

INFORMATION & REQUIREMENTS

Covering Installation of Electric Services and Meters



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ABOUT US

The Barbados Light & Power Company Limited is an investor owned electric utility incorporated under the Laws of Barbados. Since operations first began on June 17, 1911, the Company has grown and the electricity supply network now serves the entire island, with only a few homes being more than 30 meters from existing service drops.

Generation

The electricity is produced by diesel, steam and gas turbine generating plant located at Spring Garden, Garrison and Seawell. Most of the electricity is produced from the least expensive residual fuel oil available and customers enjoy the convenience of electricity at rates which are among the lowest in the Caribbean.

Transmission & Distribution

Electricity is transmitted at 24,900 and 69,000 volts from the generating stations to substations located throughout the island. Transformers, located at each of the substations, step the voltage down to 11,000 volts for distribution via feeder circuits to residential and commercial areas. (Note: In the Pine/Wilkey/Sargeants Village areas distribution is at 24,900 volts.) Polemounted or padmounted transformers then step the voltage down for supply to customer installations.

PREFACE

Effective from **January 1, 2013** this handbook is a revision of an earlier edition dated April 25, 2006. As you read on, you will see the words "Company" and "we" used many times referring to "The Barbados Light & Power Company (BLPC)." All earlier editions of, and supplements to, this handbook are superseded and should be destroyed.

If you need additional copies of this handbook, please call or write to us at:

The Barbados Light & Power Company Limited
Customer Services Department
PO Box 142
Garrison Hill,
St. Michael BB11000
246-626-4300
E-mail: customerservice@blpc.com.bb

You may also view this handbook on line at <http://www.blpc.com.bb/> then click on BLPC's Handbook of Requirements link.

Address: The Barbados Light & Power Company Limited
PO Box 142
Garrison Hill
St. Michael
BB11000

Customer Services: (246) 626-4300

Emergency Services: (246) 626-9000

Fax: (246) 228-1936

BE SAFE

Barbados Light & Power establishes requirements that excavators and others must follow when using power tools or equipment to penetrate the ground. This can be found in Section 8 of this document.

BEFORE DIGGING, NOTIFY BARBADOS LIGHT & POWER at: 1-246-626-4300

OVERHEAD HIGH-VOLTAGE LINE SAFETY NOTICE

In accordance with Barbados Light & Power's clearance requirements a person may not erect, construct, operate, maintain, transport or store any equipment or item within 3m (10 ft) of an overhead high-voltage line. When it is necessary to carry on any work or activity near an overhead high-voltage line, the person responsible for the work or activity must notify BLPC by calling 1-246-626-4300 at least three (3) business days in advance (except in emergency situations). After mutually acceptable arrangements are negotiated, necessary precautionary safety arrangements will be made.

1.0 INTRODUCTION

1.1 PURPOSE

This handbook is intended to provide information to customers, electrical contractors, engineers and architects in order to provide safety and uniformity in electrical connections to the Company's system. This handbook is filed with the Fair Trading Commission (FTC) and is in conformance with the FTC's Service Standards for Electric Utilities.

This information has been prepared with the following objectives:

- To acquaint electricians, contractors, consultants and other technical persons involved in the installation of electrical services with the Company's service requirements and procedures.
- To reduce delays experienced by customers in connecting new services through a better understanding of our procedures and requirements.
- To reduce costs to customers and to the Company through improved efficiency.
- To promote closer co-operation between the Company and those involved in the installation of electrical services.

1.2 CODE REQUIREMENTS

The Company designs, constructs, operates and maintains its lines and equipment in conformance with the applicable provisions of the most recent edition of the National Electrical Safety Code (NESC).

The customer requirements of this handbook are based on the applicable provisions of the most recent edition of the National Electrical Code (NEC). The Code is hereby made a part of this handbook by reference. Any additional requirements are established in the interest of safety and convenience. Local requirements, insofar as they may conflict with anything contained herein, will take precedence. The Chief Electrical Engineer is the "authority having jurisdiction" and is, therefore, responsible for interpretation and enforcement of the NEC. In accordance with the NEC Section 90.4, the "authority having jurisdiction" may, by special permission (written consent), waive specific requirements in the NEC or permit alternative methods.

The Company will accept any waivers as long as they do not compromise the Company's Standards or requirements of the NESC, cause the Company to be liable, or present threats to the safety of the public, its personnel or the utility grid.

1.3 REVISIONS OF REQUIREMENTS

The contents of this handbook are effective January 1, 2013 and supersede all similar requirements previously issued. Revisions of this information will be made when necessary and the Company reserves the right to make such revisions. The Company will endeavor to notify those concerned when such changes are made, but cannot guarantee to give such notice to all persons who may have accessed this handbook. It is urged that all architects, engineers, contractors, electricians and others who are interested, submit their names, email and postal addresses to be included on the mailing list to:

The Barbados Light & Power Company Limited
Customer Services Department
PO Box 142
Garrison Hill,
St. Michael BB11000
E-mail: customersupport@blpc.com.bb or customerservices@blpc.com.bb

1.4 COMPLIANCE WITH REQUIREMENTS

Before being connected to the Company's grid, the customer's installation shall be in compliance with the requirements contained in this handbook, and the requirements of the GEED.

1.5 SPECIAL CASES

Special cases may warrant departure from the requirements in this handbook. Any such departure will be neither considered as establishing a precedent, nor as a waiver of the Company's right to enforce any of the requirements contained herein.

1.6 WRITTEN CONFIRMATION

The Company will confirm in writing, upon request, all information given regarding service characteristics, applicable rates, service entrances and meter locations. The Company is not responsible for misunderstandings of any nature which may result from information given orally, unless confirmed in writing. In order to avoid delays and possible expensive changes, the above information should always be obtained before purchasing equipment or starting construction.

1.7 APPLICATION OF REQUIREMENTS

These requirements apply to all new installations and to any existing installations which are being significantly altered or which are specifically covered hereinafter.

1.8 ADVISORY SERVICES

All persons are encouraged to make use of the advisory services provided by the Company. This assistance may avoid delays in service installation and result in greater satisfaction and more efficient use of the electric service. To access these services please call our Customer Services Department at (246) 626-4300.

2.0 GENERAL INFORMATION

APPLICATION FOR SERVICE

Potential customers for electric service supplied by the Company must apply for service in writing as prescribed in Section 4.2. The customer's service will only be connected when all Company requirements are met. Under some conditions, including where additional facilities may be required, a separate agreement may be needed to facilitate electrical service provision.

Applications made on behalf of a Company, organization or any other entity should be signed by a person authorized to act on that entity's behalf. The application should be accompanied by either a certificate of Registration or Incorporation, and a covering letter, or be stamped with the Company's official stamp.

Payment of all bills on a service shall be the responsibility of the person signing the application, unless the application is made by a person authorized to sign on behalf of a Company, organization or other entity registered under the Laws of Barbados, in which case the bills will be the responsibility of the Company, organization or entity.

2.1 SUPPLY FREQUENCY AND VOLTAGE

The Company supplies electricity at 50 Hertz. Various supply options are available depending on the customer's requirements. All voltages stated are nominal and can vary +/- 6% due to load conditions.

2.1.1: Two-Wire Services

In instances where a customer has a 115 volt, two-wire service and is planning to upgrade their installation, they will be required to change to a three-wire service. This installation would have to be inspected and certified by the Government Electrical Engineering Department (GEED) before the service can be upgraded

2.1.2: Three-Wire Services

The following three-wire services are provided by the Company.

- **115/230 volts, 3-wire, single phase.** (see **Figure 2**)
- **115/200 volts, 3-wire, network.** (see **Figure 1**)

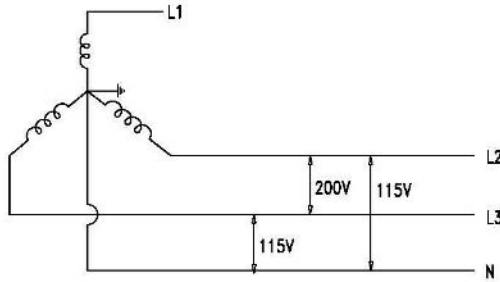
Customers requiring single phase, 3-wire service will normally have a certificate from the GEED for 115/230 volt supply. However, in situations where the low tension supply is provided from a network system, the customer will receive a 115/200 volt supply. If in doubt, the electrician or electrical contractor should seek clarification from the Company and advise the customer accordingly.

2.1.3: Three-Phase, Four-Wire Services

The following four-wire, three-phase services are provided by the Company.

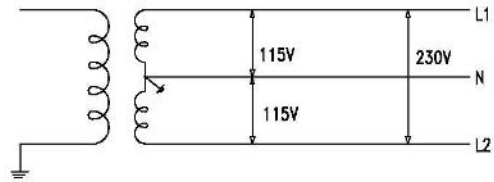
- **115/200 volts, 3-phase, 4-wire Wye** (see **Figure 4**)
- **230/400 volts, 3-phase, 4-wire Wye** (see **Figure 5**)
- **115/230 volts, 3-phase -Open Delta, 4-wire** (see **Figure 3**)*

* This is no longer provided except under special circumstances that are approved in advance by the Company.



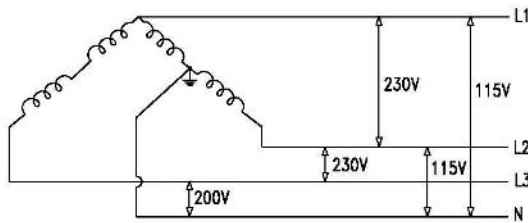
115V/200V 3WIRE NETWORK SERVICE

FIG. 1



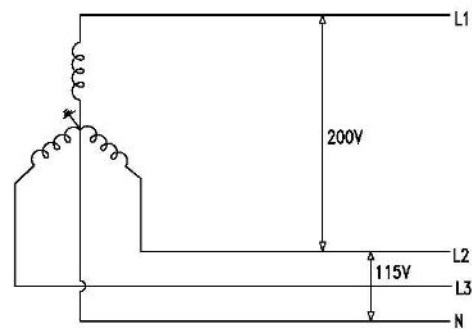
115/230V 1Phase 3WIRE SERVICE

FIG. 2



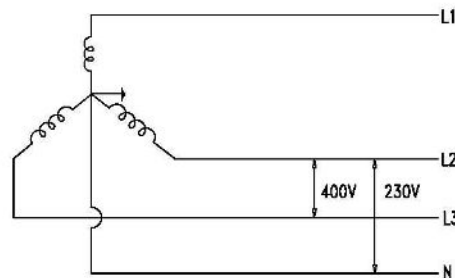
OPEN DELTA 115/230V 3Phase 4WIRE SERVICE

FIG. 3



115/200V 3Phase 4WIRE SERVICE

FIG. 4



230/400V 3Phase 4WIRE SERVICE

FIG. 5

**STANDARD SUPPLY OPTIONS
TRANSFORMER CONNECTIONS
SCHEMATICS**

FIG 1-5

High Voltage Services

The following high voltage services are provided by the Company.

- **11,000 volts**
- **24,900 volts** in areas with 24,900 volt distribution. (e.g. Pine, Wildey, Sargeants Village, Sheraton, Upton, Fort George Heights, Vauxhall and Warners)



Important Notes

1. The Company's supply is 50 Hz and special precautions should be taken with the use of equipment designed for operation at 60 Hz. This would apply to equipment designed for operation in North America and certain parts of Europe where the supply frequency is 60 Hz.
2. In every case, the customer should consult the Company to determine the characteristics of the service to be supplied before procuring any equipment for new or existing installations.
3. The Company will endeavor at all times to provide a continuous and adequate electricity supply. However, it cannot guarantee continuous electricity service from voltage and frequency variations, and will not be responsible for damage to the customer's apparatus resulting from such failure or imperfection of service. In cases where equipment could be damaged by such failure or imperfection of service, the customer should install suitable protective equipment.

2.2 ELECTRICITY RATES

Rules and Regulations

Services in this handbook are subject to the orders of the FTC and the latest tariff schedules. In case of a difference of interpretation between any provision of tariff schedules and this handbook, the provision of the schedule shall apply. A bill calculated under any tariff is subject to change under the provisions of such applicable rider(s) as may be approved and / or amended by the Fair Trading Commission.

The rates to be charged by and paid to the Company for service shall be the rates that have been filed with and approved by the Fair Trading Commission. These rates will change from time to time and will become the new prices the customer will be charged. A copy of the rates under which service will be supplied is available and is open for inspection at the Company's business offices. The rates can also be accessed from the Company's web site at www.blpc.com.bb or the Fair Trading Commission's website (<http://www.ftc.gov.bb>) in the Decisions and Orders section.

There are five types of tariffs and two riders covering services offered by the Company.

- Domestic Service (DS)
- General Service (GS)
- Secondary Voltage Power (SVP)
- Large Power (LP)
- Time of Use (TOU)
- Interruptible Service Rider (ISR)
- Renewable Energy Rider (RER)

For specific information on the various tariffs please refer to the rate schedules, which are available from the Company.

Domestic Service

This tariff is available to residential customers who occupy, for domestic purposes, individually-metered dwelling houses, apartments or condominiums suitable for year-round family occupancy. The residence shall be occupied by the owner or shall be the principal place of residence for the occupant.

Under this tariff, the Company will supply single-phase alternating current electricity at 50 Hz, up to a maximum of 200 amperes.

This tariff is not applicable to customers who occupy dwelling units used or registered for the purpose of transient occupancy such as rooming houses, hotels, guest-houses or villas, or primarily for commercial, industrial or non-domestic activities. No service may be transmitted from a customer who receives electric service to other premises without the prior written consent of the Company.

General Service

This tariff applies to services used for lighting and power to non-residential customers for which no other Rate Schedule is provided up to a maximum of 10 kVA and/or a monthly consumption of 1,000 kWh. Three-phase service may be provided under special arrangements. Seasonal, stand-by, or supplementary service is not permitted.

Secondary Voltage Power

This rate is available to all customers (except street lighting) requiring single-phase or three-phase at standard Low Tension supply.

This rate is available for customers with a billing demand of not less than 5 kVA requiring single-phase or three-phase at standard Low Tension supply. Customers connected under this rate shall be metered as to demand and the billing demand shall be the maximum measured demand of the current month or 5 kVA, whichever is greater. The measured demand may be measured in either kW or kVA at the discretion of the Company, depending on the character of the service. If the demand is measured in kW, then the maximum kW reading shall be divided by a correction factor of 0.85 for conversion to kVA for billing purposes.

Large Power

This tariff is available for customers with a billing demand of not less than 50 kVA, who own their own transformation equipment and receive supply at primary voltage (i.e. three-phase 24,900 volts or 11,000 volts). Customers connected under this rate shall be metered as to demand and the billing demand shall be the maximum measured demand of the current month or 50 kVA, whichever is greater. The measured demand may be measured in either kW or kVA at the discretion of the Company, depending on the character of the service. If the demand is measured in kW, then the maximum kW reading shall be divided by a correction factor of 0.85 for conversion to kVA for billing purposes.

Time Of Use

The Time-of-Use Tariff (this "Tariff") is available to customers who satisfy the criteria for the Large Power (LP) tariff on a first come first serve basis. This Tariff is available for a maximum of thirty (30) electricity services, with no more than six (6) services per entity subscribing unless otherwise approved by the Company.

Interruptible Service Rider (ISR)

To be eligible, customers must be able to demonstrate the ability to reduce their load to the Firm Demand Level (FDL) within 30 minutes of being notified to do so via the communication channel agreed between the customer and the Company. The minimum FDL shall be zero. The customer shall not be required to exceed 240 hours of interruption in a contractual year. For more information on the ISR please refer to the "Business Services" section of Company's website at <http://www.blpc.com.bb>.

Renewable Energy Rider

This rider is available to customers who qualify for the Domestic Service (DS), Employee (EMP), General Service (GS), Secondary Voltage Power (SVP), Large Power (LP) and Time-of-Use (TOU) tariffs. All of the provisions of the applicable DS, EMP, GS, SVP, LP and TOU tariffs will apply except as amended by this rider. This rider is specific to customers with renewable resource generation facilities (hereinafter collectively referred to as "customer-generators" and each as a "customer-generator") utilizing a wind turbine, solar photovoltaic or hybrid (wind/solar) power source located on the customer's owned or rented premises.

The customer-generator shall have a capacity limit of 1.5 times the customer's current average usage up to a maximum capacity of 150kW. The average usage is calculated based on the most recent 12 months that the customer relied on the grid. This rider is available on a first-come first-serve basis up to a maximum combined installed capacity of 20 MW. The Company reserves the right to limit the number of services per individual or entity.

This rider is applicable only to the energy produced by the customer generator or supplied to the Company's electric grid by the customer-generator. All other services supplied to the customer-generator will be billed in accordance with the rates and charges under the customer's-applicable standard tariff. Service under this rider is conditional on the continuance of service to the customer under one of the applicable standard tariffs. For more information on the renewable energy rider please refer to the Requirements for Grid Interconnection of renewable Generating Systems on the Company's website <http://www.blpc.com.bb>.

Fuel Clause Adjustment

Fuel prices rise and fall unpredictably according to world market conditions. The Fuel Clause Adjustment allows both **reductions and increases** in fuel costs to be passed on to customers automatically. It is therefore one of the most efficient ways of dealing with these fluctuating costs. The Fuel Clause Adjustment **DOES NOT** add to Light & Power's rate of return. The calculation of the Fuel Clause Adjustment is checked every

month by a representative of the Fair Trading Commission.

Service Fees

The latest revision of service fees that pertain to Barbados Light and Power's services offered to customers can be found on the Fair Trading Commission's website (<http://www.ftc.gov.bb>) in the Decisions and Orders section.

2.3 METER READING AND ELECTRICITY BILLS

The meters for Secondary Voltage Power and Large Power customers are read every month. These accounts are billed monthly. The meters of Domestic and General Service customers are read every other month and these accounts are billed monthly. In the months when the meters are not read, the customers' usage is estimated based on an average of their previous energy consumption. This bill is referred to as an **Interim bill**. This is adjusted when the meter is read in the following month.

Estimates of electricity bills may also be done where the meter is inaccessible. Even though estimates are incorporated into our billing procedures the preference is for the meter to be read by the Company's representative. Where an accurate reading cannot be acquired by the Company, the following options are available to attain a reading:

1. The Company may request an appointment to obtain the reading.
2. The Company may request a meter reading directly from the customer if urgent.
3. The customer can supply a meter reading by subscribing to the Company's Web Self Service facility at www.blpc.com.bb or emailing a picture of the meter reading to customerservice@blpc.com.bb.

3.4 SECURITY DEPOSITS

In accordance with good business practice and to minimize the impact of bad debts on the cost of providing electricity supply, the Company may require security to be given by customers for payment of electricity bills. Please refer to **Section 4.3** for further details.

3.5 REFUSAL OR DISCONTINUANCE OF SERVICE

BLPC may refuse connection of a service or disconnect a service for certain reasons, some of which are listed below.

1. Non-payment of bills for electric service.
2. Failure to make a security deposit when requested.
3. Failure to rectify a deficiency in the customer's wiring or other facilities (including renewable installations) after receiving notice from BLPC that such a condition exists.
4. Unauthorized use of electric energy including current diversion and tampering with meters and metering equipment or other facilities furnished and owned by BLPC.
5. Unauthorized interconnection of any generating source including renewable sources.
6. Operation of equipment which causes voltage flicker or objectionable service to other customers.
7. When the customer's equipment or use thereof, detrimentally affects the equipment of the Company.
8. Without notice where the customer has removed or relocated meters and/or metering equipment without BLPC's proper authorization.
9. Without notice in the event that a hazardous condition is found by BLPC.
10. When required by the GEED.
11. When the period of validity of the GEED certificate has expired.
12. When it is found that a change or addition has been made to the customer's wiring which has been connected to the supply without being certified by the GEED.
13. Violation of the agreement made with the Company which would invoke the termination procedure.

3.0 METERING & METER INSTALLATIONS

Customers will be required to adhere to the requirements in this Handbook, the BLPC Metering Standards, the NEC and the GEED.

Meters are installed by the Company to record the electrical energy used and, in large installations, the maximum demand used by customers. Metering should be located at, or near, the point of delivery.

The location of all metering equipment must be approved by the Company prior to installation. Meters shall be installed in safe and readily accessible outdoor locations. Neither customer owned meters nor enclosures shall be attached to padmounted transformers or fences.

For commercial installations where it may be necessary to install meters indoors, the location shall be chosen with regard to safety, accessibility for reading and maintenance.

3.1 METER SOCKETS

All sockets shall be sealable with padlock type seals and such seals shall be removed only by authorized Company personnel.

Meter socket bases for loads up to, but not exceeding, 200 amps, are to be supplied and installed by the customer. Customers are responsible for the proper maintenance of these sockets and should have their electrician contact the Company to allow them access to carry out such maintenance. For an individual service in excess of 200 amps, the Company will provide a meter socket base and the required metering CTs.

Location of Meter Socket Base

It is in the mutual interest of the customer and the Company to install the meter in a location suitable for meter reading, repair, and removal. The socket location is subject to approval by the Company.

The meter socket base should be placed in a location which will be accessible, at all times, to authorized BLPC personnel. In cases where it can be determined that the customer plans to fence the property, or introduce landscaping which will obstruct access to the meter, the customer is encouraged to install an underground supply and place the meter socket base on the guard wall at the boundary of the property. In this case, the meter socket base should face outwards towards the roadway and comply with the Company's requirements.

Meter socket bases must be located:

- In an area convenient to the Company's distribution system.
- On the front of the house, on a side wall within 10 feet of the street side of the house or in the case of a business, on the front one-third of the structure closest to normal public access, if the meter is outside.

- On a meter pedestal (upstand) if it is not located on the building.

Meters shall not be installed in storage rooms, cabinets, closets, bins, bathrooms, stairways, garbage compartments/cubicles, high ambient temperature rooms, dangerous or hazardous locations or in any similar undesirable places, or other locations that may be locked or otherwise made inaccessible. All meter socket bases shall be installed so that the meters will be upright (plumb).

Electrical Equipment Rooms

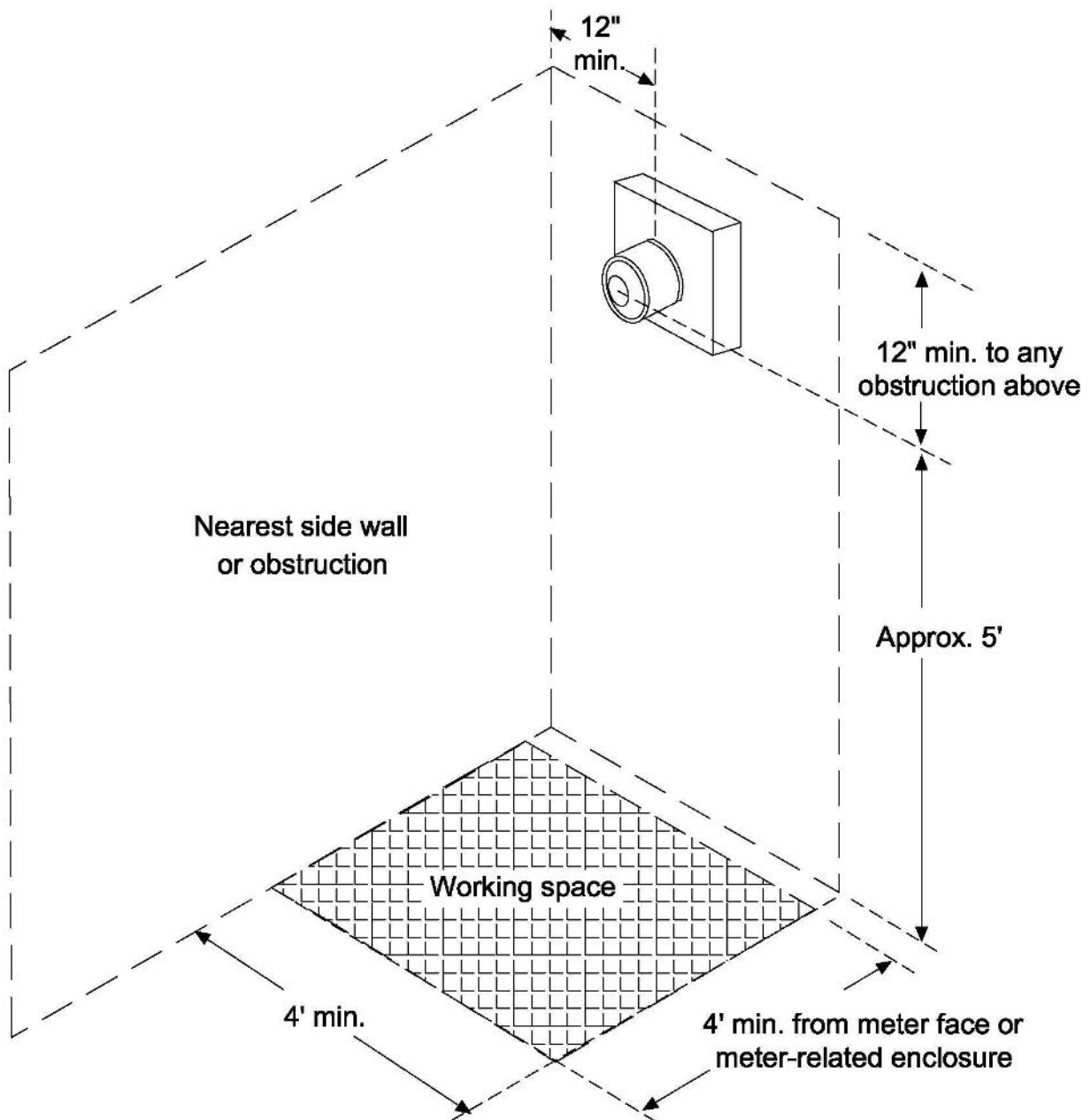
Meters for business services may be located in an electrical room. Electrical equipment rooms must:

- Contain only power and communication equipment.
- Not be used for storage.
- Be accessible during normal business hours.
- Be well lit.
- Be accessible through a door that opens directly to the outside, or, with prior approval by the Company, opens directly to the lobby of the building's main entrance. If the facility (such as a school, church, or meeting hall), could be locked during normal business hours the electrical equipment room door must open directly to the outside. The door must be at least 2 feet 8 inches wide and 6 feet 8 inches high, and open outward. The exterior of the door must have a sign which reads "Electrical Room." The customer must supply a key to the door.

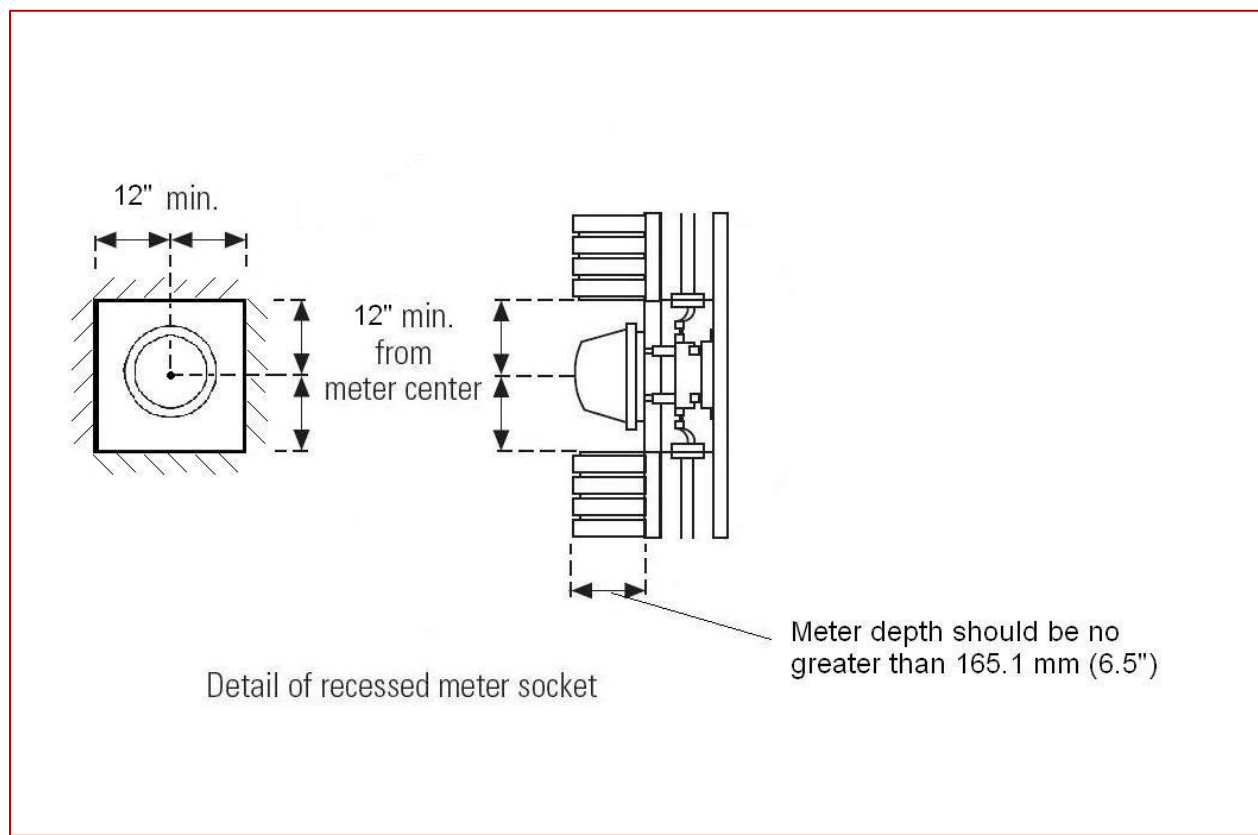
All meter socket bases shall be installed so that the meters will be upright (plumb).

Level grade shall be maintained for a minimum of 1.2m (4ft) in front of the meter enclosure to provide a safe working space. In order to meet this requirement on uneven terrain, as an option, the customer may install a pressure treated wooden platform or cement platform.

3.2 CLEARANCE FOR METERING EQUIPMENT



Clearances for Metering equipment
Fig. 6a



Recessed meters- Figure 6b

1. Not less than 1.2m (4ft) of clear, unobstructed working space shall be provided and maintained under and in front of all metering equipment. In the case of unguarded moving machinery, changes in floor level, etc., a clearance of 1.8m (6ft) shall be provided in front of all meters. A clearance of at least 254mm (10 inches) shall be provided between the nearest obstruction above and on each side of any single meter or group of meters.
2. Meter clearances are measured from the center of the meter socket or from the center of the face of the meter.
3. The 0.3m (1ft) clearance at the top and left side of the meter allows the authorized personnel to see and align the meter blades to the meter socket jaws when installing the meter.
4. Install the meter socket between 1.2m (4ft) and six feet 1.8m (6ft) above finished grade (except meter pedestals). A height of 1.5m (5 ft) is preferred.
5. Keep a clear working space, 0.37m² (4ft x 4ft), in front of the meter. This space must be permanently free of all obstructions, including landscaping.

6. For recessed meters, maintain a minimum clearance of 0.3m (1ft) radially around the meter. Please refer to **Figure 6b**.
7. Allow 0.9m (3ft) of clearance from a gas meter and 0.9m (3ft) from windows or doors for customer privacy.
8. If space is limited where meters are mounted in a group, special layouts shall be obtained from the Company before proceeding with the installation of equipment. Sufficient clearance shall be provided in choosing the location of all metering equipment so that the doors of all cabinets and switches can be completely opened.
9. When locating or relocating electric service equipment, where gas equipment has already been installed, the following guidelines should be used to ensure compliance with the minimum separation required between the electric meter or combination meter/disconnect (ignition sources) and any gas **relief valve, vent discharge, filling connection, or regulator vent**:

Gas Container/System Type	Minimum Separation (m)
Propane tank (exchanged)	1.5
Propane tank (filled on-site)	3
Propane regulators	1.5
Natural gas (piped) vented equipment	1.5

This references the applicable codes and standards of the NFPA, (NFPA-54, NFPA-58 and 49 CFR 19.2) which cover the requirements for gas equipment clearances.

3.3 SINGLE METER INSTALLATIONS

1. **Type of Socket Base:** A 5-jaw socket base is required for all 3-wire services with the 5th jaw connected to the neutral conductor.
2. **Height of Socket Base:** **The center of the meter socket base should be at a height of 1.5m (5ft) above finished grade.** In underground installations where the meter is to be located on an external guardwall, the minimum allowable height is 0.9m (3ft). **Figure 20** shows a typical metering installation for an underground service.
3. **Wiring of Socket Base:** The wiring in the socket base should be neat, not bulky and connected as shown in **Figure 19**. Any excess wire in the socket base may prevent the meter from being properly inserted into the socket base.
4. **Secure Mounting of Socket Base:** The meter socket base should be properly secured to the building or guard-wall as appropriate.

5. **Waterproofing:** The point at which the conduit enters the meter socket base should be properly sealed to prevent water from entering the socket base. All equipment installed outdoors should be designed for outdoor use since it will be exposed to the weather.

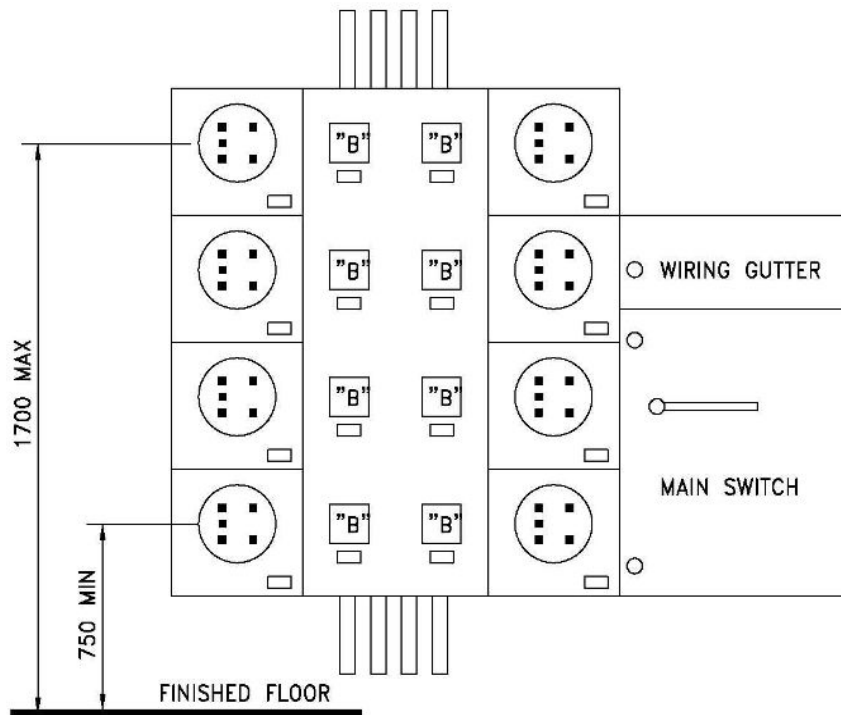
3.4 MULTI-METERING INSTALLATIONS

On installations involving more than one meter (multi-metering), the customer shall provide the multi-metering equipment and the following conditions shall apply:

1. In multi-metering installations, the meters shall be grouped together in an approved location with regard to safety, accessibility for reading and maintenance, preferably on the ground floor in a public or common area as near to the entrance as possible. It shall be the customer's responsibility to clearly identify the area served by each meter. Each room, unit or apartment number, or other area, shall be neatly and plainly marked on the service equipment. If the meter and disconnect are not a single unit, the numbers should be marked on the inside and outside of the meter enclosure with suitable permanent marking. The customer shall notify the GEED and the Company of any changes.
2. Meter socket bases must be suitable for the type of meters and characteristics of the supply provided by the Company.
3. Where up to six meters are involved, they should be grouped in one location. Where there are more than six meters, groups of not less than six meters will be permitted in accessible locations on the ground and upper floors of the building under consultation with the Company.
4. The multi-metering equipment installation shall be so designed and located that the uppermost meter shall be no higher than 5.5ft and the lowest meter shall be not lower than 0.76m (2.5ft) from the finished grade. Provision should be made for the Company to seal all unmetered sections of the installation to prevent unauthorized access. These installations should be discussed with a representative of the Company prior to purchase of the equipment.
5. Individual circuit breakers are to be installed on the load side of the meters.
6. All trunking which houses unmetered wiring shall be made with provision for sealing with the Company's seals.
7. If trunking is used, the line ends and load ends should be kept in separate trunking. Customer load wires shall never be installed in trunking that contains unmetered wires.
8. Multi-metering installations which are located outdoors shall have equipment designed and rated for outdoor use.

9. Suitable means for disconnecting the entire building shall be provided in accordance with the requirements of the GEED and the relevant NEC.

Typical arrangements for multi-metering installations are shown in **Figure 7** and **Figure 7A**. A large low tension installation may require the customer to provide either a transformer room or space for a padmounted transformer.

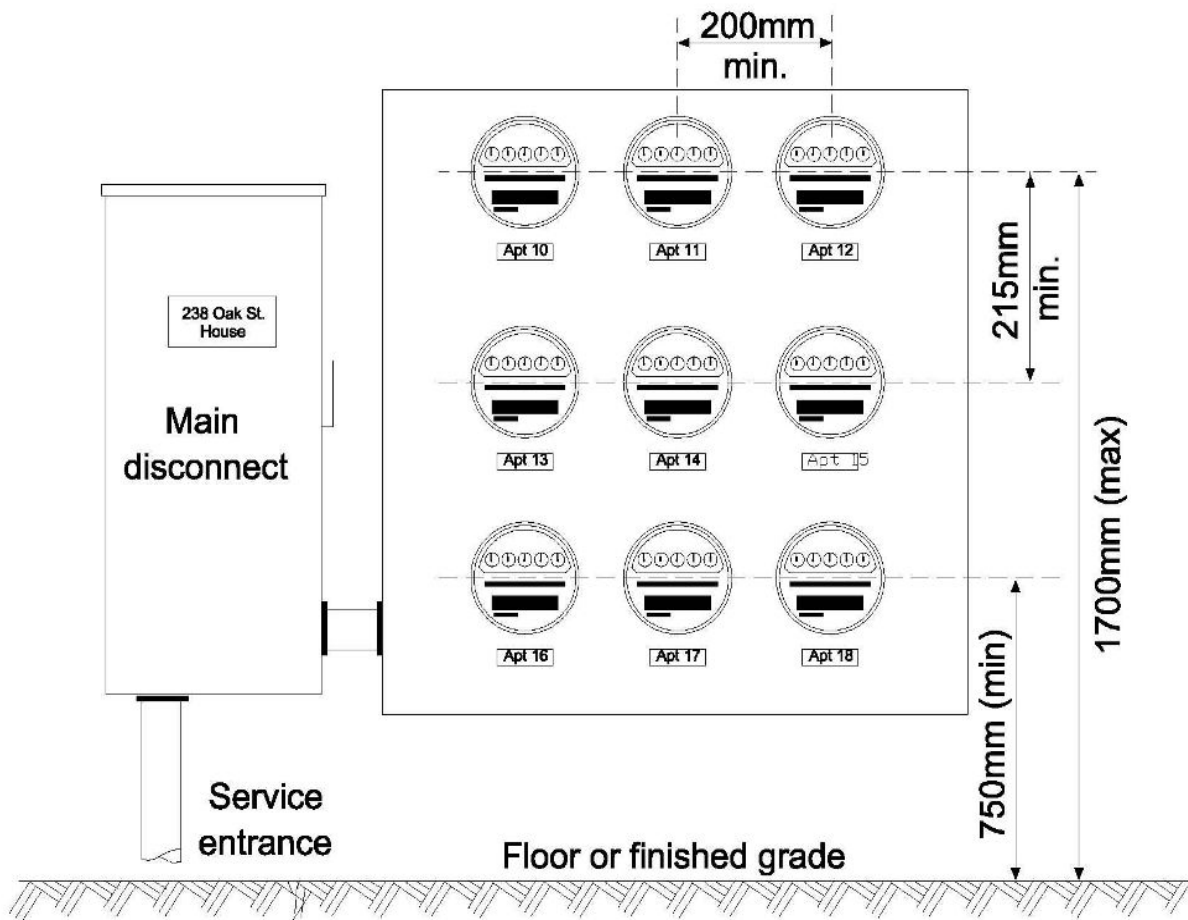


NOTES

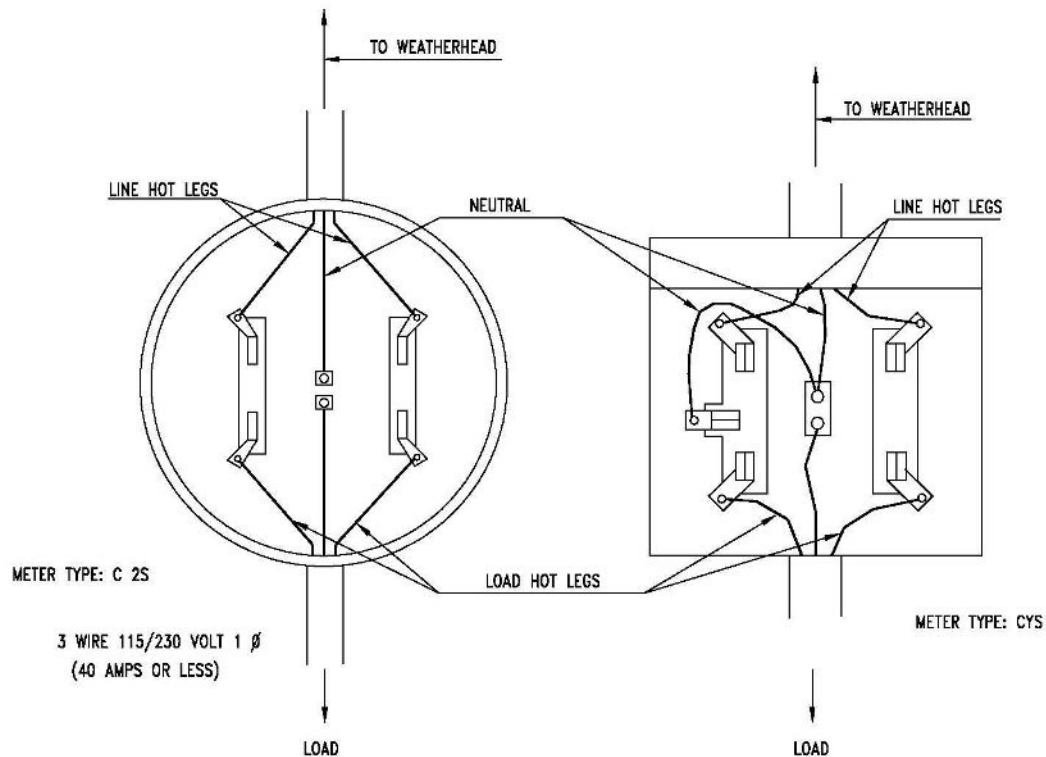
1. Meters shall be placed in a location readily assessable to the company's meter readers.
2. Each service shall be separately identified and permanently marked to identify the premises being served. (e.g. Apartment No.)
3. All trunking which houses unmetered wiring shall be made with provision for sealing.
4. Customer load wires shall never be installed in trunking that contains unmetered wires.
5. Multimetering installations which are located outdoors shall have equipment designed for outdoors where it will be exposed to the weather.

TYPICAL MULTIMETERING
INSTALLATION

FIG 7

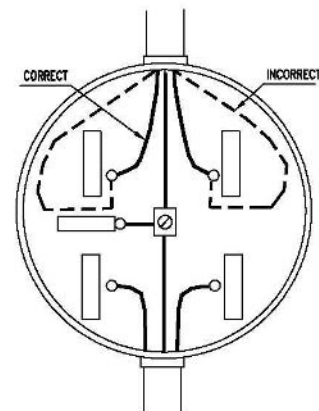


**MULTI METERING
FIG. 7A**



NOTES

1. 3 wire 115/230 volt single phase four (4) jaw socket permitted for services of 40 amps or less. Five (5) jaw socket required for services greater than 40 amps. Fifth jaw not used, but may be required if load increases a demand meter has to be fitted. Fifth jaw should always be connected to neutral.
2. A five jaw socket is always required for a 3 wire 115/200 volt network service.
3. Wiring should be installed so as not to obstruct meter plugs.



**METER SOCKET WIRING
(3 WIRE SERVICE)**

FIG 8

3.5 METERING CURRENT TRANSFORMERS (CTS)

For services in excess of 200 amps, the Company will provide metering Current Transformers (CTs) and the socket base.

For transformer room installations, Bar Type CTs shall be installed within the transformer room. BLPC will supply the CTs and the customer shall collect and install these CTs in accordance with BLPC's requirements. A conduit shall be installed by the customer from the CTs to the location of the meter socket base. The meter shall be located on the outside of the transformer room. The customer is required to provide a Current Transformer (CT) cabinet also known as an instrument transformer cabinet.

For padmounted transformers, window type CTs will be installed by the customer's electrical contractor on the secondary bushings of the transformer such as indicated in **Figure 9** and the meter located on the side of the padmounted transformer low tension compartment. This will only be possible where the transformer provides supply to a single customer.

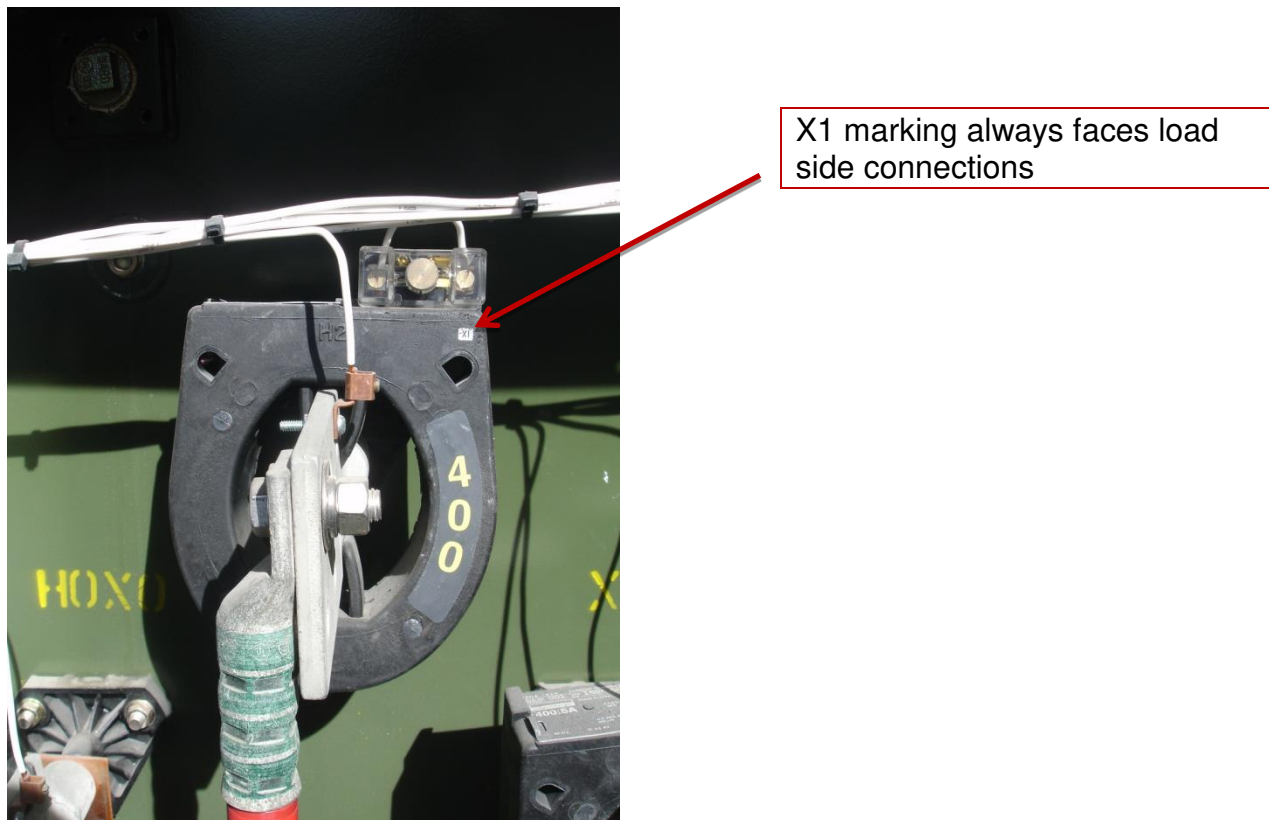


Figure 9: Window Type CT Installed on Padmount Transformer Secondary Bushings

For multi-metering installations where a single service is in excess of 200 Amps, the customer is required to provide a sealed panel suitable for the installation of the necessary bar CTs.

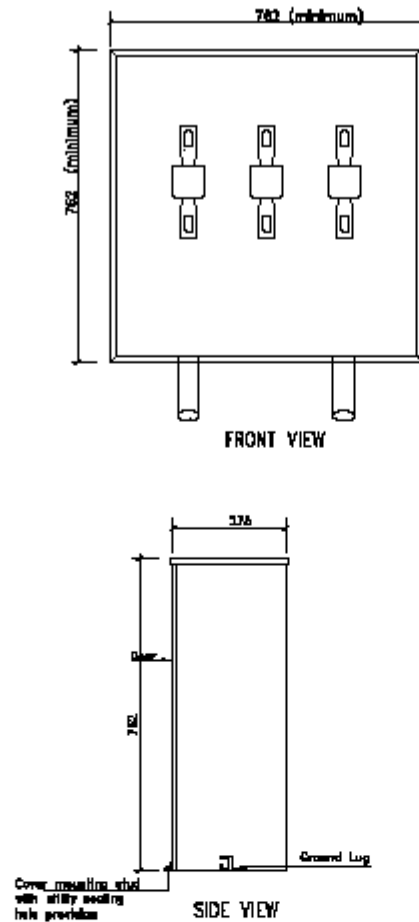
The length of the secondary metering conductors running between the meter and the CTs must not exceed 7.6m (25 ft).

Customers are not allowed to connect any equipment to the metering terminals of current transformers.

3.6 CURRENT TRANSFORMER CABINETS

The location of the CT Cabinet is subject to the approval of the Company.

CT cabinets are to be installed in accordance with the requirements of the NEC Article 312. See **Figure 10** for CT cabinet installation details. The minimum size of the cabinet should be 2.5ft W x 2.5ft H x 1ft D.



NOTES

- 1 Installation of Bar CT's when more than one customer is being fed from single transformer
- 2 CT cubicle to be fabricated from 2mm thick stainless steel material
- 3 Cubicle door to be fitted with hasp and staple to receive BL&P lock
- 4 Weather proof and UL listed

**C.T (CURRENT TRANSFORMER)
CABINET INSTALLATION DETAILS**

FIG 10

The cover of all cabinets shall be attached with hinges and be able to be readily opened. The cabinet must be mounted so that the cover does not interfere with installation or maintenance work. For outdoor locations, cabinets must be rain/weather proof.

Provision must be made so that the cabinet can be securely sealed with a padlock type seal when the cover is closed. Only Company owned devices may be installed in any cabinets housing meter connection devices or current transformers.

All current transformer cabinets must be mounted, or contain suitable mounting provisions (inside), such that the current transformers can be readily installed and removed. Transformers shall be mounted so that a clearance of at least four (4) inches is provided between all transformers, cables and the sides and top of the cabinet.

All line conductors, including the neutral, shall pass through the instrument transformer cabinet. In addition, all line conductors in the cabinet must be clearly identified (by the customer/electrician), to indicate "line" or "load". A neutral connector shall be installed by the customer to provide for connection of the metering neutral. The customer shall mount all current transformers and make all line and load side connections. Metering wires are furnished and installed by the Company.

Where holes must be drilled in walls to allow for passage of metering wires between current transformer cabinets and meter socket bases, this shall be the responsibility of the customer.

Where danger of plow or traffic damage exists, barriers consisting of concrete filled 6 inch diameter IPS steel posts, set a minimum of 1.2m (4ft) deep, must be installed for the protection of the meter/meter mounting equipment. The posts shall be located so as not to interfere with the opening of doors/covers or restrict access to enclosures.

3.7 SWITCHGEAR INSTALLATIONS

When current transformers are to be installed in switchgear, Company approval of current transformer compartment plans is required in advance.

Following are the requirements for switchgear instrument transformer compartments:

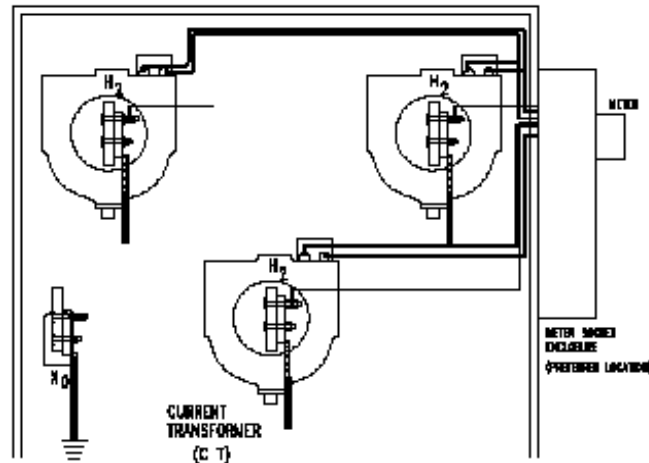
- The compartment shall be isolated by barriers and metered and unmetered buses shall also be separated by barriers.
- Bus arrangements for low voltage (below 600V) shall accommodate 0.3m (1ft) long CT bars (multiple bars require ¼" depth 3" width x 14½" height to accommodate each bar CT).

- Any removable or hinged covers over unmetered buses or connections shall have sealing provisions or approved tamper-proof fasteners.
- Upon installation of the switchgear, any existing removable CT links/supports must be removed. For all switchgear or transformer installations, it shall be the responsibility of the customer to install the instrument transformers.



Note:

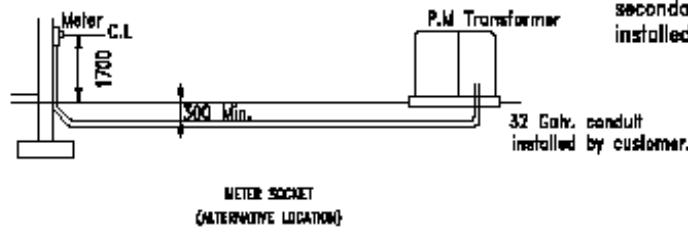
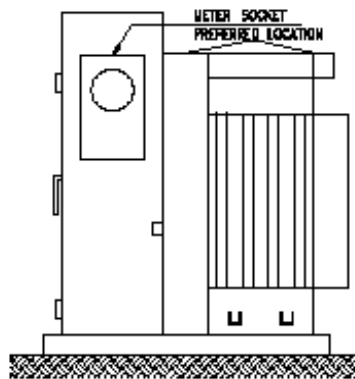
In some cases, it may be necessary for the Company's metering CTs to be installed in the customer owned service equipment. Arrangements must be made by the customer with BLPC to cover each specific case. In any event, the CTs shall be placed in a lockable enclosure which can be sealed and which is inaccessible from any other portion of the customer's service equipment. The CTs should be located before the main circuit breaker for the particular service as shown in **Figure 11**.



3 PHASE TRANSFORMER LT COMPARTMENT

NOTES

1. Installation of CTs is only permitted where one customer is being fed from the transformer.
2. CT should be of suitable rating for transformer capacity. See CT application guide.
3. CTs shall be installed with load (H2) Marking visible from the front.
4. Meter socket may be installed either directly onto the side of the transformer LT compartment or a suitable structure provided by the customer a maximum of 6000mm from the transformer.
5. Check CTs to ensure that the shorting bars are in place until the meter secondary wiring and meter are installed.



**3 PHASE PADMOUNT TRANSFORMER
C.T. AND METER INSTALLATION**

FIG 11

3.8 METERING HIGH TENSION SERVICES

In the case of customers who own their transformers and are on the Large Power (LP) tariff, a High Tension (HT) Metering Unit will normally be installed by the Company.

In all cases, the HT Metering Unit will be provided and installed by the Company in a location to be determined by the Company. This may be either a pole mounted unit or a padmounted unit. In cases where a padmounted HT Metering Unit is required, the customer will be required to provide adequate space and a concrete pad in a suitable location for this to be installed. The meter must be installed in accordance with the requirements of Sections 3.1, 3.2 and 3.3 of this booklet so that the meter reader has access to read and reset the meter.

Note: In emergency circumstances, the Company may install LT Metering for Large Power customers. For billing purposes, in the case of LT metering, a special rate will be used to take into account the transformer losses.

3.9 METER PEDESTALS (UPSTANDS)

Meter pedestals/upstands used with underground services for the exclusive use of electric metering must be approved in advance by the Company.

3.10 METER SEALS

Seals are placed on unmetered installations as a security measure. Seals should **NEVER** be broken by anyone other than authorized Barbados Light & Power personnel. Breaking seals is a very serious offence and the Company reserves the right to disconnect existing services, or refuse to connect new services, in situations where seals have been broken, until the matter has been fully investigated and resolved to the satisfaction of the Company.

3.11 ARRANGEMENT OF DISCONNECTING MEANS AND METER EQUIPMENT

The location of the service disconnecting means shall be on the **load side** of the metering equipment.

Exceptions:

1. In multiple meter locations where the NEC requires a main disconnect, the sequences shall be main disconnect-meter-switch.

4.0 PLANNING YOUR SERVICE

Customers should plan carefully to ensure that the service requested will meet their needs. It is important that customers notify BLPC as early as possible of their service requirements. BLPC should be notified well before the installation work is completed so that the Company can advise whether the required service can be supplied.

Advice will be given as to the applicable BLPC rates and types of services available. The location for the service entrance, meter, point of attachment of the Company's service drop, as well as Company transformers and poles, must be reviewed and approved by the Company before any service connections are installed.

4.1 ADVANCE NOTIFICATION

In order to expedite the connection of new services, customers may use our **"Notice of Inspection"** form to apply for service in advance of the completion of the electrical installation work and before an inspection certificate is issued by the Government's Electrical Engineering Department (GEED). The electrical contractor should ensure that a "Notice of Inspection" form is completed at the time of applying for an inspection by the GEED and that the customer submits this form to the Company together with the relevant documents.

4.2 APPLICATION PROCESS

Application forms for electricity connections are available to customers at the Company's offices as well as on the Company's website www.blpc.com.bb. All customers who wish to obtain an electrical service are required to either come into our office and sign a service contract, or if they are unable to apply in person, submit a signed contract along with a covering letter to the Company. When applying for service, the following is required:

- Barbados ID card, Passport or other valid means of identification.
- Applications made on behalf of a company, organization or other entity should be signed by a person authorized to act on the organization's behalf. The application should be accompanied by a covering letter or stamped with that organization's official stamp.
- An electrical inspection certificate of approval from the GEED if application is being made for one of the following:
 - Installation of a new service.
 - Reconnection of an existing service that has been disconnected for

more than 6 months.

- Reconnection of an existing service where wiring changes have been carried out.
- The appropriate service charge. (Please call the Company for details)
- Security Deposit where applicable. (See Section 4.3 on Security Deposits).

For other services offered by the Company please contact our Customer Services Department.

4.3 SECURITY DEPOSITS

Security deposits are held to cover any outstanding bills should the individual or organization be unable to pay. These are required for all business accounts and residential services for non-Barbadian residents. Security deposits may also be requested from other residential customers as the need arises if they are delinquent in paying their bills or have other credit related issues. Security can be provided by a cash deposit, a bank guarantee or a security bond.

- These are normally required to cover three (3) months of electricity bills.
- Cash deposits gain interest at a rate of interest approved by the Fair Trading Commission. The cash deposit will be refunded with the accumulated interest when the account is terminated or arrangements are made to provide alternative security (such as a banker's guarantee).
- Security requirements can be reviewed periodically and may be adjusted accordingly. If the amount of a cash deposit (including accrued interest) exceeds the requirement, the excess can be refunded at the customer's request. If it is not adequate to cover the requirement, the customer may be requested to pay the additional amount.

4.4 GOVERNMENT ELECTRICAL ENGINEERING DEPARTMENT (GEED) INSPECTIONS

Certificates of Approval must be received by the Company's Customer Service Department before installations will be connected to the Company's distribution system. Such certificates are to be obtained, from the "authority having jurisdiction", by the customer or contractor.

The Company shall not be responsible for the installation or maintenance of the customer's electrical equipment, neither is there any duty nor obligation on the part of the Company to inspect the same.

1. All wiring installations, including temporary wiring for construction purposes or otherwise, as well as alterations to existing wiring, must be inspected and approved by the GEED before being connected to the Company's supply. Defective installations, when corrected, should also be inspected and approved before reconnection. A certificate of approval from the GEED must be presented before the Company is authorized to make a connection.
2. The Company normally requires twelve (12) days after receiving the Inspection Certificate to provide for the installation of a new service, provided that:
 - the service pole is 27m (90ft) or less from the proposed meter position and
 - the installation meets the Company's service requirements.
3. The Company does not inspect wiring except where it affects the service entrance and metering equipment and their location.
4. Services that have been either disconnected or, in the case of a new service, not connected for more than six months, must be re-inspected and approved by the GEED before a service connection can be made.

4.5 TOWN AND COUNTRY PLANNING CERTIFICATION

The Company reserves the right not to install any service, to any lot where confirmation has not been received from Town and Country Planning that the lot complies with all applicable shore/land zoning and subdivision laws, or written evidence that other arrangements have been made between the Company and the Town and Country Planning Office. Services shall not be installed until all authorizations have been received.

4.6 INSTALLATION CONTRACTS

When contracts for electric wiring or equipment are prepared by contractors, architects or engineers, it is suggested that such contracts include the specification that "all materials, labor and workmanship be in full accordance with the latest requirements of the NEC, the local authority having jurisdiction and The Barbados Light & Power Company."

4.7 BLPC INSPECTIONS

After an application has been received for either a new service or an existing service for which the wiring has been modified, an inspection is carried out by The Barbados Light & Power Company before the electricity is connected.

Note: The Company does not check the customers' internal wiring as this is the responsibility of the GEED.

The following areas are inspected by the Company's Inspectors to ensure compliance with the requirements set out in this booklet.

- **Suitability of location of meter socket base on the building and that the socket base is positioned at the correct height.**
- **Socket base is securely attached to the building. Where the socket base is recessed on underground cable installations, there should be adequate clearance around the meter socket.**
- **Correct type of socket base, with correct wiring. Correct height and position of weatherhead to meet all the specified clearance requirements.**
- **Adequate provision for the attachment of the service drop.**
- **Additional checks on multi-metering installations.**

The Company's Inspectors are also required to carry out checks to ensure that the service can be fed from the existing distribution system.

The lines, poles and other equipment needed to provide the electricity supply are in place and are in good condition.

- The type of distribution. e.g.(115/230 or 115/200 volts network)
- Height of service drop above roadway - (greater than 6m)
- Distance of service drop - (maximum 27m)

In situations where the above requirements are not met, delays can be avoided if the electrical contractor notifies the Company at an early stage.

Once the installation meets the required standards, a meter socket blank is placed over the meter socket and sealed with a Company seal. The service application is then passed to the Company's Distribution Department for the installation to be carried out. Should the Inspector discover any non-compliance with the Company's requirements, the service connection may be delayed until the problem is rectified.

For multi-metering installations, the busbar section (splitter box), main breaker panel, line end trunking and current transformer enclosures, (if present), are also sealed at this time. Provision must be made for the fitting of these seals.

Electricians or electrical contractors should **NEVER** break the Company's seals on socket bases or unmetered sections of the installation. If our installation crew discovers that the seals have been broken, the service will not be installed.



Note: It is preferable to use equipment that is manufactured with provisions for sealing.

4.8 INSTALLATION OF SERVICE-SUPPLY LINES

The Company is not required to install service-supply lines prior to the time that the wiring of the premises is actually in progress and the structure sufficiently completed to provide a safe and suitable terminus for the service-supply lines.

4.9 TEMPORARY SUPPLIES (Special Events)

This type of supply is usually a limited-term service for installations at fairs, exhibitions, and construction projects etc. Meter sockets should be installed for temporary supplies. For all supplies, an Inspection Certificate is required from the GEED. These certificates are usually valid for three (3) months and have to be renewed for continuation of the Temporary Service. A prepayment is required on all special events. Please call the Company (246-626-4300) for details.

There shall be no other attachments to the temporary structure. If it becomes unsafe, service may be disconnected (See **Section 2.5**). See **Figure 17** in Chapter 7 for overhead temporary service structure requirements. See **Figure 20** in Chapter 8 for underground temporary, or permanent service structure requirements.

Advise us of your requirements for temporary supplies as soon as possible. We need time to plan our work.

4.10 CUSTOMER WIRING

As a rule, only one service connection is permitted to a building, or enclosed structure, separated by a solid firewall extending beyond the roof, but this can be connected to several meters. It is in the customer's best interest to make adequate provision in the initial wiring of premises for present and future use of appliances and equipment. In this regard, proper planning of the electrical installation is essential. Customers' wiring and equipment should be installed to conform with:

- (a) The Company's service requirements.
- (b) Internal wiring regulations as specified by the GEED.
- (c) Other statutory regulations established under the Laws of Barbados

Some of the requirements include:

1. In order to minimize voltage fluctuations and to improve efficiency, circuits supplying major appliances and power points should be separated from the lighting circuits.
2. In view of the ever increasing use of electrical service in the home, office, store and factory, it is strongly recommended that spare capacity of at least 50% should be provided whenever new switches, panels, feeders and circuits are installed.
3. Load mains of adequate size should be provided from the main circuit breaker to the meter position.
4. The manner in which single phase load is connected by the customer is critical with three-phase services. On 115/200 volts or 230/400 volts "wye" services, all single phase loads should be split evenly among the three-phases. On 115/230 volt, three-phase "open delta" services, all single phase loads shall be connected to the 115 volt to ground legs. No single phase load shall be connected to the "high" phase. Connections which contravene these requirements may result in overloading or single phase conditions, with the possibility of damage to the customer's equipment.

Note: The 200 volts to ground leg ("high" phase) shall be clearly and permanently marked with a **RED** marker at the point of delivery and at the meter location

5. GEED requires that customers' installations, where the distance between the panel and socket base exceeds 6ft, be controlled by an externally operable circuit breaker. The circuit breaker must simultaneously isolate

all live conductors of the consumer's installation and must contain over-current protection in all live conductors. The neutral, however, shall not be broken by the circuit breaker. The disconnecting means shall be readily accessible to the customer at the point nearest to the entrance of the customer's service conductors and it shall be plainly indicated whether the breaker is in the OPEN or CLOSED position.

6. The Company is not responsible for defects in the customer's wiring or for any damage that may result from such defects. If the customer discovers any defects in any part of the installation, steps should be taken to rectify the defects immediately in accordance with current regulations. **The socket base is provided by the customer and the Company does not accept any responsibility for its maintenance or any liability for damage that may arise from a defect in the socket base.**

4.11 IMPORTANT NOTES ON LOADS

1. Equipment such as motors, motor starting equipment, welding equipment and X-ray machines, particularly with respect to in-rush current, should not impair the quality of service rendered by the Company to its customers.
2. Motors up to 1 h.p. can be supplied at 115 Volts single phase.
3. Single phase motors of over 1 h.p. and up to 5 h.p. should be 200 volts or 230 volts, 50 Hz. Customers should consult with the Company to determine which voltage supply is available to the customer's premises.
4. Motors of over 5 h.p. must be three-phase. These should be fitted with reduced voltage starting if the customer is fed directly from the low tension distribution mains.
5. Single phase miscellaneous appliances supplied from 3 or 4-wire services should be so connected that the operating current unbalance between phases will be less than 20%.
6. Fluorescent and other gaseous discharge lighting equipment of inherently poor power factor should be corrected to a value of at least 0.85 before being connected to the system.

4.12 CHANGES IN CUSTOMERS' REQUIREMENTS

The capacity of the service provided by the Company is designed to meet the capacity requirements of the installation existing at the time that a connection is given. When the customer's actual demand is substantially less than the rated capacity of the customer's installation, BLPC will install equipment to meet this reduced demand. The customer should give reasonable notice of their intention to make changes in the electrical

equipment which would result in an increase or decrease in their demand or of any proposed change in characteristics or purpose of use so that adequate facilities can be provided.

In cases where a customer is planning to make alterations to the existing installation, prior notice shall be given to BLPC. Service connections, meters or metering equipment shall not be removed or relocated except by persons properly authorized by BLPC to do so.

Any expenses in connection with the relocation or change of Company facilities as a result of a customer change or relocation of the service entrance shall be borne by the customer.

4.13 DISTRIBUTION LINE WORK

Line extensions shall be carried out in accordance with the provisions of the BLPC's Construction Standards and Cost Allocation Rules.

The following services will normally require additional line work to be carried out and Company personnel may need to visit the proposed site and prepare an estimate for the cost of providing the service.

- **Single phase loads in excess of 125 Amps.**
- **Three-phase loads.**

In some instances, smaller single phase services may also require line extension work to be carried out. Estimates need to be prepared and these take time. During the preparation of an estimate, delays may occur which can ultimately delay the entire installation (e.g. poles have to be planted on another person's property and permission needs to be obtained.). In order to avoid delays in connection, the Company should be contacted in the early planning stages. In the case of large commercial or industrial customers, it may be necessary for the company to order equipment (e.g. transformers) and this can take up to 6 months to obtain.

Persons considering building or acquiring homes on land where the required electricity supply lines do not presently exist or do not have the required voltage or capacity, are requested to contact the Company during the planning stages to obtain the cost of electricity service. Land developers should present plans of their intended development to the Company in adequate time to allow for the electrical layout to be designed and estimated. Trees in the area which would interfere with the Company's proposed overhead electric facilities may need to be trimmed or in some cases removed by the customer or developer as required by the Company.

4.14 CUSTOMER CONTRIBUTIONS

Where the Company has to install additional lines or strengthen existing lines in order to supply a customer, a contribution may be required from the customer towards the cost of this work. The customer does not always bear the full cost of this work and allowances are given depending on the type of customer request as provided below and the anticipated electricity usage.

- **Residential/Domestic** - A fixed allowance for each connection likely to be made to the new line immediately. Further allowances may be applicable for connections installed up to three years after up to the value of the initial customer's contribution.
- **Lot Subdivision/Developments** - An allowance is given for the cost of the transformers associated with the new development.
- **Commercial/industrial** - The allowance is based on an estimate of the customer's energy consumption for the first year.

Please contact the Company for further details.

4.15 RURAL ELECTRIFICATION PROGRAMME

The Rural Electrification Programme is designed to assist those homeowners whose wooden houses are estimated to be valued at \$50,000 or less **or** no greater than 600 ft² and located more than 30m (100ft) from the low voltage mains, but who cannot afford the cost of the line extension. A homeowner who applies for electricity supply through the Rural Electrification Programme is put on a waiting list. The waiting period for connection under the programme will depend on the cost of the extension, the number of other homeowners who will benefit from the same line extension and the resources available to the Company for such rural electrification assistance.

Householders who are unable to afford this cost individually, but who are not prepared to wait to be included under the Rural Electrification Programme, may encourage their neighbours who may also be interested in obtaining an electricity supply, to join them in paying for the necessary line extension.

4.16 BRIDGETOWN - Special Considerations

The Bridgetown area poses unique challenges for our Company due to space constraints for siting distribution infrastructure. With building renovations and refurbishment taking place, it is becoming increasingly important for customers to provide the Company with the space to install the equipment needed to meet the increasing demand for power. Old buildings which previously required electricity, primarily for lighting, are now being refurbished and converted to air conditioned offices and shops. As customers increase their demand, they shall be requested to provide space for a transformer room or space outdoors for a padmounted transformer and Ring Main Unit in order for the Company to be able to provide them with supply. In smaller installations (less than 200 amps), the customer will be required to provide space for a service pillar / turret.

4.17 INSTALLATION OF EQUIPMENT

When electrical equipment is brought onto the Company's Transmission or Distribution System, it is the responsibility of the customer to ensure that it meets the characteristics of the service available at the location.

4.18 CUSTOMER'S PREMISES

The Company shall not be liable for damage to the person or property of the customer or any other persons arising from the use of electricity or the presence of the Company's equipment on the customer's premises. All property owned by the Company and located on the customer's premises shall be deemed to be personal property and title thereto shall remain with the Company. The Company shall have the right, at the termination of service, to remove all of its property whether affixed to the realty or not.

4.19 CUSTOMER'S RESPONSIBILITY

The customer shall be responsible for the safekeeping of the Company's property on their premises and, in the event of damage, shall pay to the Company any cost of inspection and repairs. The customer shall protect the Company's equipment on their premises and shall not permit any person, except an authorized representative of the Company, to break any seals, do any work on - or attach anything to - any meter or other Company apparatus located on their premises, except with the written authorization of the Company. The customer should notify the Company for operation, maintenance or relocation of Company owned equipment.

4.20 ACCESS TO PREMISES

The Company shall have the right of access, by the Company's standard vehicles and equipment, to a customer's premises and to all property furnished by the Company installed therein at all reasonable times during which service is furnished to the customer and on, or after its termination, for the purpose of reading meters, inspecting and repairing of devices used in connection with its service, removing its property or for any other proper purpose.

The customer, at their expense, shall maintain suitable and safe access, by the Company's standard vehicles and equipment, to all equipment owned by the Company on the customer's property.

If the customer's property is secured by a gate, chain or similar device, the customer shall install a device to allow installation of a Company owned lock for access to this property.

Dogs should be secured or restrained to allow safe access by company personnel to perform any work related duties on company owned equipment.

4.21 CONTINUITY OF SERVICE

The Company will use reasonable diligence to provide a continuous, regular and uninterrupted supply of service. Conditions may arise when the supply of service is subject to interruption, impairment or change from normal standards of delivery for such reasons as accidents, strikes, causes beyond its control, curtailment or change in characteristics of delivery, when considered necessary for protection of life or property, repairs or improvements to facilities or for the best interests of customers in general. When interruptions are necessary for repairs or improvements to facilities, the Company shall give reasonable notice to the customers affected, if practicable; or in an emergency, when such notification would be impracticable, such interruptions will be made without notice. Refer to the most recent FTC Decisions and Orders (<http://www.ftc.gov.bb>) on Standards of Service for Barbados Light & Power Co. Ltd for further details.

Should the supply of service be so curtailed or changed, or should it be interrupted or become impaired because of accident, strike, legal process, local interference or any cause whatsoever beyond the Company's control, and except it is caused by willful default or willful neglect on its part, the Company shall not be liable for damages, direct or consequential, resulting from such interruption, impairment, curtailment or change.

4.22 LOCATION FOR PROPER CLEARANCES

Meter enclosures, service entrance cable, conduit and drip loops, shall always be located so that the proper clearances can be provided for rain spouts, staircases, verandas, fire escapes, telephone wires, windows, blinds, and lightning rod conductors, as required by other sections of this handbook and the NEC.

How You Can Help Solve The Difficulties

Planning early and involving the Company at the design stage of the renovation or construction of a building.

Sensitizing customers of the need to provide adequate space for the electric supply equipment.

5.0 POWER QUALITY

The Company strives to provide a reliable and efficient electricity service. The electricity supply which is available through a standard commercial or residential outlet is subject to disturbances such as transients, electrical noise, and outages. There is very little that can be done in the design of an electric utility system to eliminate these disturbances. While older technologies were unaffected, most of the modern equipment in the home and office contain electronic circuits which are extremely sensitive to these disturbances. Customers should therefore install suitable devices to protect their equipment from possible malfunction or damage. The type of device selected will depend on the equipment that is to be protected, usage patterns, and individual needs.

In cases of emergency, it may become necessary to interrupt service for short periods without notice when repairs or changes require such procedure, and also to restore service without notice when such work is completed. Any equipment which might endanger life or damage property under the above conditions must be provided with suitable automatic protective devices by the customer. **All motors and electronic equipment such as computers and microprocessors, shall be controlled and protected, by the customer, from damage caused by single phasing or abnormal voltage conditions.** Such disturbances are inherent in all supply systems.

The Company cannot be held responsible for damages caused by the customer's failure to provide adequate protection.

5.1 ALLOWABLE VOLTAGE VARIATIONS

The supply voltage provided by the Company is subject to a +/- 6% variation due to load conditions. The allowable voltage limits measured at the service entrance for different configurations supplied by the Company is shown in **Table 1**.

1. The Company should be notified in cases where the voltage measured (rms steady state) at the service entrance is outside of the values shown in Table 1.

In addition, as a general rule, the voltage drop between the customer's load ends and any branch circuit should not exceed 5% of the supply voltage. This is part of the customer's installation and any correction of voltage drop which may become necessary within the installation is the responsibility of the customer.

TABLE 1

Nominal configuration	Minimum Voltage	Maximum Voltage
115V, 1 phase, 2w, L – N	109	122
115/230V, 1 phase, 3w, L - N,	109	122
115/230V 1 phase, 3w, L - L	218	244
115/200V, 1 phase 3w network, L-N	109	122
115/200V, 3-phase 4w, L - N star	109	122
115/200V, 3-phase, 4w, L - L star	188	212
115/230V, 3-phase, 4w, open delta L-L	218	244
L1, L2 – N	109	122
L3 - N (high phase)	188	212
230/400V, 3-phase, 4w network L-N	218	244
L-L	376	424

5.2 TRANSIENT VOLTAGES

Transient voltages are brief voltage fluctuations outside of the nominal supply voltage which can last up to a few milliseconds. Transient voltages, including voltage spikes or impulses, surges, swells and sags can be caused by lightning or switching loads. It has been estimated that well over 80% of all transients are generated on the customer's premises by their electrical equipment. Unlike the sustained over or under voltage condition, specialized instruments are required to capture, measure or record these transients because of their extremely short duration.

Electronic equipment is sensitive to transient voltages and should be suitably protected. The magnitude of the transient voltage and whether or not it causes damage depends on several factors. These include the amount of load switched, the point in the cycle at which switching occurs, equipment design, integrity of wiring connections and grounding system and the adequacy of equipment protection from transients. The Company does not accept responsibility for damage caused by transient voltages.

5.3 UNBALANCED LOAD

The customer shall, at all times, take and use energy in such a manner that the load will be balanced between phases. In the event of unbalanced polyphase loads, the customer shall make the necessary changes, at their expense, to correct the unsatisfactory condition.

5.4 COMMON CAUSES OF POWER PROBLEMS

Switching

Any type of switching or step change in current through an impedance will produce a voltage impulse. Thus switching of the power grid, switching or cycling of building loads such as air conditioners, refrigerators, freezers, laser printers, photocopiers, elevators and arc welding equipment will give rise to transients.

Lightning

A lightning strike can directly or indirectly transfer some of its energy into delicate circuitry by injecting transients via telephone, power lines, external antennas and data cables.

Poor grounding and/or bonding

When improperly grounded, the risk of malfunction or damage to electronic equipment increases due to increased electrical noise, circulating ground currents and high neutral-ground voltage.

Faulty wiring

Besides being a fire hazard, faulty, loose or corroded wiring is associated with arcing, overheated terminals, damaged insulation, and transients. There is an increased risk of damage to equipment during switching due to the high resistance termination. The Company recommends that customers have a qualified electrician service their installations at least every three years.

Waveform Distortion (Harmonics)

The way in which non-linear loads draw their current can distort the steady state voltage waveform and may affect sensitive loads. Some examples of non-linear loads are switching power supplies found in most electronic equipment, arc welding equipment, 3-phase rectifiers, fluorescent ballasts and high intensity discharge lighting. When analyzed, the distorted waveform consists not only of the main 50 Hz frequency but several components at higher (harmonic) frequencies. If this is causing a problem within your facility the following should be considered:

In a 3-phase 4-wire system which supplies mostly non-linear loads, while the even harmonics cancel each other out in the neutral, the odd multiples of three are additive in the neutral. Thus even when the load is fully balanced, a significant neutral current (sometimes higher than the phase current) may exist. This can cause the neutral conductor to overheat if it is not adequately sized. When supplying non-linear loads, it is recommended that the 3-phase 4-wire branch circuits should have a separate neutral for each phase conductor and feeder neutrals should be sized double that of the phase conductors.

Since it takes energy to supply current at these harmonic frequencies the available capacity of the transformer to supply the load is reduced and overheating may occur since the energy associated with these harmonic frequencies does no useful work and is dissipated in the form of heat. Thus the transformer either has to be derated or a specially designed k-rated transformer used.

Motor starting

Motors normally have a high starting current (as much as 6 times the running current) which can cause voltage drops and affect sensitive equipment. It is best to avoid this by placing sensitive equipment on separate circuits or by installing soft starting devices.

5.5 GROUNDING

The main purpose of grounding is safety - protection of personnel, equipment and buildings from faults. The ground is also used as a reference for logic circuits. The National Electric Code (NEC) published by the National Fire Protection Association (NFPA) requires a ground resistance of 25 ohms or less.

An effective path to ground is required to meet the following requirements:

1. To be permanent and continuous.
2. To have the capacity to conduct fault current safely.
3. To have sufficiently low impedance to limit the voltage to ground and to facilitate the operation of protective devices in the circuit.

The GEED inspects grounding as part of its facility inspection before issuing a certificate.

The Company recommends single point grounding where all equipment is referenced to the same potential (that of the earth) at the service entrance only so that any rise in ground potential appears equally on all circuits. This should be taken into consideration when installing additional ground rods for telephone, television and audio equipment. They should be tied in with the main ground electrode to avoid dangerous circulating ground currents during lightning.

5.6 PROTECTION OF ELECTRONIC EQUIPMENT

Transient Voltage Surge Suppressor

This is the most basic protective device which is required by all electronic equipment such as the TV, VCR, stereo, microwave oven and home computer. Most surge suppressors contain metal-oxide varistors (MOV's) which clamp transient voltages to a specific value and divert the excess energy to ground. To operate efficiently, a low resistance path to ground is required. **Models with surge protection indicators and listed to the latest version of UL 1449 standard are recommended.** Avoid choosing the relocatable **or temporary** power tap which is basically a multi-outlet extension cord.

Constant Voltage Stabilizer (Voltage Regulator)

This device regulates output voltage to near constant value for a wide input voltage swing. It is useful in environments which are subjected to frequent voltage fluctuations such as cycling motor loads, etc. Some models include filtering and surge suppressors and are known as power conditioners.

Uninterruptible Power Supply (UPS)

This device will maintain supply to the load in the event of an outage by using back up battery power. It is the appropriate choice when a power interruption can result in loss of critical data and can be used to maintain power long enough for a back-up generator to start or for systems to be shutdown in an orderly manner. Technologies may differ but they are divided into two main classes:

1. Standby - where the load is fed from the mains until the power fails when the UPS is switched in and
2. On-line where the load is fed from the UPS inverter at all times and 'sees' the mains power only when the UPS is in maintenance mode or has a fault.

Most (but not all) UPSs have built in surge suppression and power conditioning to protect them. A UPS that does not have built in surge suppression features should be protected with a separate transient voltage surge suppressor.

5.7 PROTECTION FOR MOTORIZED EQUIPMENT

Motorized installations for refrigeration, air conditioning and other power equipment should be equipped with suitable under voltage devices to protect against sustained undervoltage, voltage unbalance or service interruption. Adequate protection should also be provided for over current. Three-phase motors should be equipped with suitable loss-of-phase protection devices to prevent single phase operation, improper direction of phase rotation and excessive heating due to over current. The Company will not be responsible for damage to the customer's equipment due to the failure of the customer to provide adequate protection.

5.7.1 PRECAUTIONS TO BE TAKEN WITH THE USE OF 60 HZ

EQUIPMENT

Motorized equipment designed for 60 Hz will generally run hotter, operate less efficiently and have a shorter lifespan when operated at 50 Hz.

Refrigerators, freezers, air conditioners and other similar equipment stamped 50/60 Hz usually are derated at the lower frequency and have two sets of voltage ratings which should be followed. A typical 50/60 Hz 14ft³ refrigerator would be rated as follows in **Table 2**. It is recommended that a suitable step-down transformer be installed to reduce the supply voltage to that recommended by the manufacturer at 50 Hz.

TABLE 2		
Rated frequency	60 Hz	50 Hz
Maximum voltage	127V	115 V
Minimum voltage	115 V	105 V
Rated input	190W	158W

6.0 SERVICE INSTALLATION REQUIREMENTS

This section deals with BLPC's requirements for the installation of equipment to provide the various electric services which it offers. The following service characteristics are standard; and shall be obtained from the Company before any wiring is installed or equipment purchased.

The requirements for meters and metering equipment are covered in a separate section of this booklet.

The Company is not required to install service prior to the time that the wiring of the premises is actually in progress and the structure sufficiently completed to provide a safe and suitable terminus for the service-supply lines.

6.1 NEW AND UPGRADED SERVICE ENTRANCES

A. GENERAL

Company seals shall be cut or removed only by authorized Company personnel.

Any expenses in connection with the relocation or change of Company facilities as a result of a customer change or relocation of the service entrance shall be borne by the customer.

The customer shall be responsible for installing the service entrance which encompasses the weatherhead through the service disconnecting device/overcurrent protection, and includes the service entrance grounding.

Company personnel will work with the customer and/or electrician in determining a suitable meter location, point of attachment of the service drop and location of the weatherhead. The meter must be in a safe and readily accessible location.

All service entrance installations must be approved by the Company and the GEED. Any required local permits or certificates of inspection shall be received by the Company before new or upgraded services are connected.

All electrical connections to Company secondaries must be made by authorized Company personnel. Outdoor work may be affected by weather and scheduling may be subject to change.

For new or upgraded services, provided on an underground network, the electrician must provide lugs and bolts for the connection of the service to the Company's transformer.

B. UPGRADED SERVICE ENTRANCE

a) IN A NEW LOCATION

1. The electrician will install the new service entrance. Where rewiring requires service from the new location on a temporary basis, a bridge/jumper cable should be installed by the electrician to energize the **load side of the new main switch from the load side of the old main switch**. The new main switch will remain in the open position. **Bridges/jumper cables shall not be installed in the meter socket or breaker panel inside the premises.**
2. Once receiving approval from the GEED and the issuance of all relevant certificates or permits and Company requirements have been met, the Company will install the new service drop and meter and energize the service. The old main switch will be opened, the old cable cut clear and the new main switch closed by the electrician to provide service from the new installation. The customer/electrician must arrange for access to the premises. **Any switching of the customer's equipment and the removal of the temporary bridges will be the responsibility of the electrician.**
3. The Company shall not be liable for any damages to customer equipment as a result of operation of the main switch without removing the bridges.
4. Alternatively the Company will work with the electrician to make other mutually acceptable arrangements to de-energize and reenergize the service.

b) IN THE SAME LOCATION

1. Once receiving approval from the GEED and the issuance of all relevant certificates or permits and Company requirements have been met, the Company will isolate the supply and remove the meter so that the electrician may install the new enclosure and riser cable in the same location on the building.

The electrician will install the new enclosure, service entrance cable and the new main switch. In addition, the electrician may be required to contact the Company to reenergize the supply.

6.2 THREE-WIRE SERVICES

Residential Customers

These customers are normally provided with a 115/230 volts, 3-wire, single phase supply from the Company's overhead single phase, low tension distribution mains which is provided from a single polemounted transformer.

- **115/230 volts, 3-wire, single phase. (Figure 2)**

In some residential areas, including sections of Bridgetown and Speightstown, the supply available may be 115/200 volts, 3-wire, network, provided from a three-phase, low tension distribution system.

6.3 THREE-PHASE SERVICES

Three-phase power is usually required by large commercial and industrial customers. These customers have a number of options for the supply of three-phase power:

1. **Purchase and installation of their own transformer and associated high voltage switch.** In this instance, the customer is provided with a high tension (HT) supply and is metered on the high tension side using a Metering Unit and is billed at the Large Power (LP) tariff. The customer retains responsibility for the maintenance and operation of the transformer and associated high voltage switch. The basic voltage available to Large Power (LP) customers is normally:

11,000 Volts, three-phase.

In some areas, such as Wildey, the voltage available is **24,900 Volts, three-phase. Refer to section 2.3 for details on the LP tariff.**

2. **Use of transformer and associated switchgear owned by the Barbados Light & Power Company.** The customer is provided with a low tension supply and is metered on the secondary or low tension side of the transformer and is billed at the Secondary Voltage Power (SVP) tariff. The Company retains responsibility for the maintenance of the equipment. The basic voltages available to Secondary Voltage Power (SVP) customers are as follows:
 - 115/200 Volts, 3-phase, 4-wire
 - 115/230 Volts, 3-phase, 4-wire (see Note 1 below.)
 - 230/400 Volts, 3-phase, 4-wire (see Note 2 below.)

For installations greater than 200 amps (75 kVA), the Company will require **either** a well ventilated, lockable room provided by the customer to house its transformers **or** a concrete pad for the installation of a Company-owned padmounted transformer. With these installations, the secondary terminals of the transformer are the point of connection.

Three options are available to customers who require three-phase electricity supply using transformers supplied by The Barbados Light & Power Company Limited.

- Polemounted transformers
- Vault transformers in a transformer room
- Padmounted transformers.

The type of transformer installation will depend on the requirements of customer (size and voltage) as well as other factors such as the location (e.g. Bridgetown, industrial estate).



Important Notes:

1. **115/230 Volts, Three-phase** - In cases where a 115/230 volt three-phase supply is required by the customer, the Company will normally install two (2) single phase transformers in an *Open Delta* configuration. The open delta connection is only provided in circumstances where the transformers are installed on the customer's property and away from the main overhead supply. 115/230 volts three-phase is not available using a three-phase padmounted transformer.
2. In cases where a **230/400 volts three-phase supply** is required by the customer, the Company can install either three (3) single phase transformers or a padmounted transformer. This service is only provided in circumstances where the transformers are installed on the customer's property and away from the main overhead supply.

7.0 OVERHEAD SERVICES

The cost for overhead service depends on the extent of special engineering required. The least complicated and cheapest situation is when a transformer is on a pole, or near the property. If this is the case, engineering may not be required.

The customer is responsible for providing, installing and maintaining all equipment from the point of delivery except for the meter.

The Company is responsible for providing and installing the meter and making the final connections at the point of delivery.

7.1 SERVICE ENTRANCE CONDUCTORS

For overhead service, the service entrance conductors comprise that part of the service which extends from the point of attachment of the overhead service drop on the building or structure to the service equipment, i.e., disconnecting means and overcurrent protection (breaker or switch-fuse).

For overhead service entrance conductors 1/0 and smaller in size, the conductors must extend at least 1.5ft beyond the weatherhead to accommodate connection to the Company's service drop. Conductors larger than 4/0 in size must extend at least 24ft beyond the weatherhead. The weatherhead should be installed above the level of the point of attachment of the service drop with suitable drip loops provided to prevent the entrance of moisture.

7.2 POLEMOUNTED TRANSFORMERS

Three-phase supply up to 200 amps can be provided from a pole. For three-phase services greater than 200 amps the customer must make provision for the installation of a padmounted transformer or provide a transformer room for the installation of vault type transformers.

Note: In most areas of Bridgetown it is not possible to install polemounted transformers. For services up to 200 amps, the customer must provide space for a service pillar / turret where underground three-phase distribution is available. For loads greater than 200 amps, or where underground three-phase distribution is not available, the customer must provide a Transformer Room.

The voltages available for three-phase overhead supplies are as follows:

- 115/200 Volts, 3-phase, 4-wire
- 115/230 Volts, 3-phase, 4-wire (see Note 1. on preceding page)
- 230/400 Volts, 3-phase, 4-wire (see Note 2. on preceding page)

- 115/230 Volts, 3-phase, open delta 4-wire (Special conditions apply – see note below)

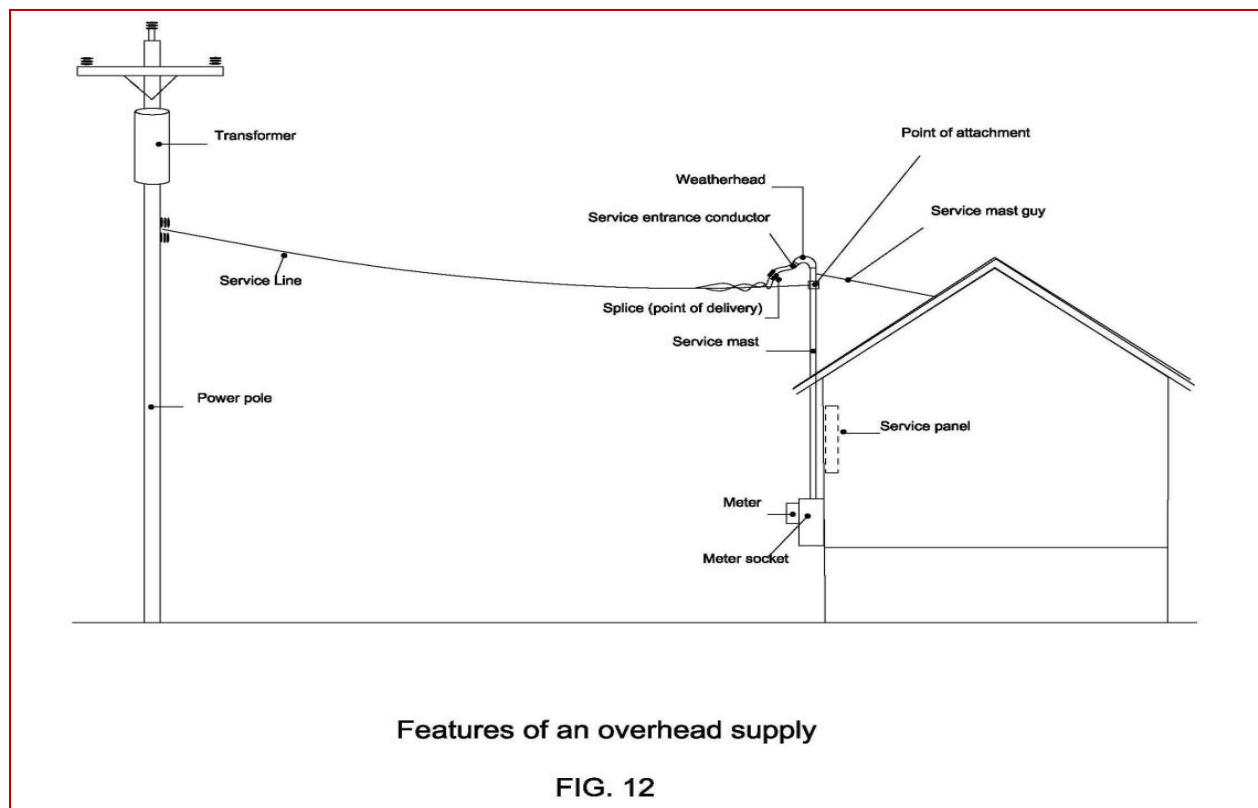
NOTE: This service is only provided to a single customer on a dedicated line extension terminating on the customer's premises. Transformers with this voltage must be clearly labeled.

Figure 12 shows a finished installation of overhead service, using a service mast. The customer provides everything shown here, except the meter, the overhead service line, the pole and the pole-mounted equipment.

After the customer installs the required equipment, the Company installs the meter in the meter socket and strings the service line.

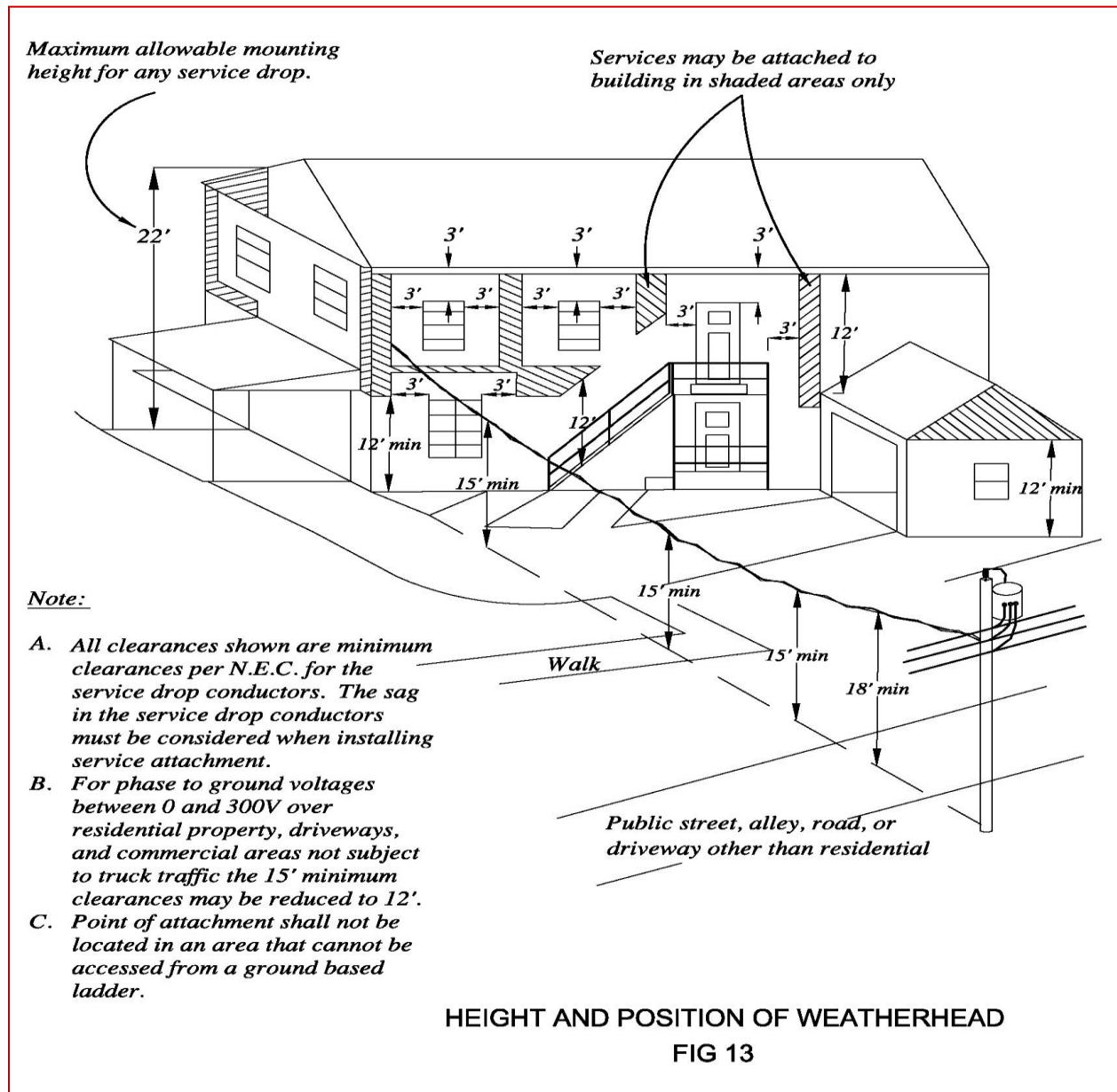
For single/three-phase service, the Company will furnish, install, own and maintain the revenue meter and overhead service drop, running from its secondary distribution system to a designated point on the customer's premises.

For overhead service, the service entrance conductors comprise that part of the service which extends from the point of attachment of the overhead service drop on the building or structure to the service equipment, i.e., disconnecting means and overcurrent protection.

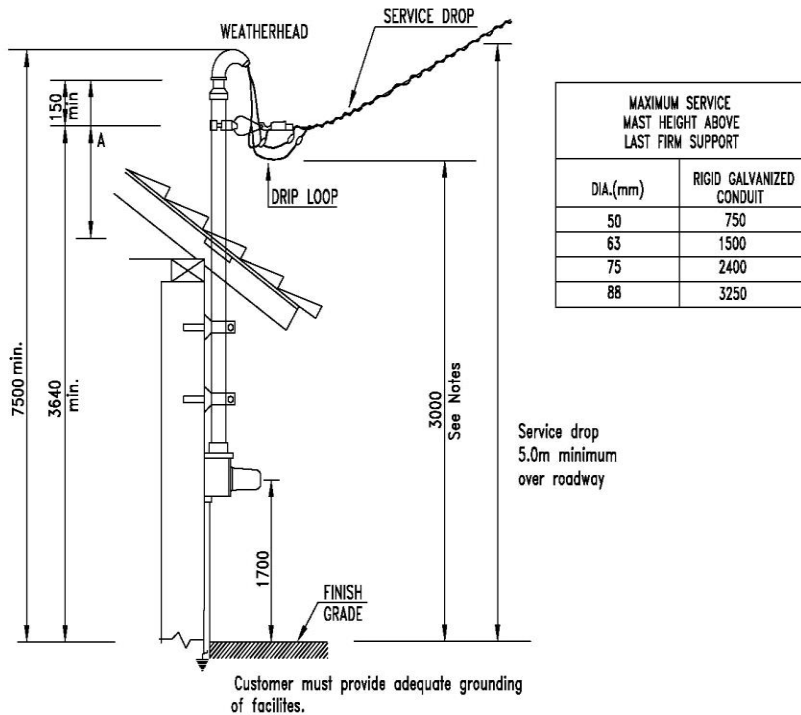


The maximum and minimum heights of a weatherhead shall be 7.3m (22 ft) and 4m (12

ft) respectively. The weatherhead should be taken up to the eave of the building so long as it does not exceed the maximum height requirement. The weatherhead and eyebolt should be positioned so that the path of the service drop is not obstructed by the eave of the building. The weatherhead should not be located near to windows or patios. The weatherhead should be securely attached to the building. The minimum and maximum height for a weatherhead on a building is as shown in **Figure 13**.



Where a service will cross a roadway, a minimum of 5.5m (18 ft) clearance is required above the roadway. If this clearance cannot be achieved, it may be necessary to install an extended metal conduit which extends above the roof of the building to the weatherhead. **Figure 14** shows a typical extended weatherhead installation. In general, the point of attachment shall be so located as to ensure that the minimum clearances given in **Figure 14** are maintained.



1. A Service Mast (extended weatherhead) may be used to get proper clearance above roadways.
2. Service mast conduit and bracket must be of sufficient strength to support service drop.
50mm diameter or larger rigid galvanized conduit is preferred.
BL&P Co. will not attach service to aluminium or PVC mast.
3. Meter socket to be placed in a location accessible to BLPC personnel.
4. Connections between service entrance conduit to be waterproof.
5. Loadends must be of minimum length of 450mm to allow for drip loop.

**ATTACHMENT OF SERVICE
CABLES AT BUILDINGS
EXTENDED WEATHERHEAD**

FIG 14

7.3 ATTACHMENT OF SERVICE DROP

There should be a direct path from the pole to the weatherhead without the service cable passing over another person's property, another building, through trees, or anything that may obstruct the service cable or be considered unsafe. The maximum distance between the pole and the weatherhead is 27m (90ft).

For installations on wooden houses, the customer/electrical contractor will securely attach a **screw hook** to the trimming board so that it is secured into the rafter. In the case of a concrete building, the contractor shall install an **eyebolt or J bolt** close to the weatherhead and **in clear line of sight of the pole from which service is taken**. Eyebolts are not provided by the Company but are available from several hardware stores. For a service **above 100 amps, a larger "oval eye bolt" is required** and this can be collected from the Company for installation by the contractor. **Figure 15** shows service drop attachments.

In accordance with the NEC Section 230.27, service drops shall be attached to buildings or other structures by fittings identified for use with service conductors. In accordance with the NEC Section 230.10, "vegetation such as trees shall not be used for support of overhead service conductors."

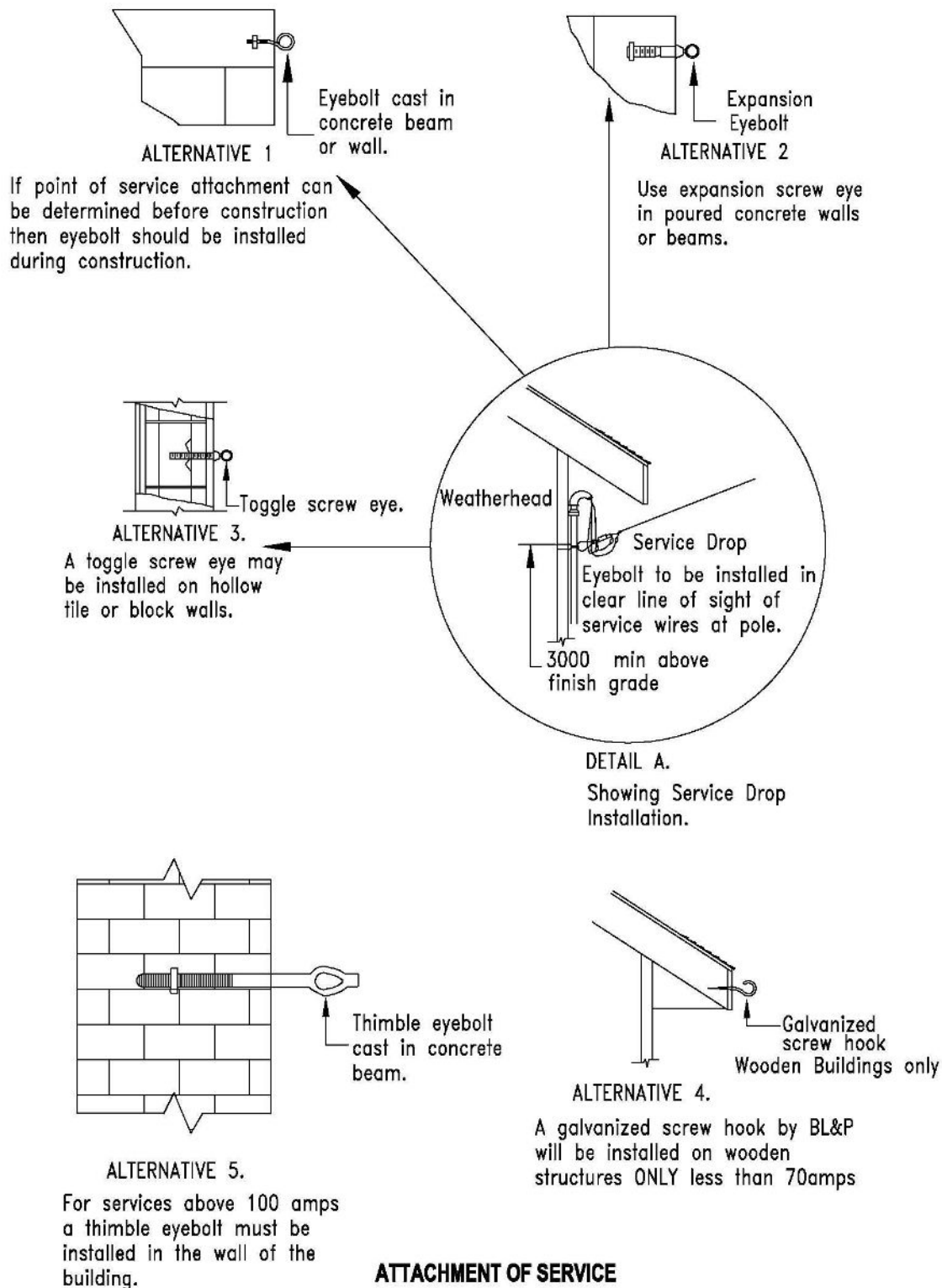
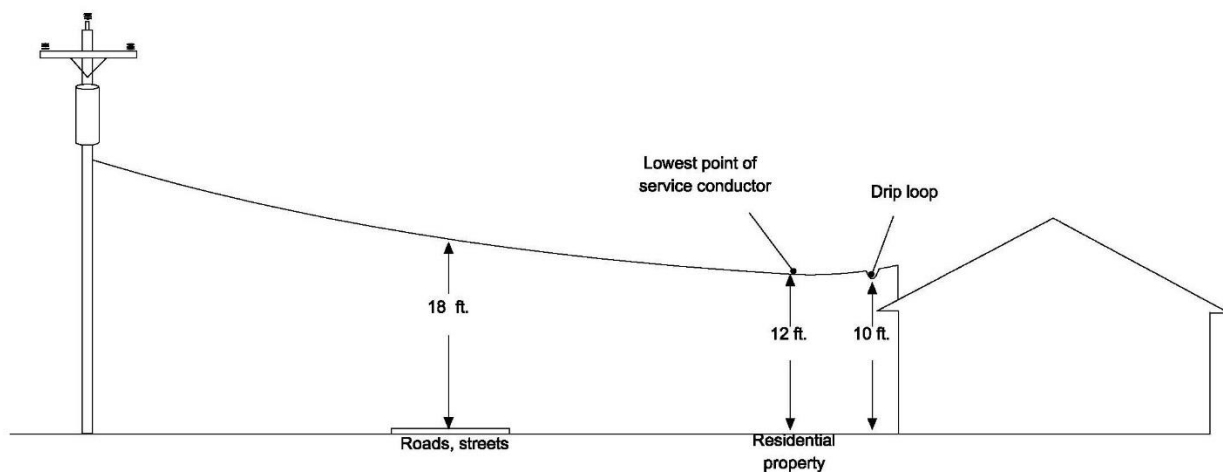


FIG 15

7.4 SERVICE DROP CLEARANCE

In general, the ground clearance for triplex and quadraplex service drops, including drip loops, shall be not less than 3.7m (12ft) for spaces accessible to pedestrians only, 4.6m (15ft) over residential driveways and 5.5m (18ft) over public ways. Additionally, a 6.1m (20ft) clearance over Class 1 highways is recommended to provide adequate clearance for future highway construction.



Clearances From Ground

FIG. 16

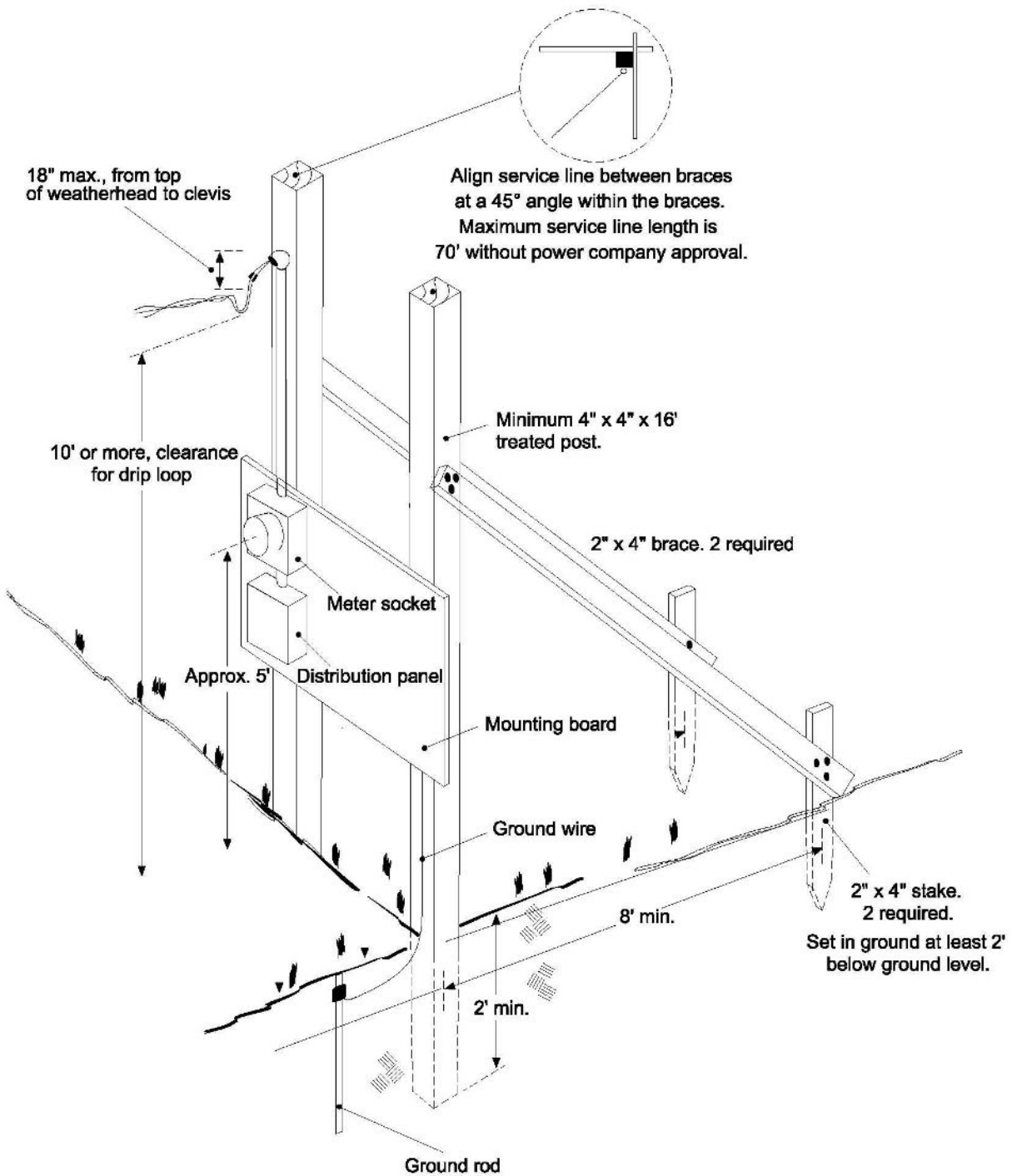
Figure 16 shows clearances under overhead lines for the conditions most commonly encountered. For other situations and for details, see the National Electric Code, the National Electrical Safety Code, or contact the BLPC planning resource for your area.

If the span of the service drop exceeds 90 feet, an intermediate support pole may be required to relieve the tension on the service mast/weather-head.

Avoid a route for the service drop that passes over a driveway. Lines which cross driveways can be struck by tall trucks and other vehicles, causing damage to the service equipment and to the building. If the service drop will pass through trees, the

customer must prune the trees to provide a clear path for the line. The customer is also responsible for regular tree pruning before it reaches the service drop height, and if necessary, tree removal to keep the path clear. If the service drop will pass over brush, the customer must clear and maintain a path for the Company's installation service personnel.

Service drops are not allowed over swimming pools.



TEMPORARY OVERHEAD SUPPLY
FIG 17

Figure 17 shows a finished installation for temporary service, using a meter post. The service is overhead from the Company to the post. From the post, the service to the building could be overhead or underground. The customer provides everything shown, except the meter and the overhead service drop.

8.0 UNDERGROUND SERVICES

For underground service, the service entrance conductors run from the “point of connection” of the underground service lateral to the service equipment. The service lateral typically terminates in the meter enclosure on the outside of the building wall.

8.1 LOCATING UNDERGROUND UTILITIES

The customer must notify the Company at least ten working days before trenching or excavating for underground service. Do not begin excavation until the locations of underground wires, cables, and pipes have been marked, or the Company has informed the customer that it has no facilities in the area. The customer may be required to submit a drawing of the proposed extent of the excavation.

The methodology employed when digging within 0.6m (2ft) of location marks must meet BL&P’s approval.

These are typical identifiers for the presence of underground utilities:

Utility	Identifier
Electric	Red ducts, Stokbord tiles, caution tape, red clay tiles

The following table shows typical identifiers for other utilities

Color	Underground Service
Yellow	Gas, Oil, Steam
Black, Orange	Telephone, Cable TV
Blue	Water
Purple	Recycled water
Green	Sewer
Pink	Temporary survey marks

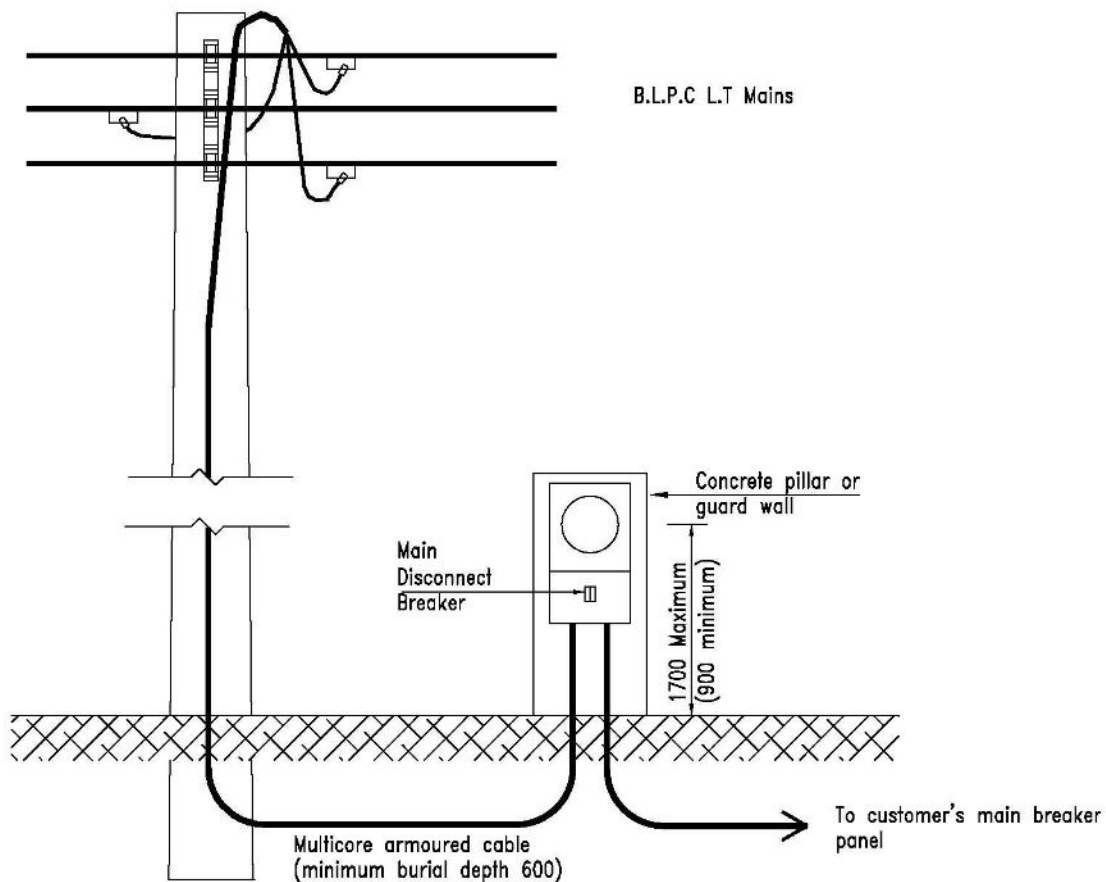
Table 3-1 - Typical Identifiers for Underground Services

Note: Other identifiers maybe found. Older installations may show various colours in the field, and existing colours may also be subject to change.

8.2 UNDERGROUND SERVICE CONNECTION FROM OVERHEAD NETWORK

In cases where an underground service connection to the overhead distribution system is desired, the customer is required to supply, install and maintain the underground service cable in accordance with the Company's requirements.

- (a) Insulated multicore cable shall be used for all underground services. **Figure 19** shows a typical connection from an overhead network. Cable should comply with National Electric Code as stated by the GEED and the individual cores should be easily identifiable.

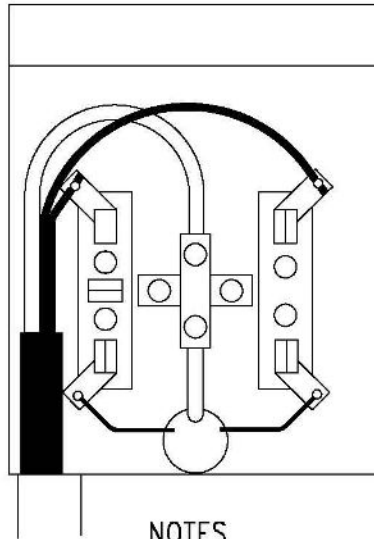


NOTES

1. Cable to be installed by customer while BLPC will run cable up the pole and connect to LT mains. This should be adequate to extend 600mm above the top of LT lines or at least 9 metres from the ground.
2. Meter socket to be installed in a location accessible to BLPC personnel.
3. Meter socket to be designed that the incoming line ends cannot be accessed through any unsealed part of the meter socket.

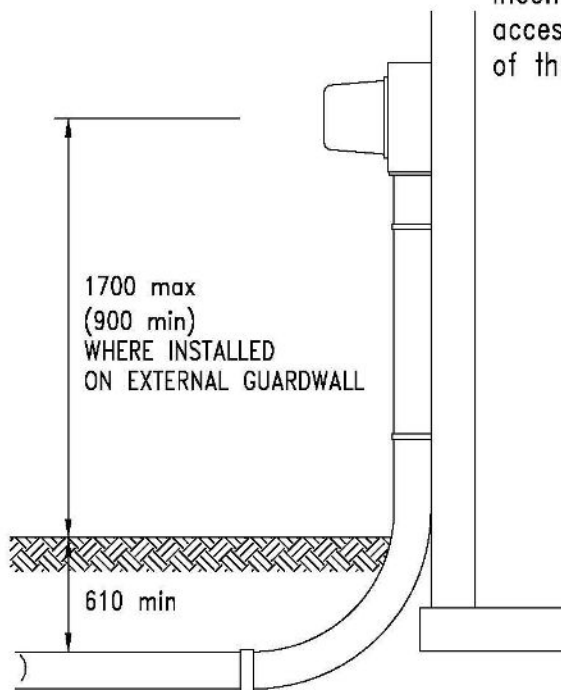
**UNDERGROUND SERVICE CONNECTION
FROM OVERHEAD NETWORK**

FIG 18



NOTES

1. Meter socket to be installed in a location accessible to meter readers.
2. Meter socket to be so designed that incoming line ends cannot be accessed through any unsealed part of the meter socket.



METER SOCKET INSTALLATION
UNDERGROUND SERVICE

FIG 19

Figure 20 shows a finished installation for temporary service, using a meter post. The service is underground from a pole, turret, or padmounted transformer. Conductors placed in the trench bring the power to the base of the post. From the post, the service to the building is underground. The customer provides everything shown, except the meter and the padmounted transformer.

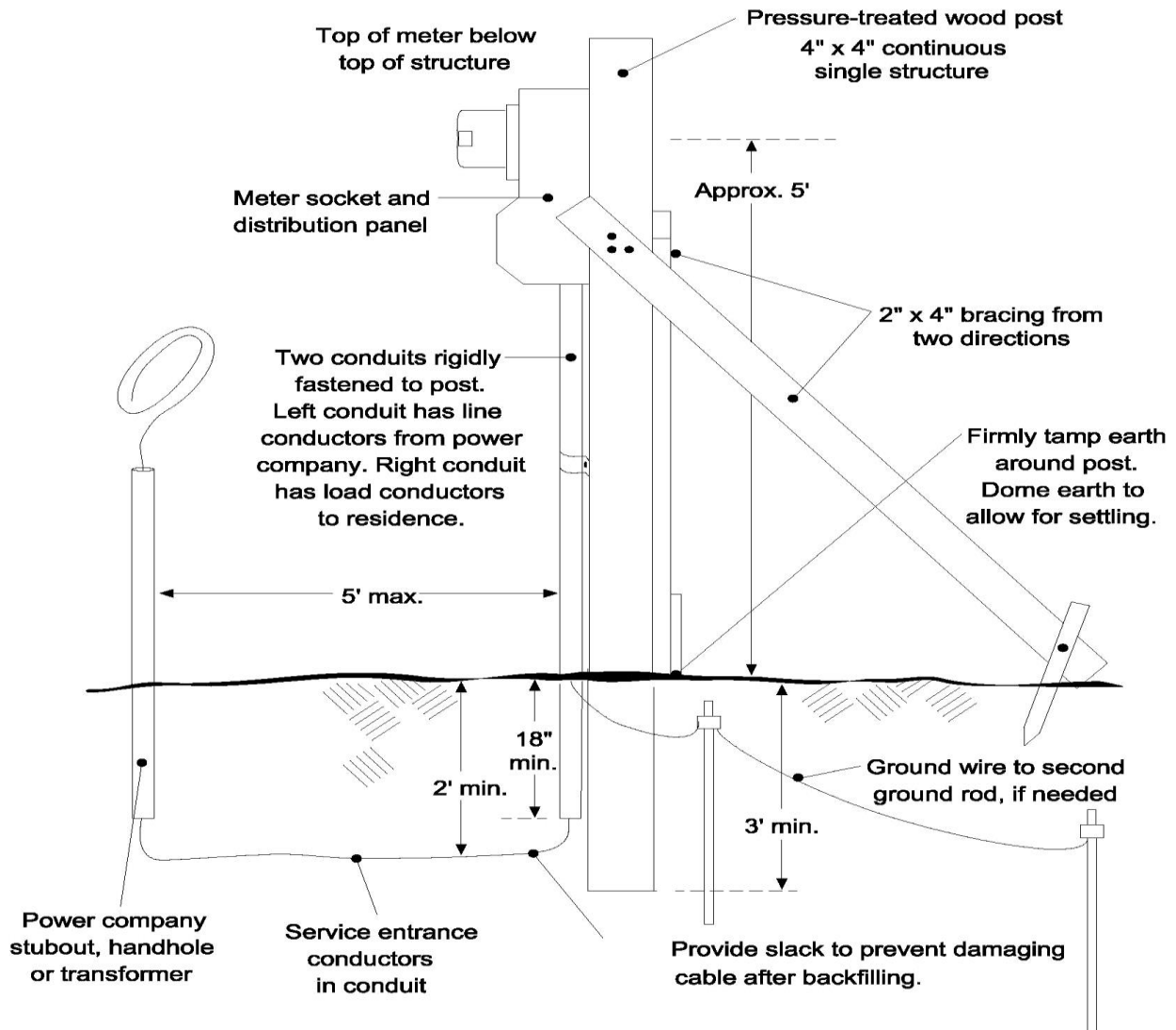


Figure 20 – Finished Installation for Temporary Service

- (b) Customers using underground services are encouraged to install the meter socket on the external side of their guard wall as long as they observe the regulations as to the height of the meter position and the regulations of the GEED.
- (c) The meter socket in any installation shall be constructed so as to ensure that the incoming line ends cannot be accessed through any unsealed portion of the meter socket.

8.3 RESIDENTIAL UNDERGROUND DISTRIBUTION

Residential customers in underground developments are normally provided with a 115/230 volts, 3-wire, single phase supply from a turret connected to the Company's underground single phase, low tension distribution mains. On developments designated as underground developments the Company will normally install single phase padmounted transformers to meet the capacity requirements of the customers. Single phase padmounted transformers are available in the following sizes:

- 25, 37.5, 50, 75 and 100 kVA

Important Note:

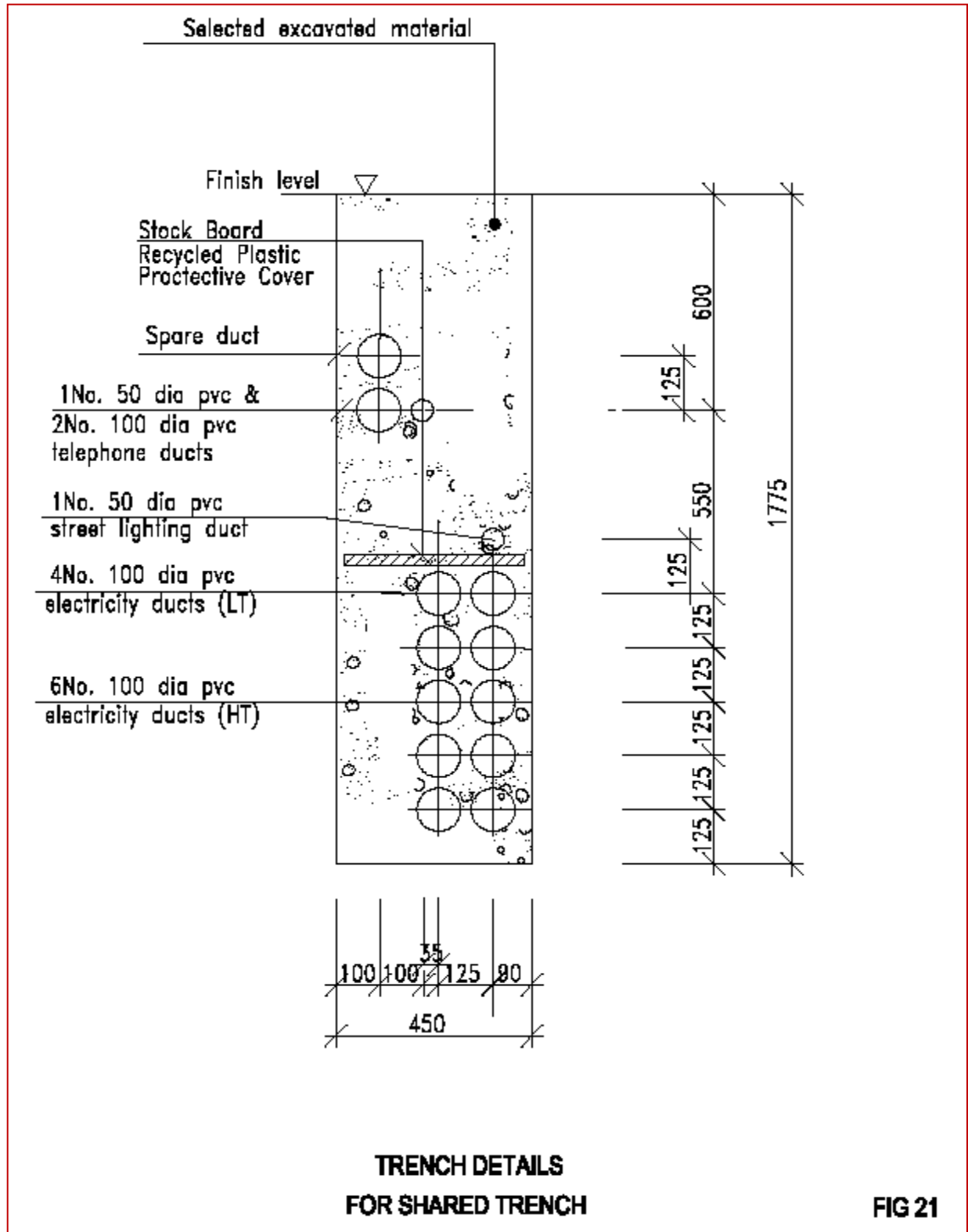
In cases where the residences are large, and as a consequence the capacity requirements are high, the Company may install three phase padmounted transformers to meet the demand. Residential customers in these underground developments will be provided with a 115/200 volts, 3 wire, network supply from a turret connected to the Company's underground low tension distribution mains.

For requirements with regards to the connection of underground residential distribution services refer to Section 6.1 A.

The developer is required to provide the following in accordance with the Company's standards:

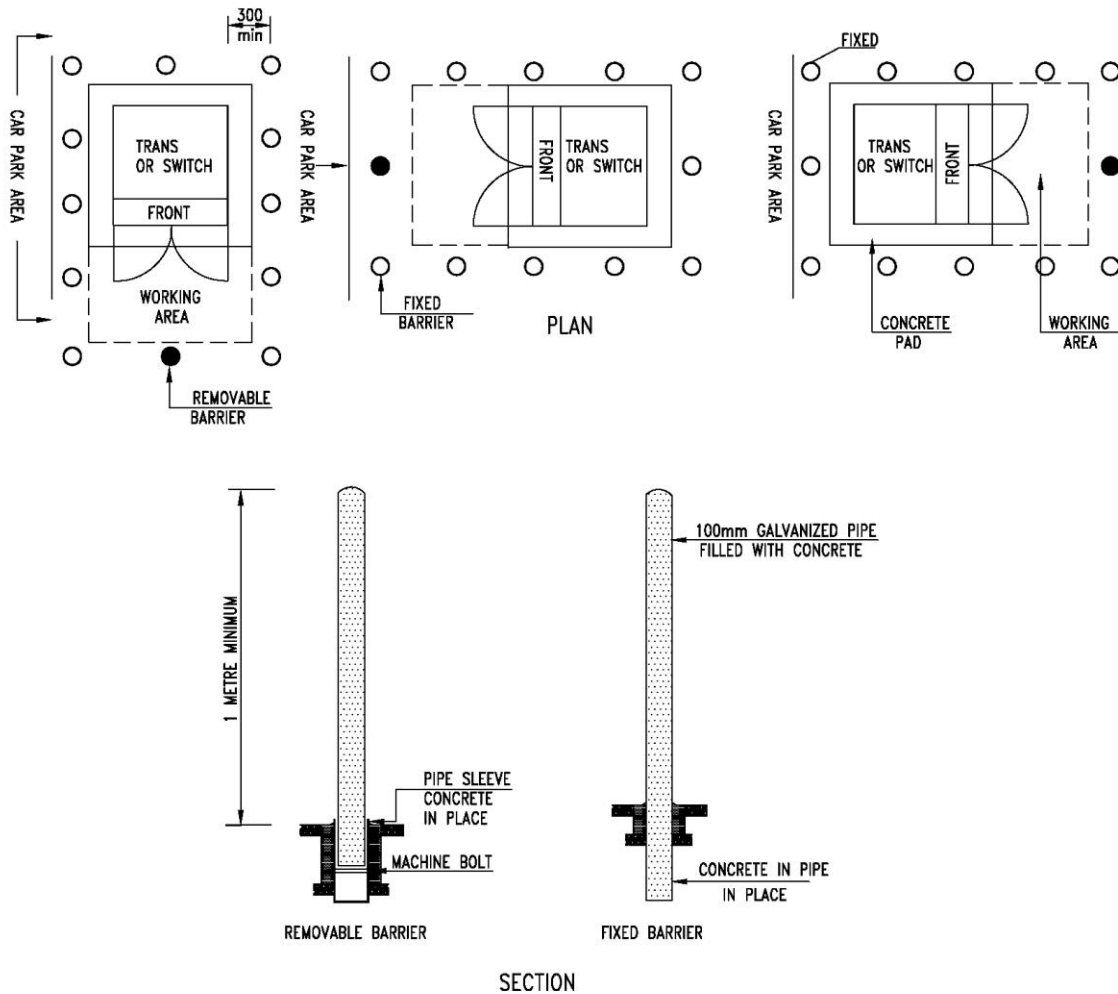
1. To supply and install 100mm (4 inch) diameter conduits for the high voltage cables and 4 inch diameter conduits for the low voltage cables including provision for pulling cables through the conduits. This includes excavation work necessary to install the conduits to the depth required by the Company. The developer is responsible for identifying the customer's LT ducts.

For safety reasons the Company requires that the high voltage cables shall be buried at a minimum depth of 0.8m (2.5ft) and be separated by at least 0.5m (1.5ft) from other underground facilities belonging to other utilities (e.g. Cable & Wireless (Barbados) Limited). (see **Figure 21**)



2. To supply and install the concrete bases (plinths) for the padmounted transformers or turrets in locations specified by the Company. In instances where the padmounted transformer is to be placed near to an area which has vehicular

traffic, the developer will be required to provide barriers to prevent accidental damage to the transformer. (see **Figure 22**).



NOTES

1. Barriers are required to protect padmount transformers from physical damage when transformers are installed in car parks and other paved areas used by vehicles.
2. Removable barriers are to be provided when use of fixed barriers would obstruct opening of transformer doors.

**PADMOUNT TRANSFORMERS
PROTECTIVE BARRIERS**

FIG 22

3. To install an earth mat and equipotential mat in conjunction with the concrete base for the padmounted transformer. The mats are typically installed at the time of constructing the concrete pad to provide a good electrical earth for the installation. (see **Figure 23**). Inspection should be carried out before the concrete is poured for the base.

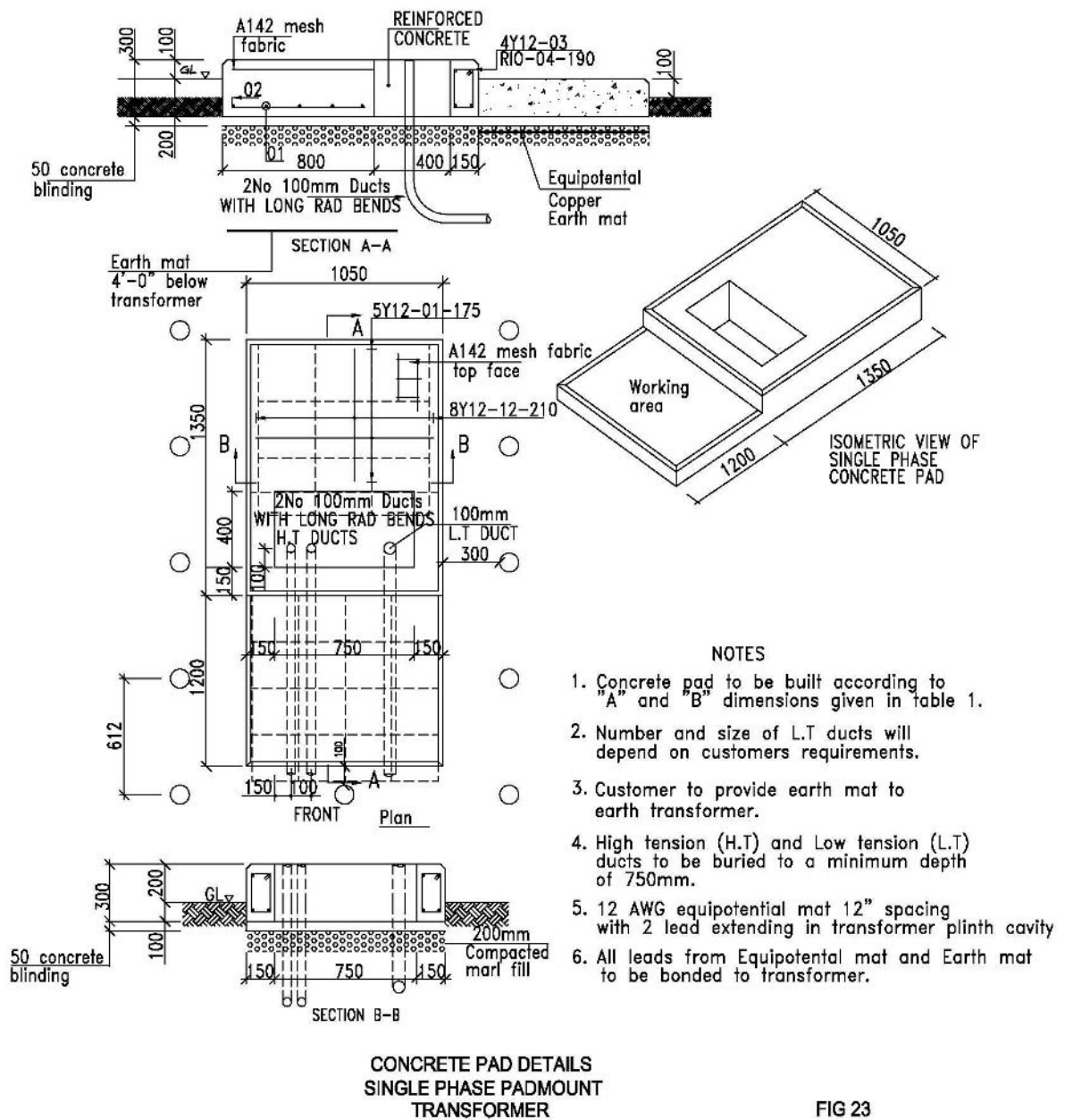
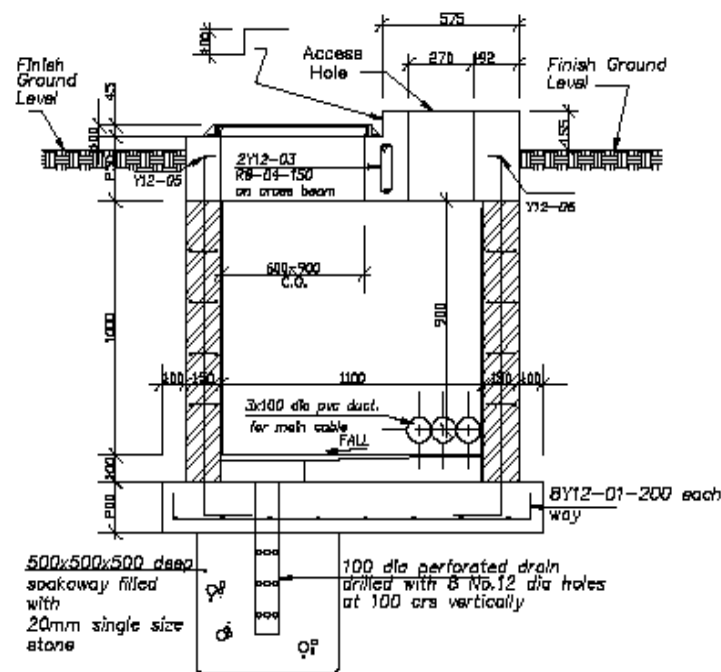


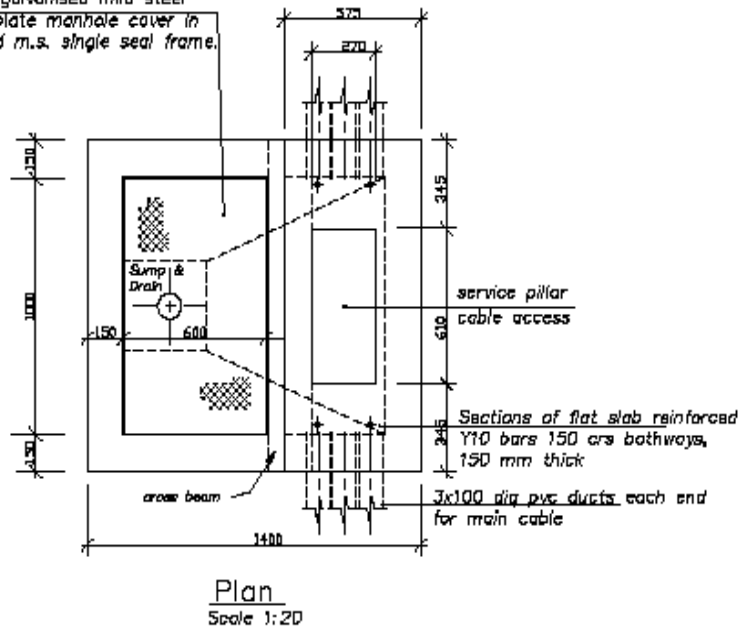
FIG 23

4. To install manholes and cable ducts in accordance with the Company's requirements for the high voltage cables, in locations specified by the Company.

-
- Plan**
Scale 1:20
- Section**
Scale 1:20
- ACCESS MANHOLE FOR 100 AMP ELECTRICAL SERVICE PILLAR**
- FIG 24A**



600x900 galvanised mild steel
chequer plate manhole cover in
galvanised m.s. single seal frame.



**ACCESS MANHOLE FOR 200 AMP
ELECTRICAL SERVICE PILLAR**

FIG 24B

6. To supply, install and maintain the underground service conduit and cable from the turret to the meter point. This shall be installed in accordance with the Company's standard requirements for this type of installation. All service cables should be clearly identified and permanently labeled at the time of installation. (see **Figure 25**).

Developers should contact the Company in the early stages of planning to discuss their requirements. ***Special arrangements will have to be made for temporary supply in underground residential areas. Contact the Company as early as possible.***

8.4 COMMERCIAL UNDERGROUND INSTALLATIONS

Barbados Light & Power is responsible for installing a padmounted transformer at or near the customer's site. Conductors to the primary side of the transformer enter at the left side of the transformer; conductors to the secondary side enter at the right. The trench runs from the right side of the transformer to the customer's building.

The customer is responsible for installing the service conductors in the trench, from the transformer to the building.

Three phase padmounted transformers are available in the following sizes.

- **45, 75, 112.5, 150, 225, 300, 500, 750, 1000 and 1250 kVA.**

The following voltages can be supplied from a three phase padmounted transformer.

- **115/200 Volts, 3-phase, 4 wire**
- **230/400 Volts, 3-phase, 4 wire**

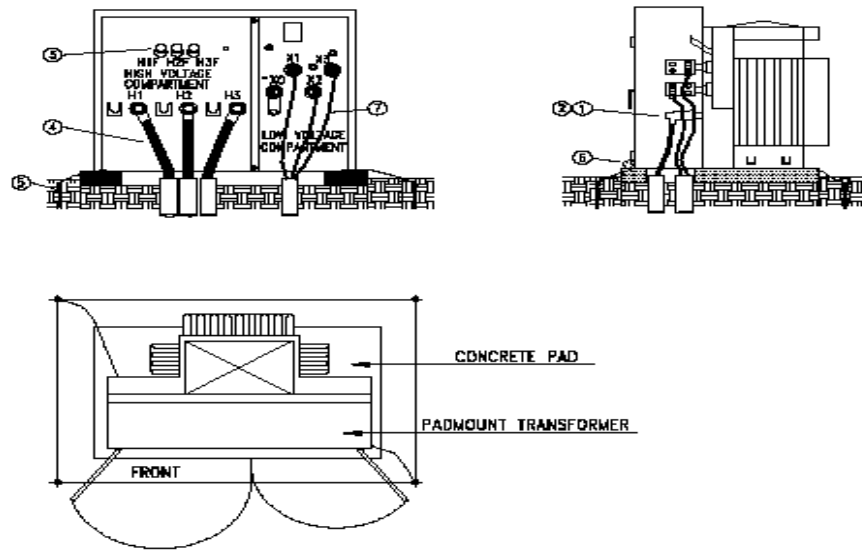
Padmounted transformers offer several advantages to the customer. Some of these advantages are listed below.

1. Padmounted transformers can be installed outdoors on a simple concrete pad. This eliminates the need for the customer to provide a transformer room and results in considerable savings.
2. Padmounted transformers need less space than transformer rooms.
3. From a safety point of view, the padmounted transformers are designed to be tamper proof and weatherproof.

The Company supplies Loop Feed transformers.

The transformer contains two sets of connections each consisting of three bushing wells. The three incoming high voltage cables which feed the transformer are connected to one set of bushing wells, while the outgoing cables which continue on to feed the next transformer are connected to the second set of bushing wells. A total of six conduits are required - three for the incoming cables and three for the outgoing cables.

Typical three phase padmounted transformer installations are shown in **Figure 26**.



NOTES

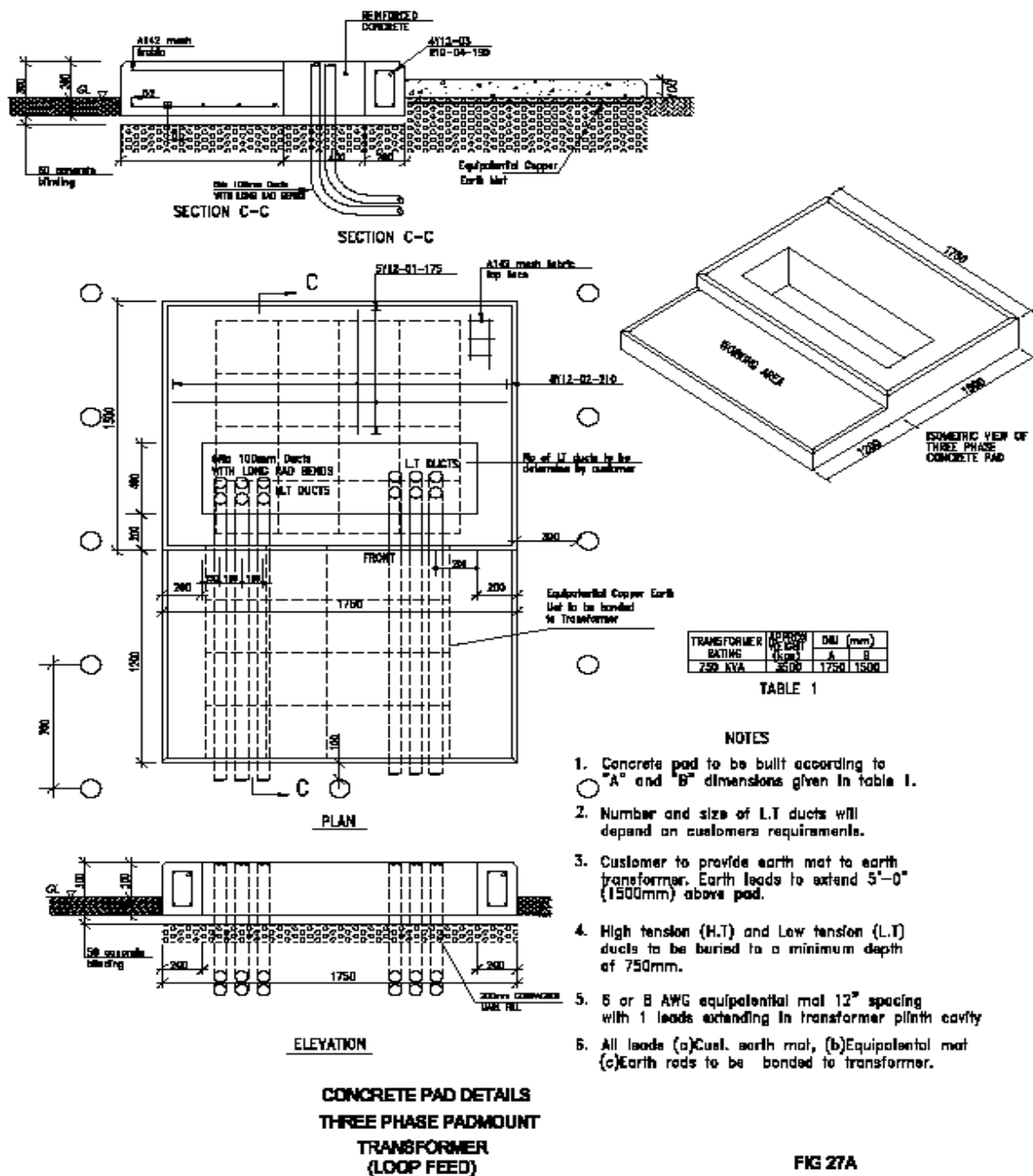
- 1 Three (3) ducts of 100mm dia are required for the high voltage cable from the cable drop at the pole to the concrete pad. The number and size of LT ducts will depend on customer requirements
- 2 Clear vehicle access should be maintained right up to the transformer and a 600mm clearance should be provided around the transformer for maintenance purposes. The doors of the transformer should be free to open without obstruction.
- 3 Where the transformer is in an open area which has vehicular traffic it will be necessary to provide barriers to prevent accidental damage.
- 4 Concrete pad details are provided in standard drawing FIG 27A.

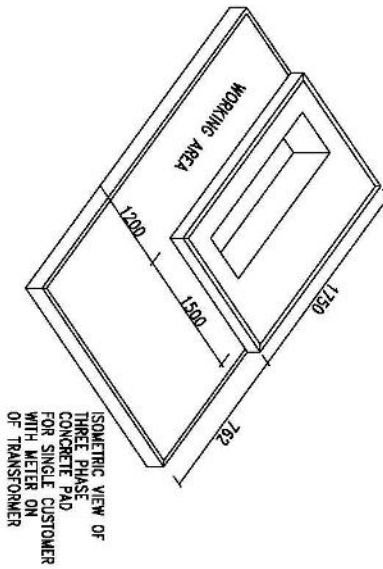
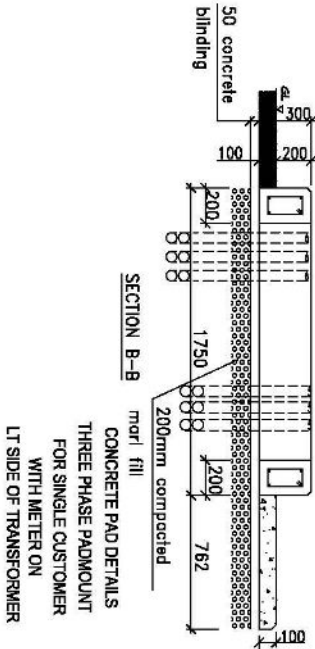
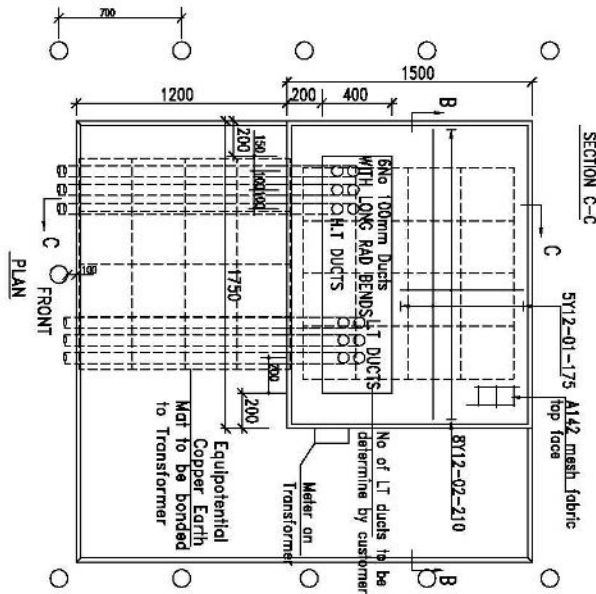
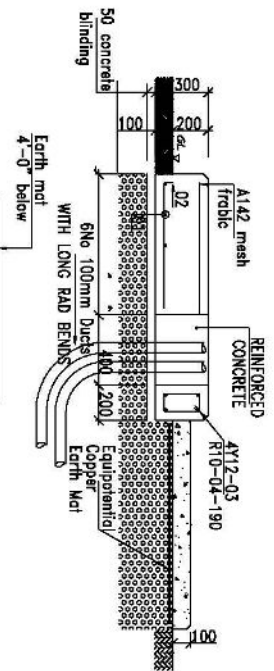
**THREE PHASE
PADMOUNT TRANSFORMER
TYPICAL ARRANGEMENT**

FIG 26

8.5 INSTALLATION DETAILS

Concrete Pad – Two concrete pad sizes have been standardized for transformer size ranges: **45kVA – 750kVA** and **1000kVA – 1250kVA**. **Figures 27A** and **27B** show the standard arrangement for the concrete pad. The concrete pad will also vary in specification if metering is required on the transformer as shown in Figure 27B. For three phase padmount transformers of size 1000kVA – 1250kVA please contact the Company's Service Planning Section.





TRANSFORMER RATING	APPROX WEIGHT (kg)	DIM (mm)
		A B
750 KVA	3500	1750 1500

TABLE 1

NOTES

1. Concrete pad to be built according to A, B, and C dimensions given in table 1.
2. Number and size of L.T ducts will depend on customers requirements.
3. Customer to provide earth mat to earth transformer. Earth leads to extend 5'-0" (1500mm) above pad.
4. High tension (H.T) and Low tension (L.T) ducts to be buried to a minimum depth of 750mm.
5. 6 or 8 AWG equipotential mat 12" spacing with 1 lead extending in transformer plinth cavity
6. All leads, Equipotential mat and Earth mat to be bonded to transformer.

FIG 27B

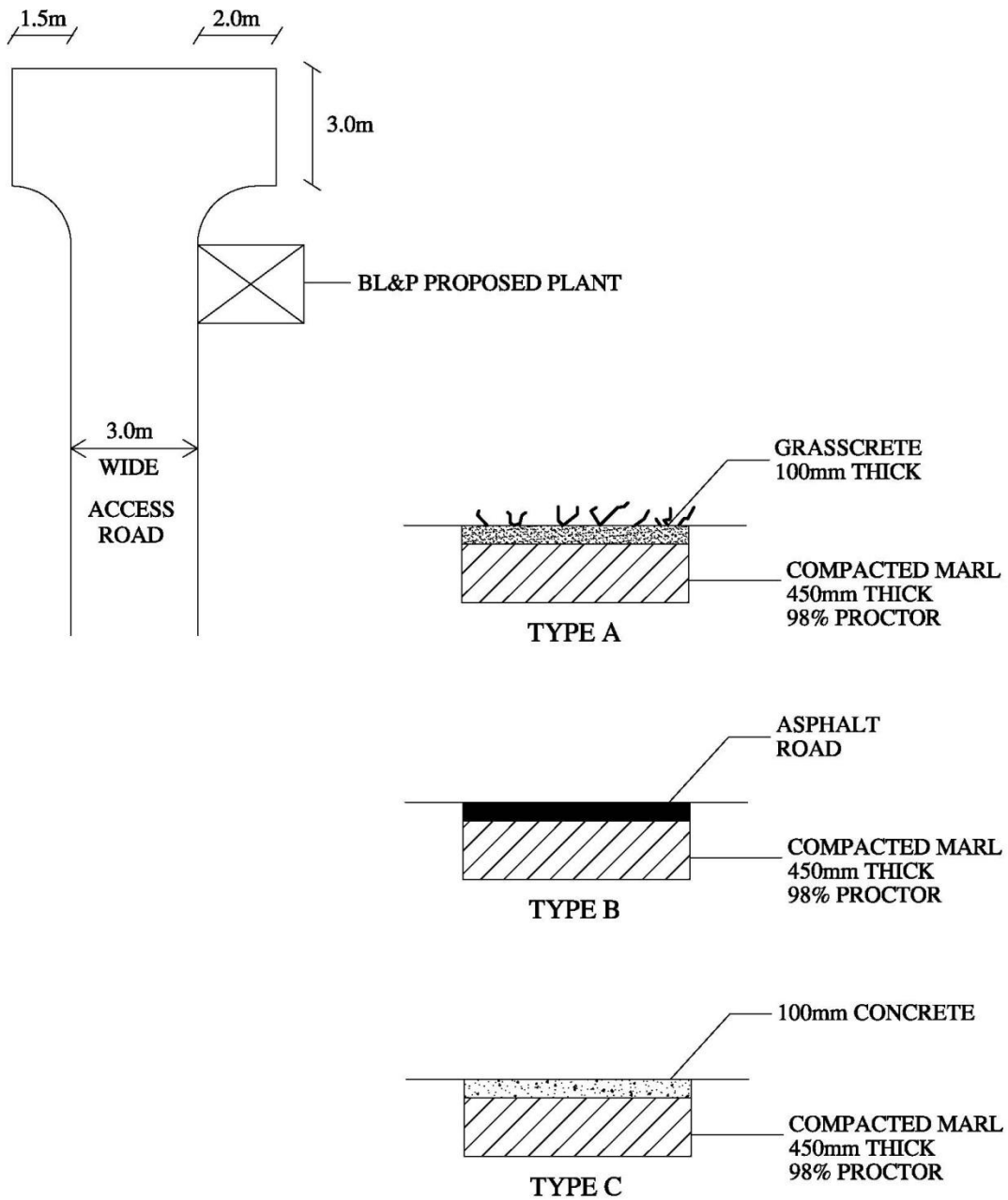
Excavation & Back Filling - All unsuitable material beneath the foundation and extended 1.0m on either side should be removed to solid rock formation. If rock is not encountered, a minimum depth of 4ft of clay should be removed and filled with imported 2 inches down crusher run stone. The crusher run stone shall be compacted with mechanical compactors in 15mm (0.59 inches) maximum layers at optimum moisture content to achieve 95% proctor density. The backfilling for each transformer foundation shall be tested for compaction by an approved independent laboratory, such as the Ministry of Public Works laboratory, if requested by the Company.

Where earthing mats which require 300mm backfill of clay or mould over the mat are to be installed, these should be located to one side of the transformer to ensure the compaction specified above is achieved.

HT ducts - For radial feed using loop feed transformers three (3) internal diameter 4 inch ducts are required for the high voltage cables from the cable drop at the pole to the transformer pad. Three (3) single core 1/0 XLPE cables will be used to supply the transformers. Three (3) additional ducts extend from the transformer for any future development

For loop feed, six (6) 4 inch ducts are required, three (3) ducts for the incoming high voltage cables and three (3) ducts for the outgoing cables from the transformer to another padmounted transformer location. For safety reasons, the Company requires that the conduits for the cables be buried at a minimum depth of 2.5ft and be separated by at least 1.5ft from underground facilities belonging to other utilities. Where the required depth cannot be achieved, appropriate mechanical protection (e.g. concrete) can be used provided that prior approval has been obtained from the Company.

Access - In order to carry out maintenance and other checks, it will be necessary to locate the transformer where it will be readily accessible to the Company's personnel at all times. Clear vehicle access should be maintained right up to the transformer. (See **Figure 28**)



BL&P ENTRANCE DETAIL

FIG 28

Physical Protection - In instances where the padmounted will be placed near to an area which has vehicular traffic, it will be necessary to provide barriers to prevent accidental damage. Barriers known as bollards used are usually 4-inch steel pipe filled with concrete. (See **Figure 22**)

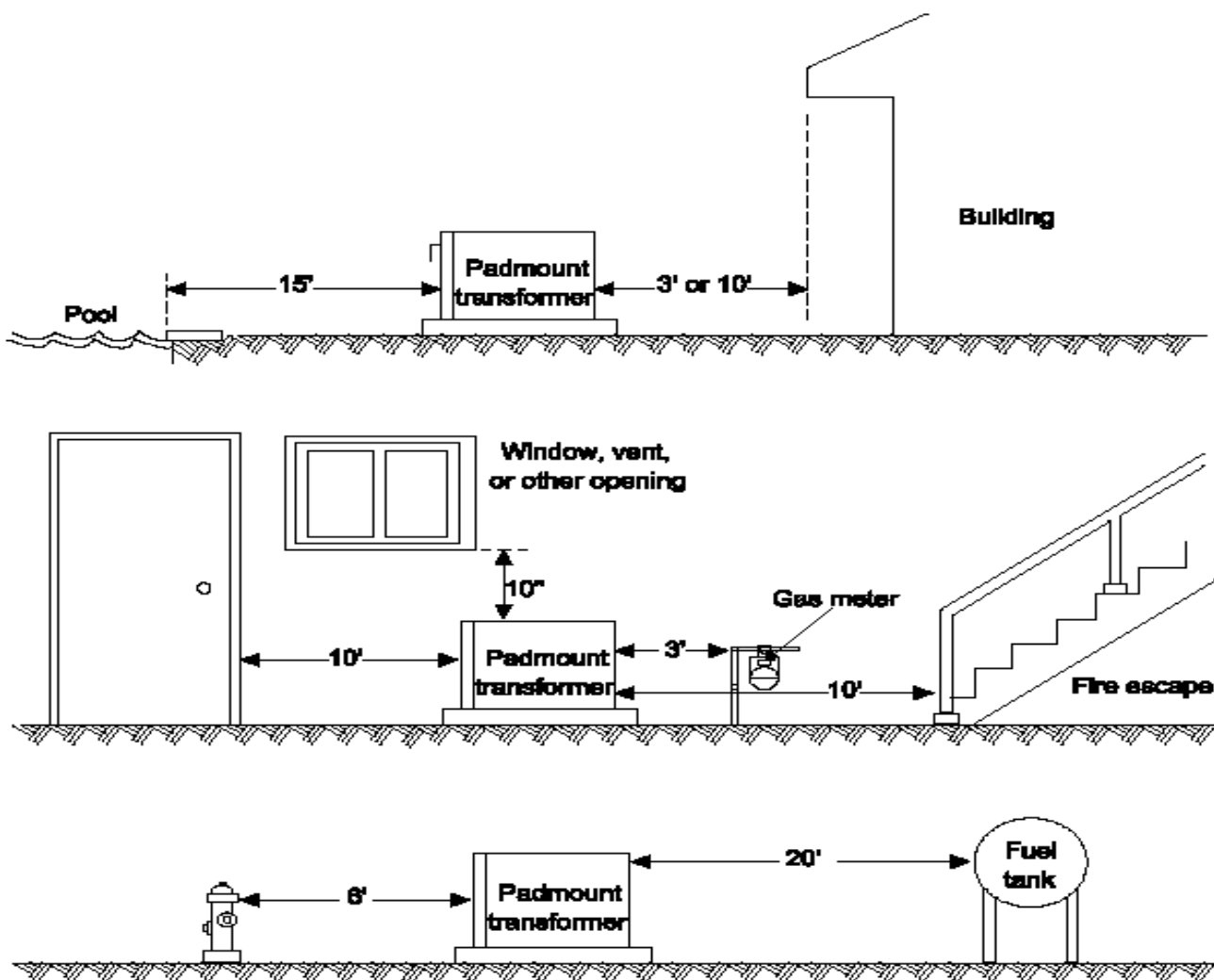
Meter Location - Where a single customer is fed from a padmounted transformer, it is possible to install metering Current Transformers (CTs) on the secondary bushings of the padmounted transformer. These CTs will be obtained from the Company. The meter can be located on the side of the padmounted transformer or on a suitable concrete pillar adjacent to the transformer in a location readily accessible by the Company's personnel. (See **Figure 11**)

In cases where several customers are supplied from a padmounted transformer, the requirements for meter/multi-metering as specified in this booklet should be adhered to.

8.6 TRANSFORMER INSTALLATIONS

Safety Clearances around Transformers - Clearances from padmounted transformers to structures are measured from the nearest metal portion of the transformer to the structure or any overhang. The clearance from a building is 0.9m (3ft) if the building has non-combustible walls (brick, concrete, steel, or stone) and 3m (10ft) if the building has combustible walls (including stucco).

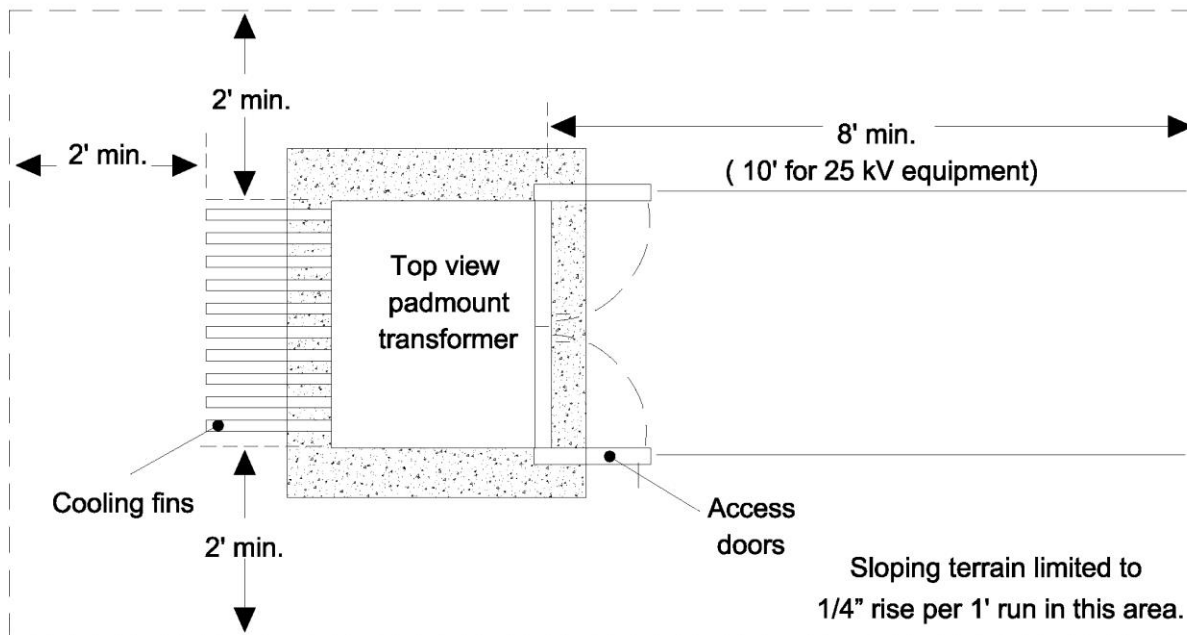
Please refer to drawing for safety clearances.



Safety clearances around a padmounted transformer
FIG. 29

Work Clearances around Transformers - A minimum clearance of 2.4m (8ft) of clear, level working space is required in front of a padmounted transformer to accommodate the use of hot sticks. The clearances shown in **Figure 30** below apply to any oil-filled electrical equipment. **Landscaping and other obstructions must not encroach on these clearances.**

A retaining wall(s) shall be required around the transformer plinth elevated 6 inches above the grade of sloping terrain, to minimize the accumulation of debris on the transformer plinth and to protect the transformer.



AERIAL VIEW

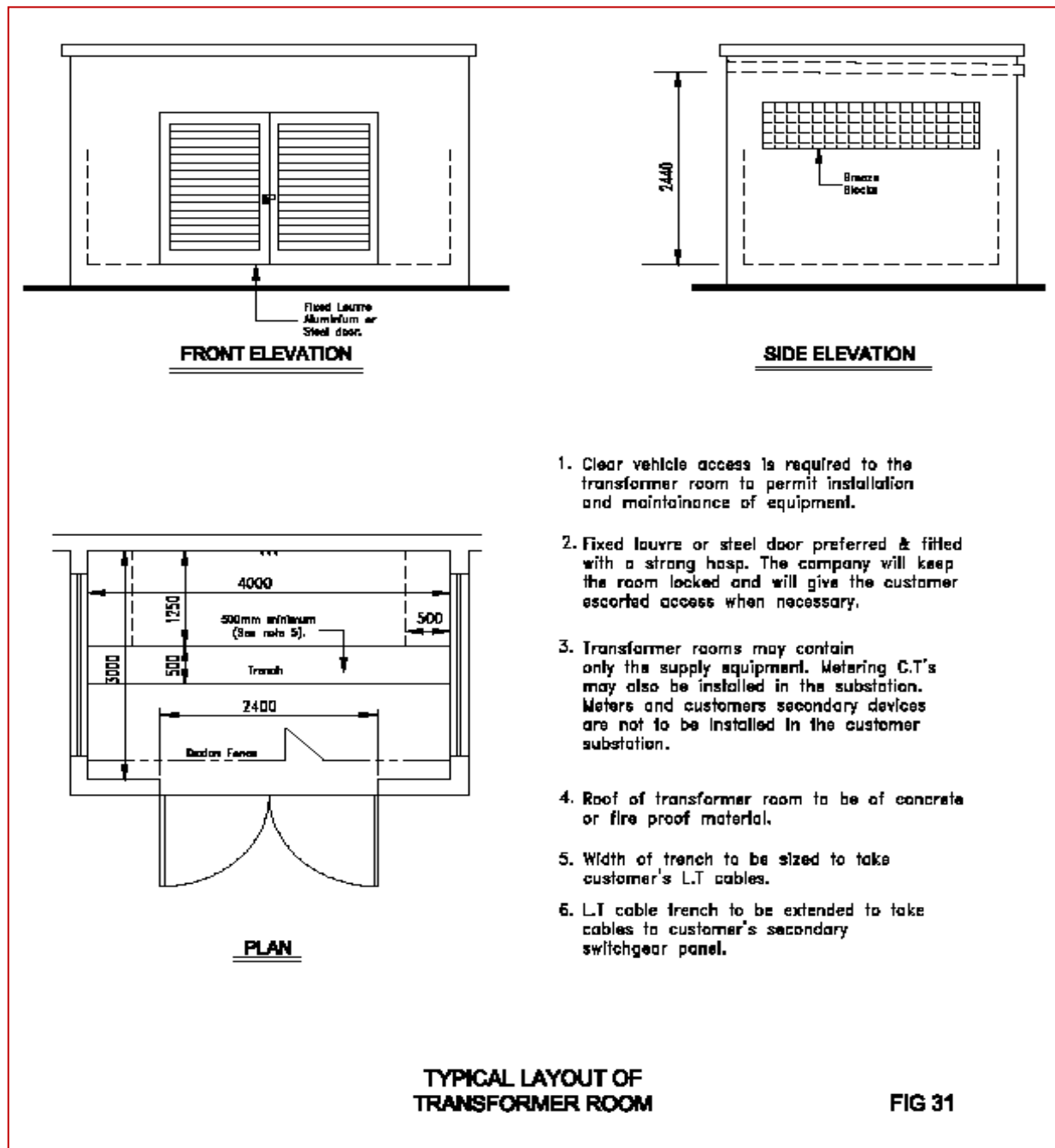
Work clearances around a padmounted transformer

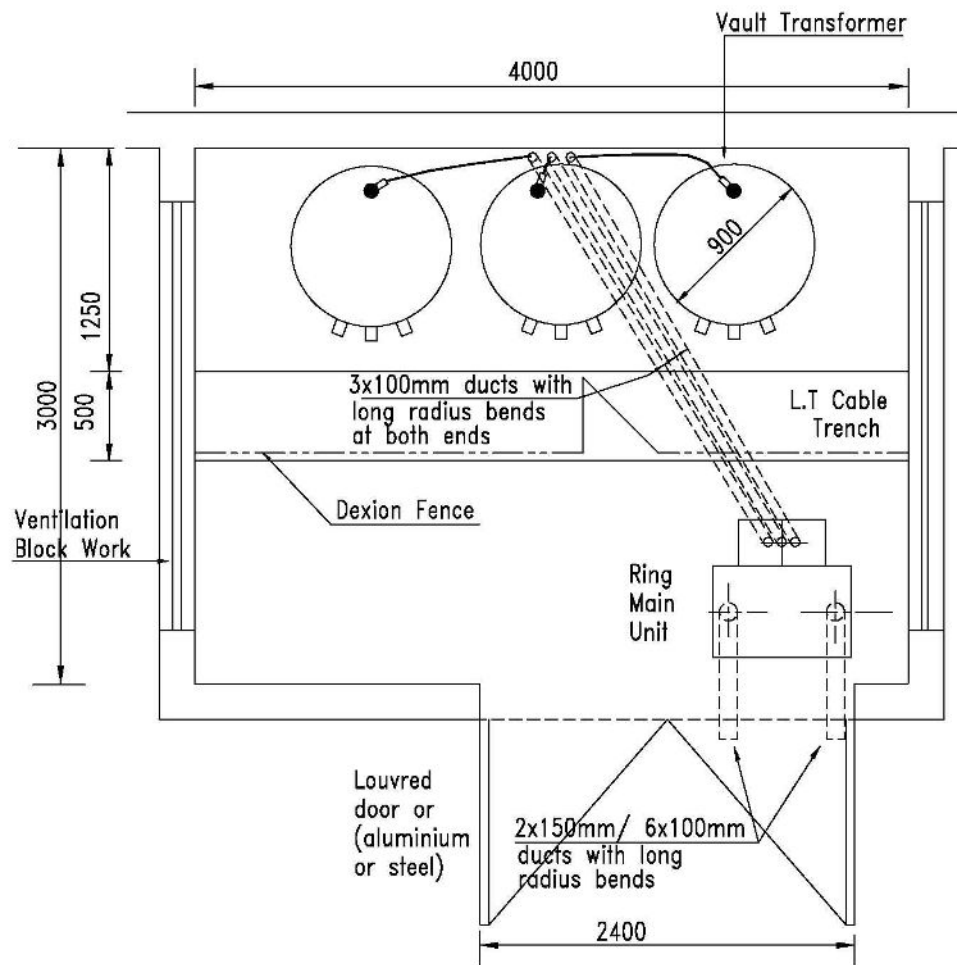
FIG. 30

8.7 TRANSFORMER ROOMS

Where it is not possible to install a padmounted transformer, the customer will be required to provide a transformer room to house the transformers. Certain important requirements are described below:

Figure 31 and **Figure 32** show typical arrangements.





1. Transformer room should be located so as to be accessible to B.L.P.C vehicles.
2. Adequate lighting shall be installed in the transformer room.
3. Routing of 2x150 mm (or 6x100mm) Dia. ducts will be decided by B.L.P.C in consultation with the customer.

**TRANSFORMER ROOM
c/w RING MAIN SWITCH
TYPICAL LAYOUT**

FIG 32

Ventilation - In order to provide adequate ventilation for the transformers, a louvered door (preferably made of aluminum or steel for long life) should be used. Wherever possible, additional ventilation should be provided by the use of "breeze blocks" of the sloping rain repellent type.

Lighting - Lighting should be provided in the transformer room. Lights should be placed in front of the transformers and not directly above them. The switch should be located near to the entrance to the room.

Access - Clear vehicle access must be maintained to the transformer room at all times for maintenance purposes. Transformer rooms should be lockable and the Company will install its own locks to prevent unauthorized access to the transformer room.

Trenches - Transformer rooms shall be built with shallow trenches to accommodate cable trays. Secondary cables should be run in these cable trays in front of the transformers so that in the event it becomes necessary to replace a transformer, this can be done without disturbing the secondary cables or cable trays.

High Voltage Cable Ducts (Conduits) - The Company uses **vault type transformers** fitted with bushing wells designed to accept high voltage elbow connections. Three (3) single core 1/0 XLPE cables will be used to supply the transformers. The customer will be required to install three (3) internal diameter 100mm (4 inch) cable ducts from the cable drop at the pole to the transformer room. The Company will advise on the location of the pole to be used for the cable drop as well as the orientation of the ducts at the base of the pole.



Note:

This requirement does not apply to installations in sections of Bridgetown where a Ring Main Switch is to be installed

High Voltage Cable Ducts (Conduits) Bridgetown - For installations in the Bridgetown area, where the high voltage supply is underground, additional space is required in the transformer room to accommodate a ring main switch (see **Figure 32**). In some cases, the space allocated for the switchgear may be used to install switches to feed other customers. The customer will be required to install six (6) internal diameter 4-inch or PVC cable ducts to connect to the Company's underground high voltage distribution system. This type of duct will be supplied by the Company. The cable route and switchgear layout will be decided by the Company in consultation with the customer. Details on the size and radius of bends should be obtained from the Company.

Transformer Room to Contain No Other Equipment - The transformer room shall not contain any customer owned equipment or building service facilities such as secondary fuses, switches, load control equipment, gas, oil, steam, or water pipes, or ventilation ducts other than those required by BLPC.

Meter Location - In the case where a single customer is supplied from the transformer room, metering current transformers (CTs) shall be obtained from the Company. The contractor will be responsible for their installation. The CTs shall be located in a CT chamber within the transformer room, but the meter will be located outside the transformer room in a location easily accessible by the Company's personnel.

In cases where several customers are supplied from a transformer room, the requirements for multi-metering should be adhered to.

8.8 THREE PHASE HIGH TENSION SERVICES

High Tension (HT) primary service is available at either 11,000 or 24,900 Volts, depending on location. It is important that the customer consult the Company in advance of making plans for the use of high tension service.

Transformer and High Voltage Switchgear - For primary supply, the customer must purchase and install a suitable transformer to change from the primary to the secondary voltage. The secondary voltage is the customer's choice. Details on the primary voltage and recommended voltage taps will be provided to each customer by the Company. The customer must install such high voltage switchgear as the Company and GEED may require. High voltage switchgear should have a short circuit interrupting capacity of 250 MVA. The complete installation must conform to the requirements of the Company and the GEED. In areas where the high tension supply is underground, additional space will be required to accommodate a high tension metering unit.

Transformers and switchgear located outdoors must be designed and installed so that they are protected from mechanical damage and all live parts are inaccessible to unauthorized personnel.

Service Cables - The Company is prepared to supply and install the underground high voltage service cable at the customer's expense. The cable route will be decided by the Company in consultation with the customer. The customer will be required to install PVC ducts to contain the high voltage cables. The sizes and radius of bends will be specified by the Company. The radius of bends is normally one meter.

Trenching - The customer is responsible for digging the service trench and installing conduit or direct-buried conductors. The customer backfills and compacts the trench.

Trenching rules and tips:

- Prior to backfilling, the customer and the Company must make a joint inspection of the trench for adequate depth, conduit or cable placement, and other items

that will be covered after backfilling. If corrections are necessary, a second inspection is required after the changes are completed.

- Before cable is installed ducts must be mandrelled in the Company's presence. The customer or his agent and BLPC representative must sign off BLPC's "Certificate of Satisfactory Completion of Cable Duct and Manhole Installation".
- All rock, debris, scrap cable and other construction items must be removed from the site before company installation work is started.

The customer may place telephone, cable TV, or other electronic signal conductors in a trench with electric utility wires, providing the installation meets the requirements of the Company and all other parties. Refer to section 8, HT ducts sub-section for clearance requirements.

GLOSSARY OF TERMS

ANSI	American National Standards Institute. An independent administrator and coordinator of voluntary industry standards.
BLPC	The Barbados Light & Power Company Limited
Clearance	A specified minimum distance between two objects to assure adequate space for safety, security, or access.
Company	The Barbados Light & Power Company Limited
Common ground point	The point where the grounding electrode connects to the equipment-grounding conductor and/or the circuit-grounding conductor.
Conduit	A pipe with a smooth interior surface for easy drawing-in of electrical conductors. Conduit may be metallic or non-metallic
CTs	Current Transformers used to meter services over 200 amps
Customer	User of BLPC's electric services (e.g. electricity consumer, architect, electrical contractor, electrician, etc.).
Delta	
Demand	The rate at which electric energy in KW, KVA, or KVAR is consumed during a specified interval of time (i.e. instantaneous, 15 minute, 30 minute). BLPC's demand meters record the highest kVA demand in any 15 minute interval during the billing period
Direct-buried Cable:	Cable which may be installed in the ground without the protection of a conduit.
Direct-connect Meter	A meter which carries full load current and connects across full line voltage. Also called a self-contained meter
Drip loop	A downward loop in the customer's conductors, near where the customer's conductors attach to the power company's overhead conductors, to prevent water from entering the service mast at the weatherhead
Fault	A partial or total failure of insulation which causes a short circuit between conductors, or between a conductor and ground, causing an abnormal current to flow. Also, a failure (break) in a conductor which causes an open circuit
Fault current	A current which flows between conductors, or between a conductor and ground, due to an abnormal connection between the two. A fault current flowing to ground may be called a ground fault current.
Guy	A cable or brace that supports a mast or pole.
High leg	In a four-wire delta service, the phase with a voltage higher than the other two phases. Also called wild leg, delta leg

GEED	Government Electrical Engineering Department
HT	High Tension (HT) is BLPC's system voltage before transformation
HT Metering Unit	A unit which houses Current Transformers (CTs) and Potential Transformers (PTs) for the purpose of metering customers who are provided with a High Tension supply.
Instrument Transformer	A transformer which delivers as its output, a precise fraction of the input line current or line voltage. Instrument transformers allow standard meters to measure high currents and voltages.
Instrument rated meter	A meter used in conjunction with instrument transformers, to measure high-voltage or high-current services. Also called a transformer-rated meter
Line Ends	BLPC's conductors at the point of connection to the customer's conductors (service entrance conductors).
Load Ends	The customer's conductors at the point of connection to BLPC's supply conductors (service drop).
LT	Low Tension (LT) is BLPC's system voltage after transformation
Meter jaw	A spring-loaded receptacle inside a meter socket which captures the terminals (blades) of a meter, and connects the meter terminals to the service conductors
Meter Pedestal	A factory-built assembly containing a meter socket and disconnect switches
Metering Unit	An enclosed combination of voltage transformers and current transformers connected to step down high voltages and currents to a level to can be measured by standard utility revenue meters.
Meter ring	A metal ring which secures the meter to the meter socket, which can be sealed by the electric utility to prevent tampering with the meter
Meter Socket	The mounting device consisting of meter jaws, connectors, and enclosure for receiving a socket-type meter
Network Supply	A 115/200 volt three wire service obtained from two phase wires and the neutral of a three phase, 4 wire, wye system.
NEC	National Electrical Code. National regulations for the installation of electrical equipment inside buildings. Published by the National Fire Protection Association. NEC rules apply to equipment on the customer's side of the point of delivery.
NEMA	National Electrical Manufacturers Association. A trade association which publishes standards for manufacturers of electrical equipment, including enclosures and racks
NESC	National Electrical Safety Code. National regulations for the installation, operation, and maintenance of electric supply and communication lines. Published by Institute of Electrical and Electronics Engineers. NESC rules apply to equipment on the electric utility's side of the point of delivery.
Neutral	The grounded conductor in a single-phase three-wire, or three-phase four-wire system.
Point of Attachment	The point at which the utility's service conductors are mechanically attached to the customer's premises. For overhead services, the point of attachment is usually an insulated clevis
Point of Delivery	The point where the utility's service line makes the electrical connection to the customer's wires. For overhead services, the point of delivery is the splice between

	the utility's and the customer's conductors. For underground services, the point of delivery is the secondary lugs of the distribution transformer, or the service stubout, or the secondary hand hole – if the utility's existing service is on the customer's property. If the utility's existing service is not on the customer's property, the point of delivery is the customer's property line. The utility determines the point of delivery based, in part, on convenient access to existing service.
Power Factor	Technically, the cosine of the phase angle between the circuit voltage and current waveforms. Since phase angles are difficult to measure, power factor is usually derived by measuring power or impedance. Power factor is the ratio of active power to apparent power (watts divided by volt-amperes). Power factor has no units, but is commonly expressed as a percentage. For example, if active power is 96 kW and apparent power is 100 kW, the power factor is 96%.
Primary Voltage	The voltage at which electricity is delivered from substations to distribution transformers. Primary voltage is greater than 600 volts.
Raceway	An enclosed channel for holding wires or cables. If designated for line conductors, the raceway must be sealable. The intermixing of line and load conductors in the same raceway is not permitted.
Readily Accessible	The ability to walk or drive to a piece of equipment as necessary for inspection, maintenance or replacement in reasonable time without prior notice to the property owner.
RGS	Renewable Generation Systems: refers to photovoltaic or wind power generating systems located on a customer's premises.
Seal	A locking device to secure a meter or other service equipment
Secondary Voltage	The voltage at which electricity is delivered from distribution transformers to customers. Secondary voltage is less than 600 volts
Select Backfill	Soil or sand free from sharp objects, rocks, scrap building material, and corrosive material
Self-contained Meter	A meter which carries full load current and connects directly across full line voltage. Also called a direct-connect meter.
Service Drop	The overhead service conductors between BLPC's system and the point of attachment (point of delivery) to the Customer's load ends
Service Point	The point of connection of BLPC's supply conductors to the customer's service conductors
Service entrance Equipment	The service equipment which is supplied by the customer: conduit, conductors, mast, weather-head, meter base, enclosures, disconnects, and panels.
Service lateral	For underground service, the service line between the distribution transformer and the point of delivery
Service mast	For overhead service, the conduit rising above the meter to provide mechanical protection to the customer's conductors and to support the service drop from the power company. Also known as the weather-head.
Socket	The mounting device for socket meters. Includes spring-loaded meter jaws, connectors for line and load conductors, and an enclosure.
Temporary service	Electric service during the construction phase of a project
Test switch	A device used to isolate connections to a meter from its instrument transformers

Transformer-rated Meter:	A meter used in conjunction with instrument transformers, to measure high-voltage or high-current services. Also called an instrument-rated meter.
UL	Underwriters Laboratories. An independent product-testing and certification organization
Voltage Transformer	A transformer whose secondary voltage is a precise fraction of its primary voltage. Using voltage transformers, high-voltage circuits can be measured with conventional meters. Abbreviation: VT, or PT (potential transformer).
Wye	