
- (iv) The consumer shall provide and maintain a telephone line to the metering kiosk for remote meter reading purpose. This telephone line shall be a direct line or a Direct Inward Dialling (DID) line and shall be terminated in a standard telephone socket outline at the metering kiosk. Provision of this telephone line must be made before installation of meters.
- (v) If the permanent telephone network is not ready to provide us this telephone line, a temporary line shall be provided in the interim period.
- (vi) Based on the contracted capacity stated in the application form C/S 1, the consumer is required to provide the correct metering CTs as follows:

	Contracted Capacity MW	CT Ratio
22kV System	0.0-0.8	50/25/5
	0.81-1.7	100/50/5
	1.71-2.5	150/75/5
	2.51-3.2	200/100/5
	3.21-5.0	300/150/5
	5.01-6.6	400/200/5
	6.51-10.0	500/300/5
66kV System	0.0-5.0	100/50/5
	5.01-10.0	200/100/5
	10.01-20.0	400/200/5
	20.01-30.0	500/300/5
	30.01-40.0	800/400/5
	40.01-80.0	1000/500/5

6.10 Meter Maintenance

Type	Cycle
High Tension	Once every two years
3-phase Low Tension (more than 100A)	Once in every ten years
3-phase Low Tension (not exceeding 100A)	Once in every fifteen years
1-phase Low Tension	Once in every fifteen years

6.11 Procedures for Assessing Estimated consumption in case of Faulty/Defective Meters

If any of the meters shall for any reason be faulty and thereby does not show accurately the amount of electricity supplied to the premises, Power Supply shall make a fair and reasonable estimate of the amount of electricity consumed during the period when the meter or meters were faulty or inaccurate, and the consumer shall pay for such amount so estimated. For this purpose, a meter shall be deemed to be inaccurate if, on testing the meter, it is found to be inaccurate by more than 1.3% (for HT) and 2.5% (for LT).

6.12 Procedures for Resolving Disputes Involving Meter Accuracy

- (i) If the consumer disputes the reading of any meter of the Power Grid Ltd which is used to measure the amount of electricity supplied to him, the consumer may request Power Supply Ltd to have the meter tested.
- (ii) If, on testing the meter, it is found to be inaccurate, Power Supply shall cause the meter to be repaired or replaced in its discretion, and shall make a fair and reasonable estimate of the amount of electricity used during the period when the meter was inaccurate, and the consumer shall pay for such amount so estimated.
- (iii) If the consumer further disputes the reading of such meter which shall have been tested and found to be not inaccurate, it may, on payment of such reasonable fee request Power Supply Ltd for a further test.
- (iv) If the further test confirms that the meter is inaccurate, any fee paid by the consumer above shall be refunded to consumer.

7. Customer Information

7.1 Leaflets on Utilities Account

Leaflets on “Starting your utilities account”, “All about your utilities bill”, “Utilities auto link”, “ Know your meters”, “Guide to electricity supply application ”; GIRO form, Application form for opening of accounts and other Forms are available at the Customer Services Centre at Upper First Storey, 111 Somerset Road.

7.2 Leaflets on Energy Conservation

Leaflets on “ Energy Conservation & Exhibition Centre” and “Energy is precious. Use it wisely”, are available at the Energy Efficiency Centre (EEC) at 111 Somerset Road #01-08. Consumers can call our EEC’s hot line at 8238293 / 8238294 to find out more information how to use energy efficiently or visit our website at <http://www.cansupply.com.sg>.

Appendix 1 Form CS/1- Application for Electricity Supply Service

[FORM CS/1 - APPLICATION FOR ELECTRICITY SUPPLY SERVICE](#)

Appendix 2 Form CS/2- Pre-application Consultation for Electricity Supply

[FORM CS/2 - PRE-APPLICATION CONSULTATION FOR ELECTRICITY SUPPLY](#)

Appendix 3 Form CS/3- Letter of Consent from the Landlord/ Management Corporation

[FORM CS/3 – LETTER OF CONSENT FROM THE LANDLORD/ MANAGEMENT CORPORATION](#)

Appendix 4 Form CS/3H- Letter of Consent from Housing & Development Board

[FORM CS/3H – LETTER OF CONSENT FROM HOUSING & DEVELOPMENT BOARD](#)

Appendix 5 Form CS/4- Request to Handover Substation

[FORM CS/4 - REQUEST TO HANDOVER SUBSTATION](#)

Appendix 6 Agreement Card for Utilities Account

APPLICATION(S) FOR THE SUPPLY OF WATER, ELECTRICITY AND/OR GAS

Appendix 7 Giro Application Form

APPLICATION FORM FOR INTERBANK GIRO

Appendix 8 Drawing - 6.6KV/LV Substation

[DRW\6.6kV-8.1.DWG](#)

[DRW\6.6kV-8.2.DWG](#)

[DRW\6.6kV-8.3.DWG](#)

[DRW\6.6kV-8.4.DWG](#)

Appendix 9 Drawing - 22KV/LV Substation

[DRW\22kV-9.1.DWG](#)

[DRW\22kV-9.2.DWG](#)

[DRW\22kV-9.3.DWG](#)

[DRW\22kV-9.4.DWG](#)

[DRW\22kV-9.5.DWG](#)

Appendix 10 Drawing - 22KV/6.6KV Substation

[DRW\2266-10.1.DWG](#)

[DRW\2266-10.2.DWG](#)

[DRW\2266-10.3.DWG](#)

[DRW\2266-10.4.DWG](#)

[DRW\2266-10.5.DWG](#)

Appendix 11 Drawing - Heavy Duty Aluminum Doors for Electric Substation

[DR\SUBSTATION DOOR-11.1.DWG](#)

[DR\SUBSTATION DOOR-11.2.DWG](#)

[DR\SUBSTATION DOOR-11.3.DWG](#)

[DR\SUBSTATION DOOR-11.4.DWG](#)

[DR\SUBSTATION DOOR-11.5.DWG](#)

[DR\SUBSTATION DOOR-11.6.DWG](#)

Appendix 12 Drawing - Substation Gate

[DRW\SUBSTATION GATE-12.1.DWG](#)

[DRW\SUBSTATION GATE-12.2.DWG](#)

Appendix 13 Form CS/5- Checklist for Grid Substation Building Plan Submission

[FORM CS/5 - CHECKLIST FOR GRID SUBSTATION BUILDING PLAN SUBMISSION](#)

Appendix 14 Substation Layout Requirements To Be Incorporated In The Architectural Plans

Substation Layout Requirements To Be Incorporated In The Architectural Plans

Item	Requirements
Cable Entry Ducts	Heavy duty 150mm dia. UPVC pipes in concrete jacket to be provided.
	To be sealed with removable water-tight plugs at both ends of pipes.
	To have piling, if necessary.
Cable Entry Ramp	Cross Sectional views to be shown.
	150mm wide removable hot-dipped galvanised mild steel gratings to be provided.
	Walls and floors to be plastered and rendered waterproof.
Cable Trenches	Sand filling to be carried out after cable installation.
	Depth of 900mm (no beams shall be allowed within/across the trenches).
	Openings to be covered by removable hot-dipped galvanised mild steel.
Switchgear Floor	Grating of 300mm width which is able to support at least 100 kg.
	To take a load of 1,600 kg per sq m. Floor beam is to be 200mm away from the HV floor opening. All floor openings to be free of beam.
Switchroom	Louvred heavy duty aluminium door to Grid drawing C/01/75E. Size: 2.9M X 1.8M wide nett for 22kV switchroom 2.7M X 1.8M wide nett for 6.6kV switchroom,
	Floor to have a 50mm thick cement rendering including a 20mm granolithic smooth finish of cement, granite chips and sand in the ratio of 1:1:1 plus 9kg ironite or equivalent approved hardener to each 45 kg of cement. For 22kV substations, final rendering of Grid switchroom floor to be done after installation of switchgear floor frame.
	Height: No part from floor to ceiling beams to be less than 3.1M. No column allowed within the switchroom.
	Hot-dipped galvanised mild steel/stainless steel railing to be provided for stairs and loading platform. (Removable type in front of door.)
	Hasp and staple (140m x 65m x 6mm) and door hinges to be of brass of stainless steel.
	Adequate natural lighting required. Provision of glass block in small modules.
	Ventilation panels at high level for all 6.6kV substation and ONLY 22kV substation integrated into customer's building.

Transformer Room/Yard	Noise level of 60 dB emitted from each transformer to be considered in the choice of location of transformer yard.
	Adequate natural cross air ventilation required. Provision of PC vent block or Aluminium ventilation panels.
	Each transformer plinth to be able to take a dead load of 6 tonnes. For 22/6.6kV transformer, plinth to be able to take a dead load of 30 tonnes. For transformer yard, 50 - 75 mm size granite chips are to be provided after completion of installation work.
	Door: 2.7M x 2.7M nett for each transformer. Heavy duty aluminium louvered doors to Grid drawing C/01/75E.
	LT trench of 800mm min. width for every 2 transformers. Separate LT trench to be provided for additional transformers.
	Hasp and staple (140mm x 65mm x 6mm) and door hinges to be of brass or stainless steel.
Wall/Column finished	All concrete surfaces shall be properly prepared and 20mm cement plastering work carried out such that there should be no cracks, blisters and other defects.
	The emulsion painting system used for external walls shall be suitable for outdoor application. There shall be a five (5) years warranty of the textured coating on all walls against all defects arising from colour-fastness, faulty workmanship and/or materials, etc.
Electrical Installation	Schematic layout to be shown
	All wiring to be in surface conduits.
	Circuits to be controlled by miniature circuit breakers and ELCB.
	Isolators for battery chargers to tap supply by-passing ELCB.
	Substation to be adequately lit. Light fittings are to be installed at 3M (suspension in type) and 2.4M (wall-mounting type) from floor level. Wire-mesh casing to be provided for light fittings installed in cable chamber. To label circuits at DB (distribution board) corresponding to the respective switches, sockets and isolators, etc.
Cable Chamber 'Basement' (where required)	Trap door floor openings 760mm x 760mm leading to cable chamber to have - (a) hinged aluminium chequered covers complete with wall catch. (b) cat ladders with 6 non-skip steps. Details as shown on drawings.
	Adequate natural ventilation required e.g. PC vent block/Aluminium vent panels. Height: 2.0m with no part less than 1.5m. To paint the front and back of all beam with 50mmH red luminous paint. Chamber floor to be 'suspended' type capable of supporting 400 kg/m ² (min).

	<p>Floor level: 150mm above the immediate external final road or driveway level and above highest flood level recorded. Wall and floor to be waterproofed and adequate drainage to be provided, where necessary.</p> <p>Doors to be fitted with panic hardware and paint in red "Push lever down to open" on internal side of door.</p>
Metering Kiosks	To be provided for PowerGrid (see Appendices 31 to 33) when customer is taking HT supply.
Woodwork, metal work, etc.	To be suitably painted and anti-termite treated for all woodwork.
Ceiling	To be of smooth finishes and emulsion painted. All beam to be encased in RC concrete.
Roof	To be of flat RC suitably waterproofed and laid to falls of 1:80 minimum. Roof eaves with multiple 150mm wide long slot openings to be incorporated for rain water to free-fall direct into apron drain.
Drainage	Proper drainage around the substation to be provided with hinged hot-dipped galvanised m.s. gratings.
Gate/Perimeter	To be 1.8m high and designed to blend aesthetically with the overall development. 2.1m height maybe required for 22/6.6kV substation.
	Hollow section anodised aluminium gates to Grid drawing SN1642-D.
	A 600mm wide concrete apron to surround the fence externally.
Access Road	To withstand heavy vehicles with laden load of 10 tonnes for all 22kV & 6.6kV substations except 22/6.6kV substation where laden load of 30 tonnes is required.
	Width of driveway to be 4000mm (min) and surface to be properly paved. 5000mm (min) driveway width required for 22/6.6kV substation.
	No car parking lots are to be drawn in such a way as to obstruct vehicular access to substation.

NOTE:

- (a) Appointed project LEW is to liaise closely with Architect and Structural Engineer to obtain all their respective requirements for incorporation into final layout plans submitted for Grid's endorsement.
- (b) All dimensions and figures are to be checked by the Architect/structural engineer/appointed project LEW prior to substation construction.
- (c) If the management Committee (MC) was to subsequently replace the security personnel with other means e.g. electronic security systems, etc; Power Grid Ltd shall be consulted on the free access arrangement to the substation.

Appendix 15 Requirements to be indicated on Single-Line Drawings of customer's electrical installation

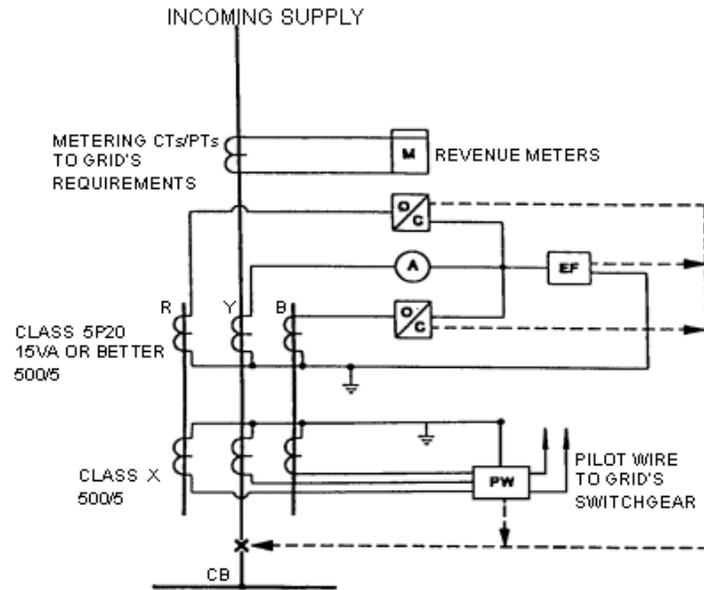
POWER SUPPLY LTD - Requirements to be indicated on single-line drawings of customer's electrical installation

- 1 To indicate the salient technical details of the circuit control equipment and interlocks at the main switchboard, standby generator, etc.
- 2 To indicate against each main switchboard the contracted load in kW.
- 3 To indicate clearly the position(s) of revenue metering current transformers or revenue metering points and the mains/sub-mains circuits serving the landlord's and tenants' requirements where multiple customers are being served by the same supply lines.
- 4 To show clearly positions of all current transformers, CT ratio, class of accuracy and VA Burden for metering and protective relays. To specify the type of protection to be provided for the incoming and/or outgoing circuits. (Please refers to drawings in Appendices 17 & 18 if applicable).
- 5 To indicate against all the incoming/outgoing circuit breakers on the main intake switchboard, the number of poles, the rating and short-time withstand current ratings of the switchgear.
- 6 To indicate provision of pilot lamps before the incoming circuit breakers/switch for monitoring of the status of the main incoming supply service.
- 7 To indicate the propose metering scheme for the installation.

Appendix 16 Form CS/14- Checklist for Single-Line Drawings Submission

[FORM CS/14 - POWER SUPPLY LTD - CHECKLIST FOR SINGLE LINE DRAWINGS SUBMISSION](#)

Appendix 17 Protection Requirements for Customer HV Main Incoming Switchgear



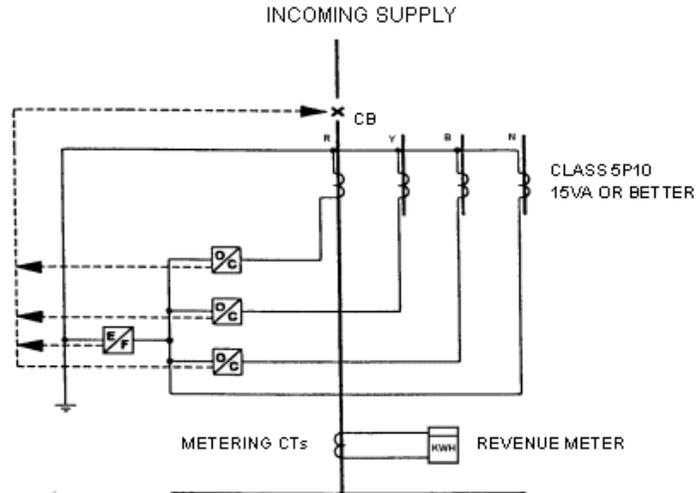
CUSTOMER'S HV MAIN INCOMING SWITCHBOARD

O/C	Overcurrent relay type IDMTL with 3/10 characteristics.
E/F	Earth fault relay type IDMTL with 3/10 characteristics.
P/W	Pilot wire protection relay Solkor 'R'/'RF', HOR 4.
A	Ammeter
CB	Circuit breaker
----->	To circuit breaker trip circuit.

Note:

- Pilot wire protection CT shall comply with the following requirements:
 - Rated knee point emf at maximum secondary turns not less than 80V.
 - Exciting current at the rated knee point emf not more than 150mA.
 - Resistance of the secondary winding, corrected to 75°C not more than 0.15 ohm.
- Where there are more than one incoming service, a bus-section breaker shall be provided and be electrically & mechanically interlocked against parallel operation of the incoming services.

Appendix 18 Protection Requirements for customer LV Main Incoming Switchgear



CUSTOMER'S LV MAIN INCOMING SWITCHBOARD

O/C	Overcurrent relay type IDMTL with 3/10 characteristics or DTL relay. DTL relay shall be set at 100% of approved load with a time lag of not more than 0.5 second.
E/F	Earth fault relay operating at primary fault current of 20% of approved load subject to a maximum of 120 Amp with time lag of not more than 0.5 second. The overall ohmic resistance of earthing system should not exceed one ohm.
CT	Current transformer Class 5P10, 15VA or better.
CB	CIRCUIT BREAKER WITH ADEQUATE BREAKING CAPACITY Circuit breaker using shunt trip shall be provided with series trip (Direct acting trip) device that operates with no time lag under short-circuit condition, or with HRC fuses in series.
-----➔	To circuit breaker trip circuit.

Note:

Where there are more than one incoming service, a 4-pole bus-section breaker shall be provided and be mechanically interlocked against parallel operation of the incoming services.

Appendix 19 Form C- Certificate of Fitness for Turn On

[FORM C - CERTIFICATE OF FITNESS FOR TURN-ON](#)

Appendix 20 Form CS/11- Declaration of the Earthing System

[FORM CS/11 - DECLARATION OF THE EARTHING SYSTEM](#)

Appendix 21 Application for Appointment for Electricity Supply Turn On by Fax

[APPLICATION FOR APPOINTMENT FOR ELECTRICITY SUPPLY TURN-ON BY FAX](#)

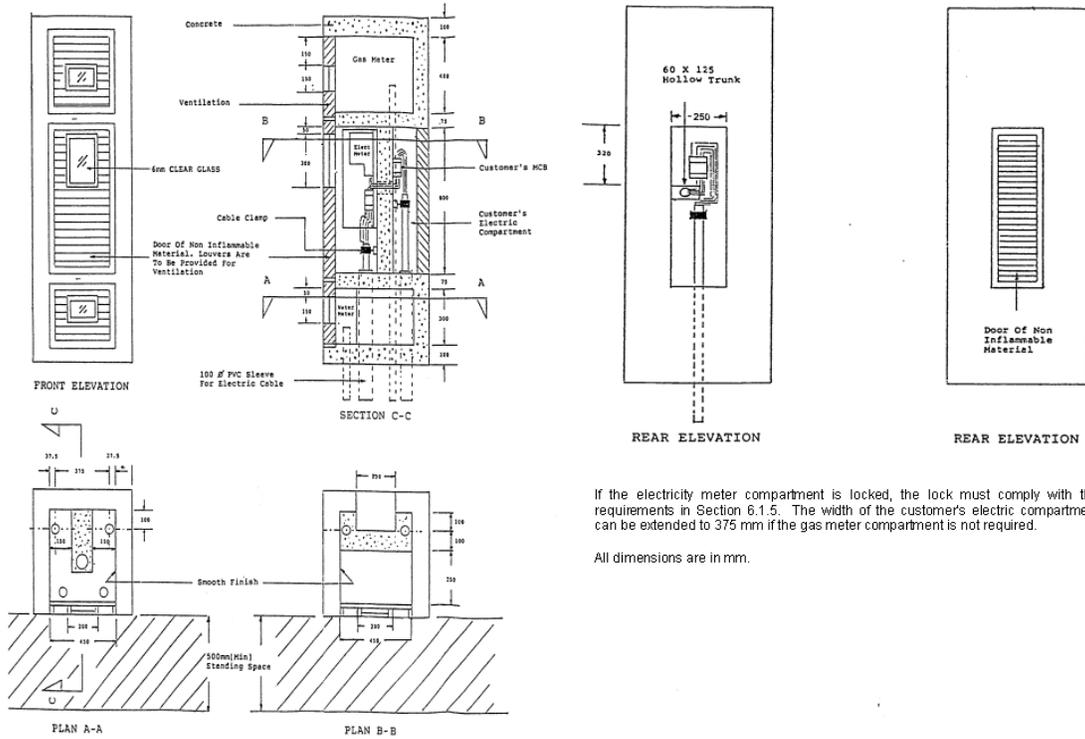
Appendix 22 Statement of Turn On of Electricity

STATEMENT OF TURN-ON OF ELECTRICITY

Appendix 23 Technical Requirements for Service Cable and Meter Compartment for Compound Houses

- 1 The service cable termination and meter compartment shall be located at the front-gate pillar/perimeter wall such that it is accessible to PSL's and Grid's officer without the need to enter the customer's premises.
- 2 It shall be constructed of concrete, brick or high impact fibre glass and shall be completely weatherproof. Provision shall be made to prevent any stagnation of water within the compartment.
- 3 The main dimensions of the compartment are shown in the layout drawing (see Appendix 25). The depth of the compartment shall be between 250 mm and 300 mm.
- 4 A meter board of 20 mm thick and constructed of teak wood or any hardwood chemically treated against termite attack shall be provided. Plywood board is not acceptable. A minimum space of 450 mm (W) x 800 mm (H) shall be allowed for the termination of the service cable and the installation of service MCBs and meters. Customer's MCBs or connectors shall be mounted on a separate board in a separate compartment.
- 5 A hinged door with a clear glass viewing window shall be provided. The viewing window with a 200 mm (W) x 300 mm (H) x 6 mm (thickness) glass cover shall be positioned to be directly in front of the meter location. To avoid high humidity and condensation within the compartment, sufficient ventilation shall be provided. The access door shall not have less than 450 mm clear access opening.
- 6 The door shall be constructed of stainless steel, anodised aluminium or high impact type fibre glass reinforced material. Where a metal door is provided, a means of earthing shall be provided.
- 7 One 100mm diameter UPVC lead-in pipe shall be provided for PG service cable. The pipe shall be laid up to 100 mm from the floor slab of the electric meter compartment and shall undercross any drain in front of the compartment.
- 8 There shall be adequate standing space in front of the compartment to facilitate meter reading, installation and maintenance work. Where there exists a drain in front of the compartment, a suitable concrete platform or hinged galvanised steel grating shall be provided.
- 9 The compartment shall be exclusively used for service cable and electricity meter. No water meter, gas meter or other facilities shall be placed within the same compartment.
- 10 Please obtain clearance from URA's Development Control Division if the meter-box structure exceeds their stipulated dimensions.

Appendix 24 Drawing - Standard Meter Compartments At Gate Pillar

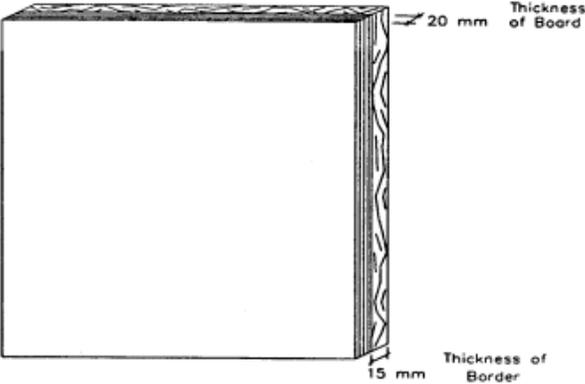


If the electricity meter compartment is locked, the lock must comply with the requirements in Section 6.1.5. The width of the customer's electric compartment can be extended to 375 mm if the gas meter compartment is not required.

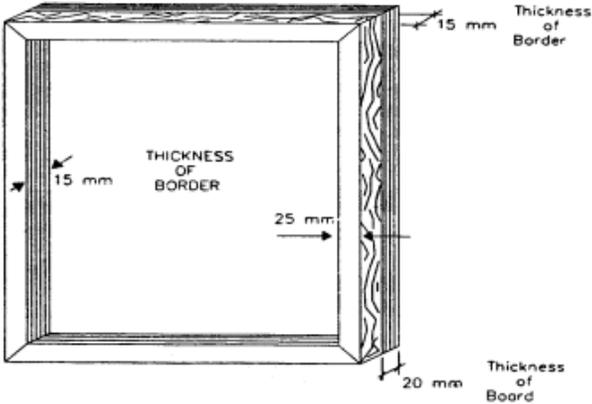
All dimensions are in mm.

STANDARD METER COMPARTMENTS AT GATE PILLAR

Appendix 25 Drawing - Standard Meter Board



Front View of Standard Meter Board



Back View of Standard Meter Board

Appendix 26 Drawing - Standard Size for Single-Phase Meter Board

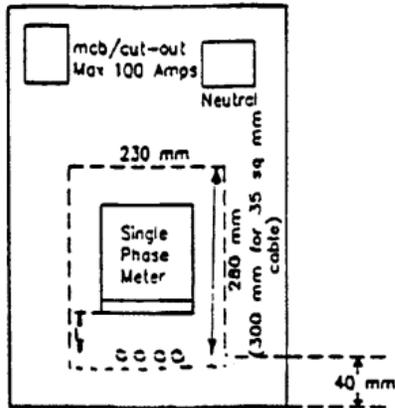


Fig A

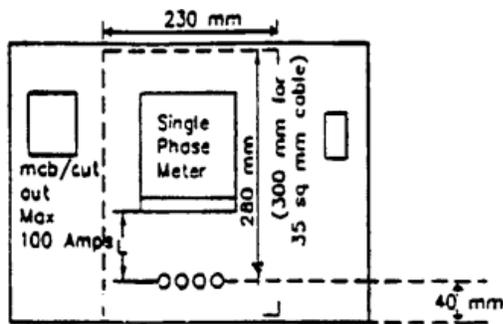


Fig B

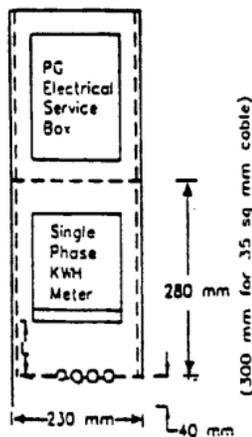
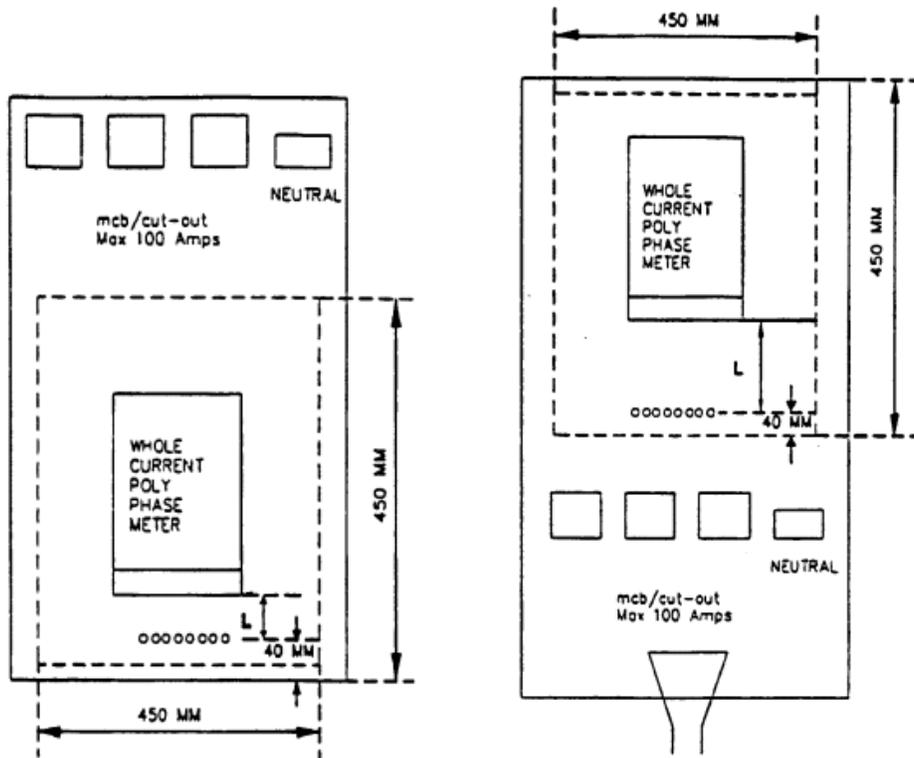


Fig C

1. Minimum space for single-phase meter position (enclosed within broken lines):-
 - (i) 230 mm (W) x 280 mm (H) for 25 sq. mm cable and below.
 - (ii) 230 mm (W) x 300 mm (H) for 35 sq. mm cable.
2. A customer's earthing terminal shall be provided on the meter board for termination of the earthing lead and earth continuity conductor.
3. Not more than one wire shall be connected to each terminal of the meter terminal block.
4. All wires on the meter board from MCB/Cut-Out to meter and meter to main switch should preferably be run on the surface.
5. The size of cables to be used for connection to meters should not exceed 35 sq. mm.
6. The minimum length of wire "L" protruding from the meter board to the meter terminal shall be at least 200 mm.
7. For meters grouped in a centralised meter room etc, an additional minimum spacing of 70 mm is necessary between each row of meters for ease of installation/change.
8. Some typical layouts are shown in figures A, B and C.

Appendix 27 Drawing - Standard Size For Three-Phase Meter Board

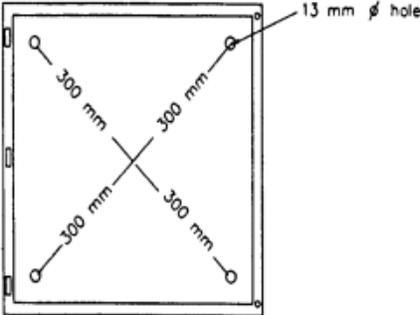


Overhead Type

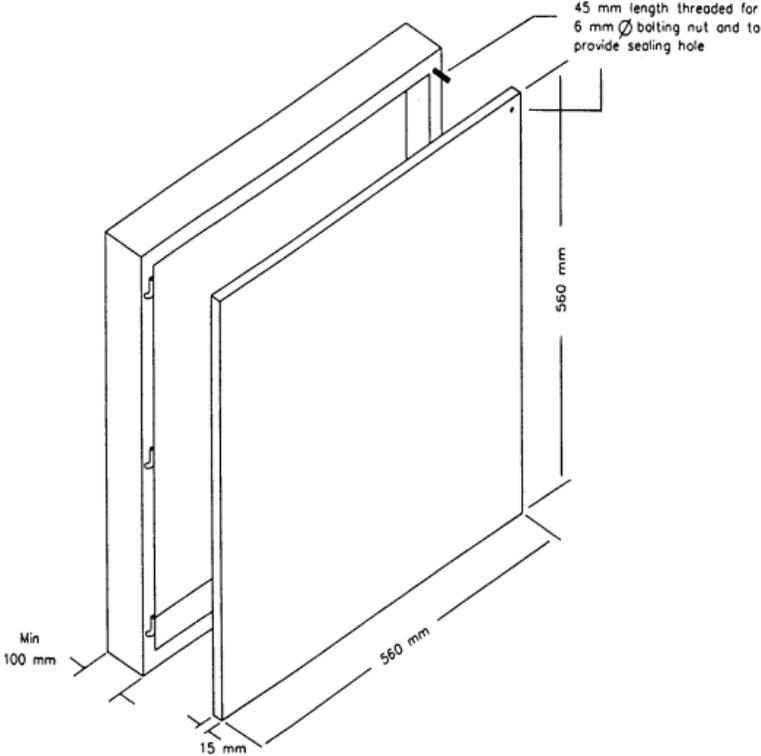
Underground Type

1. Minimum space for three-space meter position 450 mm (W) x 450 mm (H) (enclosed within broken lines).
2. A customer's earthing shall be provided on the meter board for termination of the earthing lead and earth continuity conductor.
3. Not more than one wire should be connected to each terminal of the meter terminal block.
4. All wires on the meter board from MCB/Cut-Out to meter and meter to main switch should preferably be run on the surface.
5. The size of cables to be used for connection to meters should not exceed 35 mm².
6. The minimum length of wire "L" protruding from the meter board to the meter terminal should be 200 mm.

Appendix 28 Drawing - CT Meter Panel for Low Voltage Supply



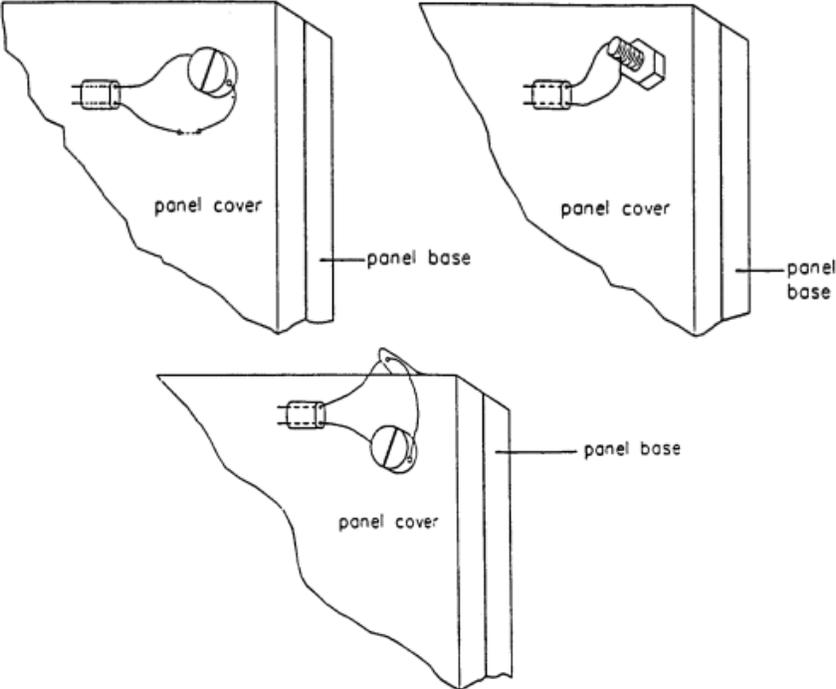
Front Elev. (Panel Box)



PANEL BOX

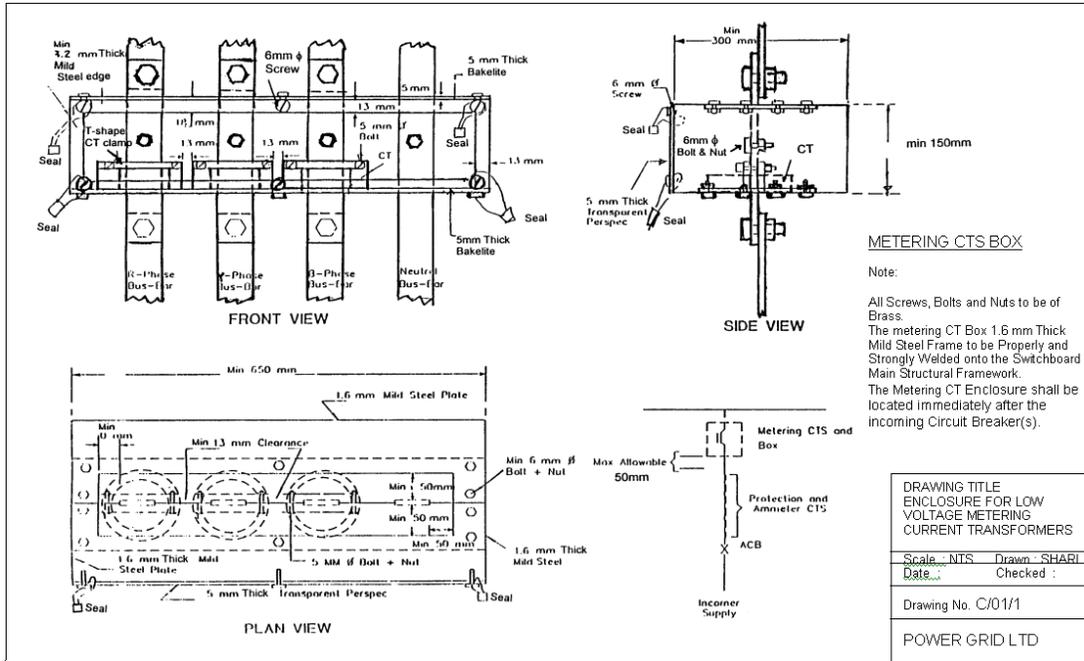
METER MOUNTING PANEL

Appendix 29 Drawing - Methods of Sealing Meter Panels



All holes for threading sealing wires should be 2 mm size

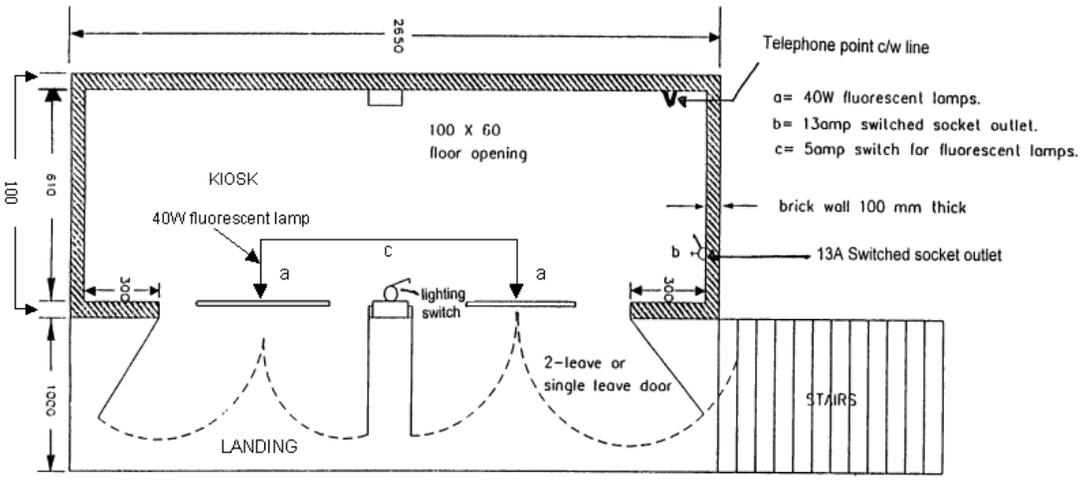
Appendix 30 Drawing - Enclosure for Low Voltage Metering Current Transformers



Enclosure for Low Voltage Metering Current Transformers

Appendix 32.1

Drawing - HV Metering Kiosk Requirements (for 3 or 4 feeders)



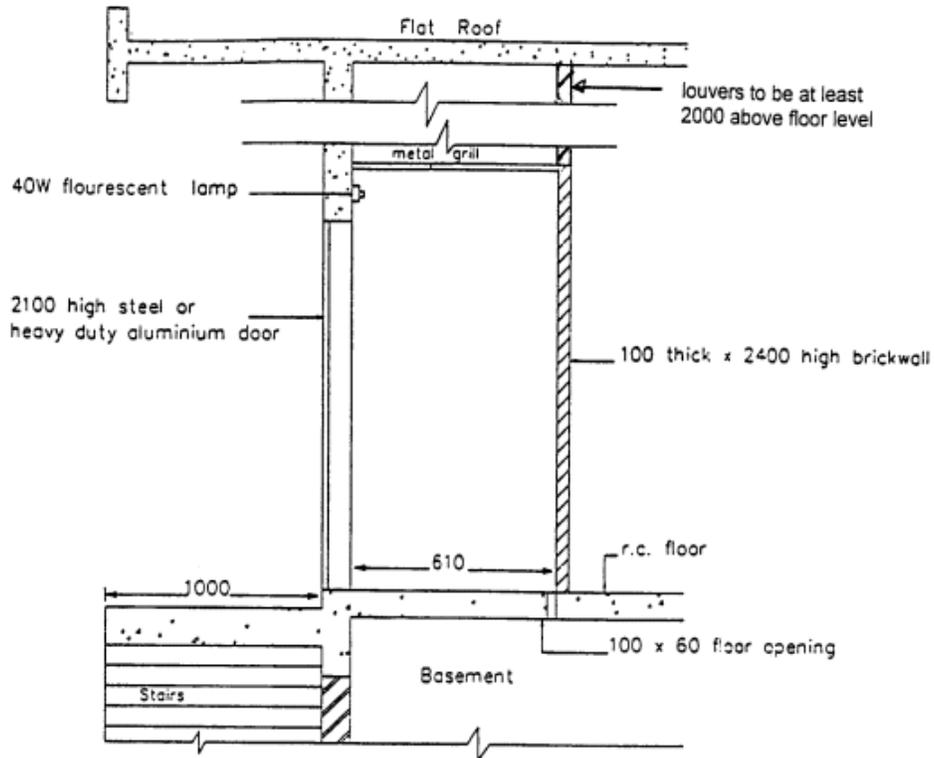
Floor Plan of Metering Kiosk

Not to scale.
All dimensions in mm.

Floor Plan of Metering Kiosk

Appendix 32.2

Drawing - HV Metering Kiosk Requirements (for 3 or 4 feeders)



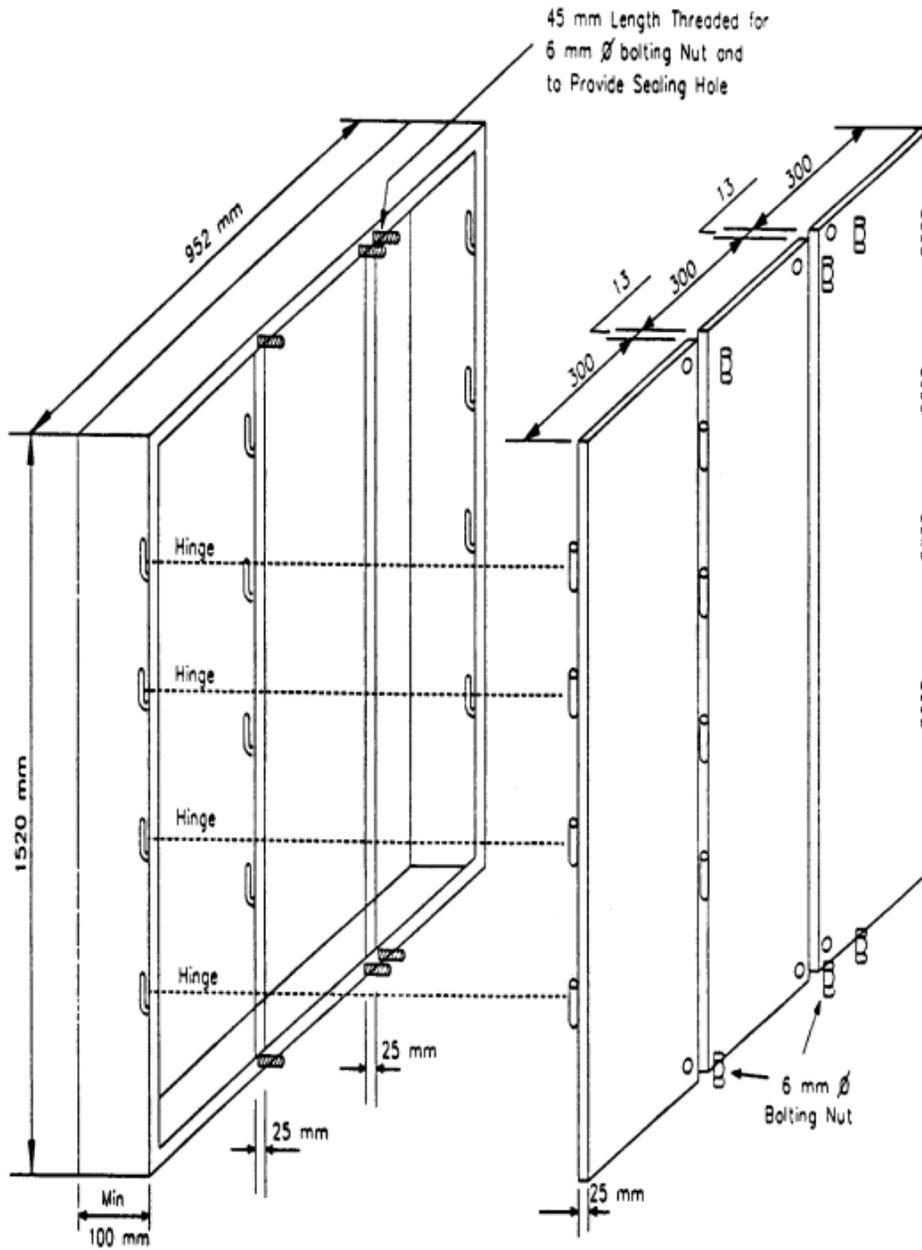
Side Elevation of Metering Kiosk for 3 or 4 feeder panel

The following are required:

- Metering kiosk: 810 mm by 2650 mm by minimum height 2400 mm of solid brick as shown.
- Floor opening 100 mm by 60 mm as shown.
- Staircase and 1000 mm landing where required.
- Steel or heavy duty aluminum door of 800 mm wide by 2100 mm height to be fitted with a lockset which can be opened with one of the approved PG masterkeys as given in section 6.1.5.
- One 13A switched socket outlet and two 40W lighting points and one telephone point c/w DID line.
- Meter grill top cover or ventilation louvers as preferred.
- If landing is above ground level, safety rails must be provided.

Note: Drawing not to scale. All dimensions in mm.

Appendix 33 Drawing - HV Metering Panel Requirements (for 1 or 2 Feeders)



Drawing Not to scale

Thickness of plate	1.6 mm Min
Hinge	4 nos Min

Note:

For 3 or 4 feeders, consumer to provide 2 nos of the above metering panel

Appendix 34 Form - Voltage Ratio, Sequence & Phase Angle Tests Report

[FORM - METERING VTS - VOLTAGE RATIO, SEQUENCE & PHASE ANGLE TESTS REPORT](#)