



CUSTOMER METERING STANDARDS

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1. GENERAL ADMINISTRATION

Administration

Customers planning alterations or new installations involving metering shall contact the Electrical Inspector at their local Customer Service Center (CSC).

Metering Equipment

The metering equipment will be ordered by the Electrical Inspector once the electrical permit and the requirements of section 4.10 have been completed.

Metering equipment is not typically maintained in inventory at Customer Service Centers (CSC) and must be ordered from the Manitoba Hydro Customer Metering Department located in Winnipeg.

Depending on the equipment ordered, allow up to 10 days for delivery. High voltage transformers will take longer depending on availability of transformers and associated equipment.

Low Voltage – over 200 Amperes, Low Voltage Switchgear Assemblies, and High Voltage switchgear Assemblies:

The associated Metering Equipment will need to be picked up at the Customer Service Centre (CSC) or in Winnipeg at Customer Metering 400 Dovercourt Dr. by the electrical contractor. The electrical contractor must call the Electrical Inspector when the current transformers (CTs) and potential transformers (PTs) have been installed. It may take up to 5 working days for Manitoba Hydro staff to install the meter and wire the transformer.

2. INTRODUCTION

- 2.1 This Standard is a publication of Manitoba Hydro for use by its customers and others concerned with revenue metering installations within the Manitoba Hydro service area.
- 2.2 The information in this Standard supersedes all information previously published in the Manitoba Hydro Customer Metering Standards issued May 1, 2004.
- 2.3 Installations other than those listed in this Standard will require written authorization from the **Customer Metering & Electrical Codes Department Manager or designate**.
- 2.4 In addition to the requirements detailed herein, all electrical installations within the Manitoba Hydro Inspection jurisdiction must comply with the current edition of the Manitoba Electrical Code. For installations within the jurisdiction of the City of Winnipeg Inspection Department, the City of Winnipeg Electrical By-Law shall also apply.
- 2.5 Contact your Manitoba Hydro representative early in the planning stage for any modification or addition to your electrical system including increased load.

3. DEFINITIONS

For the purpose of correct interpretation, certain terms have been defined and where such terms appear throughout this Standard, they shall be understood to have the meaning as follows:

Approved - As applied to electrical equipment - Approved in accordance with the Manitoba Electrical Code.

Compartments - Separate compartments are required for the following switchgear

- a) Incoming cable termination
- b) Circuit breakers
- c) Voltage transformers
- d) Current transformers
- e) Load-break switches and fuses combination
- f) Group-operated isolation disconnect

The compartment walls shall be constructed of sheet steel barriers to prevent the passage of ionized gases into adjacent compartments. Individually hinge front and rear access doors are required on the switchgear for each of these compartments. The doors shall be equipped with padlock facilities.

Customer Service Termination Enclosure (C.S.T.E.) - An approved outdoor customer service termination enclosure which may or may not contain revenue metering transformers. The CSTE must be installed on the line side of the service box.

Calculated Load - The load on the customer's service is determined by Section 8 of the Manitoba Electrical Code.

Customer - The owner, leaseholder or his/her agent.

Estimated Load - The demand load expressed in kVA on the customer's service as determined by Manitoba Hydro from connected load characteristics and usage.

Finished Grade - Normally a finished ground grade. In instances where there has been an installation of a deck, a landing or other platform accessible to people, the installed platform will be classified as the finished grade where such installations are in the vicinity of Manitoba Hydro plant/equipment.

Intensive livestock operations - Is any livestock operation requiring a Manitoba Government, Department of Agriculture, Technical review as detailed in the Provincial Farm Practice Guidelines?

Lock Box - A box for the housing of the customer's key to allow Manitoba Hydro entry into normally locked rooms containing Manitoba Hydro owned metering equipment.

Meter Enclosure - An approved cabinet for enclosing revenue metering devices associated with metering transformers.

Metering Facility- Any meter socket, open meter loop, metering transformer compartment, meter enclosure and transformer rated meter mounting device.

Meter Pulse - A transformer-type meter fitted with a device to initiate pulses according to the load. These pulses are recorded and processed to obtain billing results.

Self-Contained Meter - A meter designed to be connected directly into an electric circuit.

Meter Socket – An approved meter mounting base for the purpose of installing a socket type meter.

Transformer-Type Meter - Means a meter in conjunction with metering transformers.

Metering Transformer –A high accuracy current transformer (CT) or potential transformer (PT) which reproduces in its secondary circuit, in a definite and known proportion, the current or voltage of its primary circuit.

Metering Transformer Enclosure/Compartment - A separate enclosure or compartment for the housing of metering transformers.

Poly-phase –Electrical system that uses or generates two or more alternating voltages of the same frequency but differing in phase angle

Switchgear Assemblies - An approved dead-front indoor enclosed and outdoor enclosed assemblies of switchgear devices.

Transformer Cabinet (CT Cabinet): An approved indoor/outdoor enclosure designed to enclose revenue metering transformers. The Transformer Cabinet must be installed on the load side of the service box.

Transformer Rated Meter Mounting Device – A self-contained device that incorporates an instrument transformer and meter mounting device.

Underground Secondary Network System - A system of underground distribution feeders and transformers strategically located to supply a secondary grid at 125Y216V within the Winnipeg Central District. This system allows for a multiple power supply to any given point connected to the secondary grid.

Voltage, Low - A voltage of 750 volts or less.

Voltage, High - A voltage over 750 volts.

4. GENERAL METERING REQUIREMENTS

4.1 Federal Requirements Applicable To Suppliers of Electrical Energy

Manitoba Hydro, as a supplier of electricity, must meet the following legal requirements.

- i) Registration with Measurement Canada.
- ii) Presentation of all meters to Measurement Canada or a Measurement Canada Accredited Meter Verifier/Meter Service Organization for inspection, accuracy tests and sealing, prior to initial installation.
- iii) Periodic servicing, calibration and re-certification of all meters according to schedules defined in the Electricity and Gas Inspection Act and Regulations.

4.1.1 The following outlined text reflects relevant data from Measurement Canada's Bulletin GEN-18-E that Manitoba Hydro customers should be familiar with.

Attribution and Use of Revenue Meters Under the *Electricity and Gas Inspection Act*

Background

Recent events involving the supply and metering of electricity for resale to clients by property developers, property managers and realty companies and the use in these metering applications of either unapproved electricity metering devices or approved metering devices that have not been verified has underscored the need for clarification to the electricity industry with respect to the metering applications that warrant attribution as revenue metering and with respect to the statutes that are applicable when revenue meters are used.

This bulletin delineates the pertinent references in the [*Electricity and Gas Inspection Act*](#) (the Act) that apply with regard to the attribution and use of revenue meters and suppliers of electricity.

Interpretation**1. Provisions for Suppliers of Electricity**

1.1 In accordance with [section 6](#) of the Act, no person (or corporation) can undertake to supply electricity or gas on the basis of measurement unless he holds a valid certificate of registration from the director appointed pursuant to the [Act](#). Any person (or corporation) that contravenes this provision of the Act is guilty of an offence and is subject to prosecution on summary conviction or indictment under [section 33](#) of the Act.

1.2 In accordance with [subsection 16\(2\)](#) and [section 18](#) of the Act, all suppliers (contractors) are obligated to keep detailed records for each revenue meter in their system in a manner that is in accordance with the Regulations and all such records shall be made readily available for examination by Measurement Canada representatives. Any person (or corporation) that contravenes these provision of the Act is guilty of an offence under [section 33](#) of the Act and is subject to prosecution on summary conviction or indictment under [sections 33](#) and [34](#) of the Act.

2. Attribution of Revenue Meters.

In accordance with [section 2](#) and [subsection 9\(1\)](#) of the Act, any meter used for the purpose of establishing the basis of a charge for a supply of electricity or gas is a revenue meter and as such includes any sub-metering device or any apportionment metering device used to determine the electricity or gas charges to individual tenants in a multiple-client realty complex. Only meters that are used solely for non-billing applications such as load monitoring, energy management, Manitoba Hydro bill reconciliation ("check" metering), do not fall under the scope of the revenue meter classification, provided in each case that no assessment of electricity charges whatsoever is based on the meter.

3. Provisions for Use of Revenue Meters

3.1 In accordance with [subsections 9\(1\)](#) and [9\(4\)](#) of the Act, all revenue meters must belong to a type approved by the director and each approved meter must be subsequently verified and sealed in accordance with the Act and regulations prior to being put in service.

3.2 In cases where Measurement Canada proceeds with an enforcement action when [subsection 9\(1\)](#) or [9\(4\)](#) of the Act has been contravened, Measurement Canada will, as a first step, formally inform the affected parties (consumers) of the illegal nature of their metering and of their rights as consumers under the Act.

3.3 Any supplier of electricity or gas that either uses or causes to be used a meter that contravenes the provisions of [subsections 9\(1\)](#) or [9\(4\)](#) of the Act is guilty of an offence and is subject to the enforcement provisions under the [Act](#) which includes prosecution on summary conviction or indictment of the offending contractor or corporation and required removal of all non-conforming meters.

4. For additional information, please contact the Program Officer responsible for electricity or gas measurement. Further information regarding Measurement Canada and its programs can be found on the Measurement Canada internet site at <http://mc.ic.gc.ca>.

For detailed information contact the district office of **Measurement Canada:**
4th Flr. - 400 St. Mary Avenue
Winnipeg, MB R3C 4K5
Telephone Number: (204) 983-3804, fax Number: (204) 983-3159

4.2 Provision of Metering Facilities

- 4.2.1 For a low voltage service up to and including 200 amperes, Manitoba Hydro will provide and install a self-contained meter.
- 4.2.2 For a service over 200 amperes, Manitoba Hydro will provide and install a transformer type meter.
- 4.2.3 Single and multiple occupancy structures shall be limited to one meter of the same voltage service supply to each individual addressed unit.
- 4.2.4 Multiple occupancy structures shall be limited to one meter of the same voltage service supply for public area load.
- 4.2.5 Where a Power Quality Meter is required by Manitoba Hydro or requested by the customer, the customer shall provide provision for future capability of a **dedicated** telephone facility (RJ-11) within the meter enclosure. A 1" conduit shall be installed between the meter cabinet to the communication room. A twisted shielded 6 pair communication cable, shall be installed which is suitable for the location and meets the requirements of the Manitoba Electrical Code.
- 4.2.6 The customer shall normally provide and install self-contained meter sockets, metering transformer enclosures, meter enclosures and associated raceways and fittings.
- 4.2.6.1 For low voltage metering exceeding 200 amperes and not utilizing a transformer rated meter mounting device, (see Definition) the customer shall supply and install a remote metering enclosure as per 6.8
- 4.2.7 All enclosures, raceways and fittings shall be installed in accordance with the

current edition of the Manitoba Electrical Code.

4.2.8 Interconnection between the meter socket or meter enclosure and the metering transformer enclosure shall be a minimum distance of 150 mm from both sides of the meter enclosure. Rigid conduit or EMT to be 35 mm, maximum distance 3 m, and not have more than equivalent of three (3) 90 degree bends.

4.2.9 Any deviation will require special permission in writing from the Customer Metering & Electrical Codes Department Manager or designate.

4.3 Sealing of Metering Facilities

4.3.1 There shall be padlock facilities for all covers or doors which enclose revenue metering equipment and associated wiring.

4.3.2 Sealing provision shall incorporate at least one sealing screw except where padlocking facilities are required by Manitoba Hydro.

4.3.3 Meter rings shall be of the screw type with provision for sealing.

4.3.4 Seals shall not be removed without authorization from Manitoba Hydro.

4.4 Provision for Metering

4.4.1 All power supplied by Manitoba Hydro shall be metered except where otherwise specifically permitted. The meters installed by Manitoba Hydro have been approved, tested, and sealed by Measurement Canada or a Measurement Canada Accredited Meter Verifier.

4.4.2 Provisions shall be made by the Customer to accommodate Manitoba Hydro metering equipment at the supply voltage provided by the Manitoba Hydro.

4.4.2.1 Where the Customer provides the service transformation, the metering equipment shall be on the Manitoba Hydro supply side of the transformation, except for residential apartments.

4.4.2.2 Where Manitoba Hydro provides the service transformer, the metering equipment shall be on the load side of the transformation.

4.4.3 Type and location of metering shall be as specified by Manitoba Hydro

4.4.3.1 Metering facilities shall be dedicated to Manitoba Hydro equipment.

4.4.4 Metering facilities for intensive livestock operations and chemical / fertilizer plants shall be located outside the Bio-security zone or 30 m from all livestock buildings and lagoons, whichever is the greater distance.

4.5 Refusal of Connection

4.5.1 Manitoba Hydro reserves the right to refuse electrical connection to any installation not conforming to the requirements of this standard.

4.6 Customer Care of Metering Facilities

4.6.1 Manitoba Hydro owned metering facilities located on a customer's premises are in the care of the customer who may be held responsible for damage, loss, or destruction of the facilities due to vandalism or other acts not deemed to be an Act of God (e.g., fire, flood).

4.6.2 Where damage to Manitoba Hydro owned metering facilities is deemed to be the responsibility of the customer, the customer shall pay Manitoba Hydro on demand

an amount equal to the cost of repairing or replacing it, as determined by Manitoba Hydro.

- 4.6.3 Where metering equipment is tampered with or removed without authorization, the customer may be billed for the estimated non-recorded consumption.

4.7 Access to Metering Equipment

- 4.7.1 Manitoba Hydro employees and agents shall have access to all metering equipment for the purpose of changing, testing and reading equipment. Where access to the metering equipment is not possible due to locked doors, Manitoba Hydro may request a key for this purpose. A lock-box to keep the key on site may be installed by Manitoba Hydro.

- 4.7.2 A minimum working space of 1 m with secure footing shall be provided and maintained in front of the metering equipment.

- 4.7.3 Meter sockets shall be installed in a readily accessible location acceptable to Manitoba Hydro

- 4.7.4 Metering facilities shall be located on the exterior of single or multi-dwelling units, summer cottages, row housing and buildings such as churches, rinks, sewage treatment or lift stations, and seasonal commercial buildings. Except for buildings that require the meter to be indoors due to theft, vandalism and accessibility.

- 4.7.5 All meter sockets in or on a building shall be grouped in a location acceptable to Manitoba Hydro. Any deviation will require special permission in writing from the Customer Metering & Electrical Codes Department Manager or designate.

4.8 Service Voltages

4.8.1 Low Voltage

Service voltages normally available to Manitoba Hydro customers are as follows:

- 120/240V 1 Ø 3w
- 120/208V 3 Ø 4w
- 347/600V 3 Ø 4w
- 120/208V poly-phase 3w *
- 125/216V poly-phase 3w * (Underground Secondary Network Area)
- 125/216V 3 Ø 4w (Underground Secondary Network Area)

Note: * Two line conductors and a neutral from a 3 Ø system.

4.8.2 Underground Secondary Network Area (See Map Page 13)

4.8.2.1 The following low voltage services are normally available within the Underground Secondary Network Area:

- 125/216V poly-phase 3w, maximum 100A. Two phases and the neutral from the three-phase, four wire system. Requires a 5-jaw meter socket base (box-type) installed on the **load** side of the main switch.
- 125/216V 3Ø 4w, maximum demand 500 kVA. **Metering facilities shall be installed on the load side of the main switch.**

4.8.2.2 Manitoba Hydro reserves the right to supply service at 347/600V or another suitable voltage as determined by Manitoba Hydro.

4.8.2.3 No new (or modifications to existing) 240V 3Ø 3w or 600V 3Ø 3w services will be allowed in the Underground Secondary Network Area.

4.8.2.4 Service entrance equipment consisting of a circuit breaker or circuit

breaker-fuse combination with a rupturing capacity of at least 100,000 amperes RMS symmetrical or a disconnecting switch equipped with Class J, Form 1 high rupturing capacity fuses is required for all new services or modifications to existing services within the Underground Secondary Network Area.

- 4.8.2.5 Service points and service entrance equipment location information / requirements for the underground network system, can be obtained from the **Winnipeg Central Department CSC Office**.

Note: All new (or modifications to existing) services within the Underground Secondary Network Area must be wired to suit the requirements of the Network System whether or not they can be supplied from the Network System at the time of installation/modification.



IMPORTANT: TO DETERMINE SERVICE AVAILABILITY AND/OR SPECIAL REQUIREMENTS IN OR NEAR THE UNDERGROUND SECONDARY NETWORK BOUNDARY, PLEASE CONTACT MANITOBA HYDRO'S WINNIPEG CENTRAL DISTRICT OFFICE.



Underground Secondary Network Area Map

4.8.3 High Voltage

4.8.3.1 Manitoba Hydro will normally supply the following voltages subject to the voltage being available in the locale (Manitoba Hydro must be contacted regarding availability):

- 2400/4160V
- 4800/8320V
- 7200/12470V
- 14400/24900V
- 33000V delta
- 66000V delta
- 66000/114300V
- 79700/138000V

4.9 Customer Instrumentation and Load Management

4.9.1 Customer instrumentation including energy management circuits and relays, must be connected on the load side of Manitoba Hydro revenue metering. **Customer owned circuits shall not be connected into Manitoba Hydro revenue metering circuits and all customer owned equipment must be mounted independent of the cabinets reserved for Manitoba Hydro.**

4.9.2 Manitoba Hydro may supply signals in the form of energy pulses for customer use as an energy management tool.

Note: An End-of-Interval (EOI) demand timing pulse is not allowed.

4.9.3 Where the customer requires energy pulses from Manitoba Hydro's metering facilities, they must complete eForm 1958/f Manitoba Hydro Access to Meter and/or Metering Potential and Current Transformers Release and Indemnity. A capital contribution will also be required.

4.9.3.1 These pulses will be supplied through an isolating relay. Incremental costs incurred by Manitoba Hydro for providing these signals will be the

responsibility of the customer. The customer shall supply and install a 6" x 6" x 4" junction box and minimum 14mm conduit as close as practical to the meter enclosure.

4.9.3.2 Manitoba Hydro will install the output wires from the isolating relay to an externally mounted terminal block in the junction box supplied and installed by the customer.

4.9.4 Any deviation will require special permission in writing from the Customer Metering & Electrical Code Department Manager or designate.

4.10 Metering Equipment Drawing

4.10.1 Drawings or plans for metering equipment shall be submitted to Manitoba Hydro Customer Metering & Electrical Codes Dept. for acceptance where:

- multiple metering centers are to be installed;
- the ampacity of the customer's service exceeds 200 amperes;
- the supply service is poly-phase, and the calculated demand exceeds 50 kVA;
- the supply voltage exceeds 750 volts; or
- prescribed by Manitoba Hydro.

4.10.2 Drawings shall include the following information:

- connected load and calculated load (kW or kVA) for each meter;
- supply voltage;
- location and mounting height of metering transformer enclosures;
- location and mounting height of meter(s) or metering enclosures;
- distance between metering transformer enclosure(s)/compartment(s) and remote meter(s);
- customer service termination enclosure/metering transformer enclosure dimensions;
- installation of a CSTE wall, pad, or structure mounted;
- location of equipment and conductors on the line side of the metering facilities;

- manufacturer's switchgear drawing; &
- schematic of proposed metering layout.

4.11 Metering Transformers

- 4.11.1 Where the customer's service **ampacity** exceeds 200 amperes, current transformers (CTs) will be utilized.
- 4.11.2 Where the customer's service potential exceeds 240 volts, potential transformers (PTs) will be utilized.
- 4.11.3 The customer is responsible for the installation of all metering transformers.
- 4.11.4 The customer is responsible for the supply and installation of all wire connectors to facilitate connection of conductors.
- 4.11.5 Manitoba Hydro will be responsible for the installation of secondary wiring for metering transformers.
- 4.11.6 The number and type of metering transformers will be as specified in Table 1.
- 4.11.7 Metering transformers shall be mounted in an arrangement acceptable to Manitoba Hydro, be easily installed and removed, and have their terminals readily accessible.
- 4.11.8 Potential transformers (PTs) shall be connected on the line side of the current transformers (CTs).
- 4.11.9 Interconnection between the metering transformer compartment and the meter enclosure shall be a minimum distance of 150 mm from both sides of the meter

enclosure. Rigid conduit or EMT to be 35 mm, for a maximum distance of 3 m, and not have more than equivalent of three (3) 90 degree bends.

4.12 Multiple Metered Buildings

4.12.1 In multiple metered buildings, main switches and related metering equipment must be clearly and permanently identified indicating their area coverage. Suite/Unit doors are also to be clearly and permanently identified. The **interior and exterior** of the meter stack and the interior of individual load centres shall be permanently identified. The property owner will be responsible to reconfirm correct meter area coverage should a discrepancy arise between the actual identification of the areas,

Note: Splitters, tap boxes, wire ways, etc., installed on the line side of metering equipment must be complete with sealing/padlock facilities approved by Manitoba
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5. LOW VOLTAGE – 200 AMPERES OR LESS

5.1 Limits

- 5.1.1 Load Limits - The maximum calculated non-continuous load for a self-contained meter is 200 amperes per phase.
- 5.1.2 Voltage Limits - The maximum voltage limit for a self-contained meter is 600 volts phase to phase.

5.2 Provision of Meter Sockets

- 5.2.1 The customer is required to supply and install an approved meter socket complete with a screw type sealing ring, for each service 200 amperes and less.
- 5.2.2 Sockets with current bypass switches will not be accepted.
- 5.2.3 A single phase service served from an underground supply system by Manitoba Hydro (not including the proposed underground secondary network system) requires a minimum 200 Amp meter socket, designed for connection to an underground supply system and be equipped with studs on the line side to provide for connection of compression type wire connectors.

5.3 Location of Meter Sockets

- 5.3.1 Multiple metering centers shall be identified by address or unit number with a permanent legible label on all meter sockets and disconnects. This identification shall also be provided on the non-removable portion of the meter sockets see (4.12).

- 5.3.2 Where the supply voltage is less than 300 volts between conductors, meter sockets shall be installed on the line side of the service box or feeder disconnecting means, except that in multiple metering centers, meter sockets may be on the load or line side of the feeder disconnecting means.
- 5.3.3 Meter sockets shall be installed on the load side of the customer's main service box in the proposed Underground Secondary Network System.
- 5.3.4 Where the supply voltage exceeds 300 volts between conductors, meter sockets shall be located on the load side of the service box or feeder disconnecting means.
- 5.3.5 Meter sockets shall be mounted level on the horizontal and vertical planes. In the Winnipeg Central Department CSC area, meter sockets shall be located on the sidewalk side of the premises (buildings with sloping sides require special provisions).
- 5.3.6 Residential (Single Detached) Services
For various reasons, existing meter and service point of attachment locations may no longer be acceptable. Therefore, prior to commencing the installation or alteration of any residential service, it is imperative that the customer or contractor confirm acceptability of the service point of attachment and meter location. **To arrange for confirmation, contact the nearest Manitoba Hydro Customer Service Center (CSC).**
- 5.3.7 For residential premises where the metering facility is a meter loop (for bottom connected-type meters) and where an alteration is being made to the load center, a meter socket base must be installed in a location acceptable to Manitoba Hydro.

- 5.3.8 Where the existing metering facilities are located within the building and where the service conduit or metering facility is being replaced, relocated or altered in any way, a meter socket base shall be installed on the exterior of the building in a location acceptable to Manitoba Hydro. In such cases where range and lighting loads are metered separately, the two loads shall be supplied through one meter only. The service point of attachment must also be acceptable to Manitoba Hydro. All existing electrical services and meters will be removed.
- 5.3.9 Where the building is multiple metered and the service conduit or metering facility is being replaced, relocated or altered in any way, a single meter socket base shall be installed for the individual unit loads. These meter sockets shall be grouped in a location acceptable to Manitoba Hydro. In such cases where range and lighting loads are metered separately, two loads shall be supplied through one meter only. All existing electrical service and meters will be removed.
- 5.3.10 Where an existing single occupancy structure has two or more meters of the same voltage service supply and the service conduit or metering facility is being replaced, relocated or altered in any way, a single meter socket base shall be installed for the new and/or existing loads. The single meter socket base shall be installed in accordance with this standard. All existing electrical service and meters will be removed.
- 5.3.11 Multiple metered structures shall be limited to one meter of the same voltage service supply to each individual addressed unit.
- 5.3.12 All metering equipment disconnected due to electrical alterations is to be left in a safe location near the new load center and Manitoba Hydro should be contacted for pick up. Lost or damaged equipment will be billed to the customer.

5.4 Meter Socket Heights

- 5.4.1 Mounting height measurements for meter sockets shall be taken to the center of the meter socket.
- 5.4.2 Meter sockets on the exterior of a building or structure shall be installed not less than 1.2m and not more than 1.8m above finished grade or deck.
- 5.4.3 Meter sockets on mobile home pedestals or similar equipment shall be installed not less than 1m and not more than 1.8 m above finished grade.
- 5.4.4 Meter sockets inside a building shall be installed not less than 1.2 m and not more than 1.8m above the floor, except that meter sockets which are a part of a multiple metering center in a dedicated electrical room may be installed not less than 0.5 m above the floor.

5.5 Connection of Meter Sockets

- 5.5.1 The customer shall be responsible to connect all customer owned conductors within the meter socket.
- 5.5.2 Where the service supply is from a grounded system, the service neutral conductor shall be connected to the neutral terminal inside the meter socket.
- 5.5.3 Where a meter socket is located on the load side of a service box the neutral terminal or block shall be insulated from ground.
- 5.5.4 Depending on the supply voltage, the jaw arrangement of meter sockets shall meet the requirements of Figures 1 to 4.

- 5.5.5 Five and seven jaw meter sockets shall be of the box type.
- 5.5.6 Line and neutral connections in self-contained meter sockets shall be those specified in Figures 1 to 4.
- 5.5.7 The 5th and 6th jaw terminal in a 5 or 7 jaw meter socket shall be permitted to be interconnected to an insulated terminal block within the meter socket by a minimum #10 insulated conductor.
- 5.5.8 The B phase or neutral connection shall be made in the meter socket.

6. LOW VOLTAGE – OVER 200 AMPERES

6.1 Provision of Metering Facilities

- 6.1.1 The customer shall provide and install metering transformer enclosures, meter enclosures, and associated raceways and fittings.
- 6.1.2 Customers shall be responsible for the supply and installation of a raceway and communication cable when required.
- 6.1.3 The customer shall be responsible for the supply and installation of all wire connectors to facilitate connection of conductors, except where Manitoba Hydro supply extends into the metering enclosure.
- 6.1.4 The customer shall be responsible for the installation of all Manitoba Hydro metering transformers.
- 6.1.5 For mounting of metering transformer, a minimum # 10 self tapping screw may be used for the ready replacement of the transformers (see Drawing # 1).
- 6.1.6 For single phase, maximum 400 Amp service, the customer shall supply and install an approved transformer rated meter-mounting device. The device shall incorporate a 4 jaw skeleton meter base, complete with current shorting device. Manitoba Hydro will supply metering transformer (s) to be installed by the customer.
- 6.1.7 For a single phase installation that utilizes a CSTE, customer shall supply and install a metering enclosure as per 6.8.
- 6.1.8 Manitoba Hydro will be responsible for the installation of the secondary wiring

for metering transformers.

- 6.1.9 Where ever a standby generator has been installed, the metering shall be isolated from the standby supply.

6.2 Current Transformers (CTs)

- 6.2.1 Current transformer (CT) primary connections shall be secured in an approved manner and the conductors shall be formed and supported so that no tension is applied to the current transformers. The maximum conductor size to be terminated directly onto the current transformer (CT) bus bars shall not exceed 2 - #250 kcmil copper or 2 - #350 kcmil aluminum.
- 6.2.2 Current transformers (CTs) of the bar type will be utilized where the estimated load is not greater than 1000 amperes.
- 6.2.3 Current transformer (CT) bus bars must not be drilled or altered in any physical shape.
- 6.2.4 Where the customer's service ampacity exceeds 400 amperes and the transformer enclosure employs bus bars to connect the transformers, the bus bars shall be manufactured to receive both 200 ampere and 1000 ampere class current transformers (CTs) (see Drawing #2).
- 6.2.5 Window type current transformers (CTs) will be utilized where the estimated load exceeds 1000 amperes. For the size of the window openings (see Table 2).
- 6.2.6 Where window type transformers are to be installed, the bus shall be sectionalized, with removable links bolted on each side of the current transformers (CTs).

6.2.7 Where window type transformers are to be installed, each bus bar and neutral must be drilled and tapped for 10/32” screws on the line-side of the current transformer (CT).

6.2.8 The number and type of current transformers(CTs) will be as specified in Table 1.

6.3 Potential Transformers (PTs)

6.3.1 Where the supply voltage exceeds 300 volts between phases and the customer’s service ampacity exceeds 200 amperes, potential transformers (PTs) will be utilized.

6.4 Metering Transformer Enclosures

6.4.1 Metering transformer enclosures shall be dedicated to Manitoba Hydro metering equipment.

6.4.2 Metering transformer enclosures shall be constructed in accordance with the current CSA Standard 22.2 No. 40 and be suitable for the location (see Appendix A).

6.4.3 Indoor metering transformer enclosures shall be installed on the load side of the service box or feeder disconnecting means and be located within sight of and a maximum distance of 9 m to the disconnecting device.

6.4.4 Indoor metering transformer enclosures shall be installed at a minimum of 300 mm to a maximum height of 1.2 m to the bottom of the enclosure, from the finished floor level.

- 6.4.5 Where the supply voltage is from a grounded system, all neutral conductor(s) shall be connected to an insulated terminal block complete with a 30 ampere wire connector in the metering transformer enclosure. New designs for a metering transformer enclosure must incorporate the system neutral conductor. For current designs, where the neutral conductor does not pass through the metering transformer enclosure, a 25 mm x 3 mm copper bus shall extend from the system neutral into the metering transformer enclosure and terminate on an insulated terminal block complete with a 30 ampere screw lug.
- 6.4.6 Where the metering is supplied from an ungrounded delta system, the B or center phase conductor(s) shall be connected to an insulated terminal block complete with a 30 ampere wire connector.
- 6.4.7 Any deviation will require special permission in writing from the Customer Metering & Electrical Codes Department Manager or designate.

6.5 Outdoor Located Metering Transformer Enclosures

- 6.5.1 Metering transformers shall be permitted to be installed on the line side of the consumer's service disconnecting means provided:
- The transformers are located outdoors; and
 - The transformers are located in a suitable wall, structure or pad mounted weatherproof enclosure; or a single phase transformer rated meter mounting device.
- 6.5.2 The maximum conductor size to be terminated directly onto the current transformer (CT) bus bars shall not exceed 2 - #250 kcmil copper or 2 - #350 kcmil aluminum.
- 6.5.3 Where more than two line or load conductors per phase are required to be terminated in a metering transformer enclosure, suitable factory installed

termination facilities must be provided to allow removal of the transformers without disconnecting line and load conductors.

6.5.4 Bus bars shall be sized for the maximum rating of the equipment.

6.5.5 C.S.T.E.

An approved outdoor weather-proof cubicle/metering pedestal may be installed on the line side of the main switch by the customer at a mutually acceptable location to accommodate the revenue metering transformers and meter. The cubicle/metering pedestal must be for the sole use of Manitoba Hydro for revenue metering. The cubicle/pedestal door shall be equipped with three point latching. A minimum of 35 mm raceway shall be provided between the meter enclosure and the Manitoba Hydro compartment.

Note: There shall be no entry or exit from the top of an outdoor enclosure.

The CSTE (wall or structure mounted) shall be installed not less than 300 mm or more than 1.2 m from finished floor / grade or deck to the bottom of the cabinet.

6.5.6 The CSTE (on a concrete or fiberglass pad) shall be installed a minimum of 300 mm above finished grade.

6.6 Metering Transformer Enclosure Size

6.6.1 1 \emptyset < or = 400A- 750 mm (30") x 750 mm (30") x 250 mm (10") minimum dimensions

6.6.2 1 \emptyset > 400A – 900 mm (36") x 900 mm (36") x 300 mm (12") minimum dimensions

6.6.3 3 \emptyset - 900 mm (36") x 900 mm (36") x 300 mm (12") minimum dimensions

6.7 Pole Mounted Metering

- 6.7.1 Manitoba Hydro does not allow low voltage (<750V) pole mounted metering on new installations.

6.8 Meter Enclosures

- 6.8.1 Customers shall supply and install a meter enclosure suitable for the location.
- 6.8.2 A suitable meter enclosure complete with a viewing window shall have minimum dimensions of 850 mm (32") x 360 mm (14") x 305 mm (12") enclosure and shall comply with the construction requirements of the current CSA Standard C22.2 No. 40 (see Drawing #3) unless located inside a switchgear.
- 6.8.3 Meter enclosures shall normally be installed at a height not less than 1m or not more than 1.2 m above grade (measurement to bottom of enclosure).
- 6.8.4 Meter enclosures installed on a pad mounted metering transformer enclosure shall be permitted to be lower than 1 m provided:
- the enclosure is protected from mechanical damage; and
 - the enclosure has a minimum clearance of 300 mm from bottom of the CSTE.

- 6.8.5 There shall be no entry or exit from the top of any meter enclosure.

6.9 Transformer rated meter mounting devices

- 6.9.1 Mounting height measurements shall be taken to the center of the meter socket.
- 6.9.2 Transformer rated meter mounting device shall be installed not less than 1.5 m and not more than 1.8 m from finished floor / grade or deck..

7. METERING: LOW VOLTAGE SWITCHGEAR ASSEMBLIES

7.1 Sealing of Metering Facilities

- 7.1.1 There shall be padlock facilities for all covers and doors enclosing revenue metering equipment and associated wiring.
- 7.1.2 Sealing provision shall incorporate at least one sealing screw except where padlocking facilities are required by Manitoba Hydro.
- 7.1.3 Meter rings shall be of the screw type with provision for sealing.
- 7.1.4 Seals shall not be removed without authorization from Manitoba Hydro.

7.2 Provision of Meter Facilities

- 7.2.1 For a service over 200 amperes, Manitoba Hydro will provide and install a transformer type meter.
- 7.2.2 Where a Power Quality Meter is required by Manitoba Hydro or requested by the customer, the customer shall provide provision for future capability of a **dedicated** telephone facility (RJ-11) within the meter enclosure. A 1” conduit shall be installed between the meter cabinet to the communication room. A twisted shielded 6 pair communication cable, shall be installed which is suitable for the location and meets the requirements of the Manitoba Electrical Code.
- 7.2.3 The customer shall provide a metering transformer enclosure, meter enclosure and associated raceways and fittings.

7.3 Plans and Specifications

- 7.3.1 Plans and specifications for service and metering equipment shall be submitted to Manitoba Hydro Customer Metering & Electrical Codes Dept.

7.3.2 Where the plans & specifications are acceptable to the Manitoba Hydro Customer Metering & Electrical Codes Dept., metering transformers will be ordered.

7.3.3 Metering transformers and associated equipment may be obtained by prior arrangement:

- in the Winnipeg area - Manitoba Hydro Customer Metering & Electrical Codes Dept; or
- outside of Winnipeg - the local Customer Service Centre (CSC).

7.3.4 Plans and specifications shall include the following information:

- connected load and calculated load (kW or kVA) for each meter;
- supply voltage;
- location and mounting height of metering transformer enclosures;
- location and mounting height of meter(s) or metering enclosures;
- distance between metering transformer enclosure(s)/compartment(s) and remote meter(s);
- customer service termination enclosure/metering transformer enclosure dimensions;
- installation of a CSTE wall, pad, or structure mounted
- location of equipment and conductors on the line side of the metering facilities;
- manufacturer's switchgear drawing; and
- schematic of proposed metering layout.

7.4 Service Voltages, Low Voltage

7.4.1 Manitoba Hydro preferred supply voltages are as follows:

- | | |
|---|-------------------|
| • 120/240V 1 Ø 3w | • 120/208V 3 Ø 4w |
| • 120/208V poly-phase 3w * | • 347/600V 3 Ø 4w |
| • 125/216V poly-phase 3w * (Underground Secondary Network Area) | |
| • 125/216V 3 Ø 4w (Underground Secondary Network Area) | |

* Two line conductors and a neutral from a 3 Ø system.

7.5 Location of Metering Facilities

7.5.1 Metering facilities shall be installed in a readily accessible location, acceptable to Manitoba Hydro.

7.6 Access to Metering Equipment

7.6.1 Manitoba Hydro employees and agents shall have access to all metering equipment for the purpose of changing, testing, inspecting and reading equipment. Where access is not possible to the metering equipment due to locked doors, Manitoba Hydro may request a key for this purpose. A lock-box to keep the key on site may be installed by Manitoba Hydro.

7.7 Current Transformers (CTs)

7.7.1 Current transformer (CT) primary connections shall be properly secured and conductors shall be formed and supported so that no tension is applied to the current transformer. The maximum conductor size to be terminated directly onto the current transformer bus bars shall not exceed 2 - #250 kcmil copper or 2 - #350 kcmil aluminum.

7.7.2 Current transformer (CT) bus bars must not be drilled or altered in any manner.

7.7.3 Current transformers (CT) of the bar type will be utilized where the customer's estimated demand load is not greater than 1,000 amperes (see Table 1).

7.7.4 Where the customer's service ampacity exceeds 400 amperes and the transformer enclosure employs bus bars to connect the transformers, the bus bars shall be manufactured to receive both 200 amperes and 1,000 ampere class current transformers (CTs) (see Drawing #2).

- 7.7.5 Window type current transformers (CTs) will be utilized where the customer's **estimated** load exceeds 1000 amperes. For the size of the window openings (see Table 2).
- 7.7.6 Where window type transformers are to be installed, the bus shall be sectionalized, with removable links bolted on each side of the current transformers (CT's).
- 7.7.7 Where window type transformers are installed, each bus bar and neutral must be drilled and tapped for 10/32" screws on the line side of the current transformer (CT).
- 7.7.8 The number and type of current transformers (CTs) will be specified in Table 1.

7.8 Potential Transformers (PTs)

- 7.8.1 Where the supply voltage exceeds 300 volts between phases and the customer's service ampacity exceeds 200 amperes, potential transformers (PTs) will be utilized.

7.9 Metering Transformer Enclosures/Compartments

- 7.9.1 Where the supply voltage is from a grounded system, all neutral conductors shall be connected to an insulated terminal block complete with a 30 ampere wire connector in the metering transformer enclosure. New designs for a metering transformer enclosure must incorporate the full size neutral conductor. For current designs, where the neutral conductor does not pass through the metering transformer enclosure, a 25 mm x 3 mm copper bus shall extend from the system neutral into the metering transformer enclosure and terminate on an insulated terminal block complete with a 30 ampere screw lug.

- 7.9.2 Where the metering is supplied from an ungrounded delta system, B or center phase conductor(s) shall be connected to an insulated terminal block complete with a 30 ampere wire connector.
- 7.9.3 The metering transformer compartment shall be dedicated to Manitoba Hydro metering equipment.
- 7.9.4 The metering transformer compartment shall comply with the construction requirements of the current CSA Standard C22.2 No. 31 (see Appendix A).
- 7.9.5 The manufacturer shall provide a separate metering compartment for each set of metering transformers for exclusive use of Manitoba Hydro.

7.10 Transformer Type Meters

- 7.10.1 For a service over 200 amperes, Manitoba Hydro will provide and install a transformer type meter.
- 7.10.2 Manitoba Hydro will supply and install the meter and the associated test block(s).
- 7.10.3 Meters shall be located inside a suitable enclosure or switchgear compartment.
- 7.10.4 The meter enclosure shall comply with the construction requirements of the current CSA Standard C22.2 No. 40. See Drawing #3 and #4 for sizes. The size shall be determinate on the meter type.

7.11 Transformer Type Meters Located Outdoors/Indoors

7.11.1 The meter shall be installed at a height not less than 1.2 m and not more than 1.8 m above finished grade (measurement shall be taken to the center of the meter socket).

7.11.2 Meter enclosures shall normally be installed at a height not less than 1m and not more than 1.2 m above finished grade (measurement to bottom of enclosure). Meters shall not be located on metering compartment doors, for any new installations or upgrades.

7.12 Cable or Bus Bars

7.12.1 The manufacturer shall provide all bus bars or cables required for connection of the metering transformers.

7.13 Meter Installations

7.13.1 Where the meter is located inside the switchgear, it will be mounted on a removable panel located a minimum of 280 mm behind the exterior door. The exterior door of the meter compartment shall be hinged and have provision for a padlock and three point latch.

8. METERING: HIGH VOLTAGE

8.1 Service Voltages, High Voltage

8.1.1 High voltage supply is subject to availability in the locale. Manitoba Hydro must be contacted regarding availability. High voltage metering equipment will be provided for preferred supply voltages subject to conditions of this standard.

8.2 Plans and Specifications

8.2.1 Plans and specifications for service and metering equipment shall be submitted to Manitoba Hydro Customer Metering & Electrical Codes Department for acceptance prior to manufacture/construction.

8.2.2 Plans and specifications shall include the following information:

- connected load and calculated load (kW or kVA) on each meter;
- location of equipment and conductors on the line side of the metering facilities;
- manufacturer's switchgear drawing;
- supply voltage; and
- in service date (I.S.D.).

8.3 Location of Metering Facilities

8.3.1 Metering facilities shall be installed in a **readily accessible** location, acceptable to Manitoba Hydro.

8.3.2 Where the customer provides transformation and the voltage is 25 kV or lower, the metering transformers shall be located on the **line side of the first transformation or as otherwise designated by the Customer Metering & Electrical Codes Department.**

- 8.3.3 Where the customer provides transformation and the voltage exceeds 25 kV, Manitoba Hydro will designate the location of the metering transformers when plans are submitted for acceptance.
- 8.3.4 Manitoba Hydro must have reasonable access to revenue metering facilities.
- 8.3.5 Where required to facilitate access to normally lock electrical or metering rooms, Manitoba Hydro may supply a metal lock box to contain the customer's key.
- 8.3.6 The customer shall contact the local Electrical Inspector for installation details.
- 8.3.7 Manitoba Hydro will provide and install all metering transformers, fuses, meters and secondary wiring for pole metering installations.
- 8.3.8 The customer shall provide and install all facilities required to accommodate Manitoba Hydro revenue metering equipment.
- 8.3.9 Manitoba Hydro will require a capital contribution to cover installation costs.
- 8.3.10 Pulse metering may be provided upon request. A customer contribution will be required.

8.4 High Voltage Switchgear Assemblies

- 8.4.1 Provision shall be made for three current transformers (CTs) and three potential transformers (PTs).

- 8.4.2 Potential transformers (PTs) will be supplied with integral fuses mounted on top of the transformers. The manufacturer shall contact Manitoba Hydro to determine primary connections.
- 8.4.3 Potential transformers (PTs) shall be mounted in a separate compartment with means for disconnecting the primary circuit before access can be obtained to either the transformers or primary fuses. Provision shall be made for automatically disconnecting the secondary circuits, before disconnecting the primary circuits. The primary of potential transformers (PTs) shall be positively grounded in the open position.
- 8.4.4 Where a primary neutral connection is required, a neutral disconnect contact similar to that used for the primary phase disconnecting means shall be supplied. The neutral contact must make connection before the phase contacts.
- 8.4.5 Welded nuts or an equivalent mounting method shall be provided for ready replacement of the potential transformers (PTs) without the necessity of reaching behind the mounting pan or frame.
- 8.4.6 The disconnect device shall have 3-point latching system or equivalent as a means of securing it in the closed position.
- 8.4.7 Provision shall be made for padlocking the disconnect device compartment in the closed position.
- 8.4.8 Mounting provision and hardware, 4 wire Y circuits:
- Three potential transformers (PTs), (connected phase to neutral) and three current transformers (CTs) are required.
 - The isolated neutral bus must be extended through the potential transformer (PT) cell.

- The primary phase and neutral connections for the potential transformers (PTs) shall be of the blade and jaw type, with the neutral contact making connection before the phase contacts.
- These potential transformers (PTs) shall be installed complete with integral fuses in a draw-out or tilt-out assembly arranged to isolate and ground the terminals in the draw-out or tilt-out position.
- The assembly shall be installed at a height not to exceed 1m from ground level to the top of the drawer and must provide minimal weight transfer during operation.
- The primary blade shall be supported with an appropriate insulator located between the transformer's primary connection terminal and the primary service conductor designed to minimize mechanical burden on the transformer terminal (see Appendix A).
- The secondary connections shall be a **POSITIVE CONNECTION BLADE TYPE OR PLUG AND SOCKET TYPE** with provisions for automatically disconnecting the secondary circuit, before the primary circuit.

Note: All secondary connections must be reasonably accessible.

8.4.9 Mounting provision and hardware, 3 wire Δ circuits:

- Two potential transformers (PTs), (connected phase to phase) and two current transformers (CTs) are required.
- The primary phase connections for the potential transformers (PTs) shall be of the blade and jaw type.
- These potential transformers (PTs) shall be installed complete with integral fuses in a draw-out or tilt-out assembly arranged to isolate and ground the terminals in the draw-out or tilt-out position.
- The assembly shall be installed at a height not to exceed 1m from ground level to the top of the drawer and must provide minimal weight transfer during

operation.

- The primary blade shall be supported with an appropriate insulator located between the transformer's primary connection terminal and the primary service conductor designed to minimize mechanical burden on the transformer terminal.
- The secondary connections shall be a **POSITIVE CONNECTION BLADE TYPE OR PLUG AND SOCKET TYPE** with provisions for automatically disconnecting the secondary circuit, before the primary circuit.

Note: All secondary connections must be reasonably accessible.

8.4.10 Switchgear Meter Compartment

A switchgear meter compartment shall be lockable with minimum dimensions: 850 mm x 360 mm x 305 mm, complete with viewing window and 19mm plywood backboard suitable for installation of the Manitoba Hydro's revenue meter.

8.5 Remote Transformer Type Meter Installations

8.5.1 This section covers the requirements for remote meter installations required by this standard or as otherwise required by Manitoba Hydro.

8.5.2 Interconnection between the meter enclosure and the metering transformer enclosure shall be a minimum distance of 150 mm from both sides of the meter enclosure. Rigid conduit or EMT to be 35 mm, for a maximum distance of 3m, and not have more than equivalent of three (3) 90 degree bends.

8.5.3 Any deviation will require special permission in writing from the Customer Metering & Electrical Codes Department Manager or designate.

8.5.4 The customer shall provide a suitable enclosure c/w viewing window and dimensions 850 mm x 360 mm x 305 mm for the exclusive use of Manitoba Hydro. The cabinet shall be located in a suitable location and shall be installed not less than 1 m, or more than 1.2 m from finished grade/floor to the bottom of to the cabinet. Manitoba Hydro will provide and install a transformer type meter.

TABLES	
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TABLES

Table 1 – Metering Transformer Requirements (Low Voltage)

SERVICE VOLTAGE	PHASE	WIRE	LOAD IN AMPERES	NO. OF CTs	TYPE OF CTs	NO. VOLTAGE TRANSFORMERS	FIGURE NO.
120/ 240	1	3	201-400	1-3W	Bar	-----	5
120/ 240	1	3	401-1000	2-2 W	Bar	-----	6
120/ 240	1	3	Over 1000	2-2W	Window	-----	----
120- 208 Y	1	3	201-1000	2-2 W	Bar	-----	7
120/ 208 Y	3	4	201/1000	3-2 W	Bar	-----	8
120/208 Y	3	4	Over 1000 To 4000	3-2 W	Window	-----	----
347/600 Y	3	4	201-1000	3-2 W	Bar	3	-----
347/600	3	4	Over 1000 To 4000	3-2 W	Window	3	-----

Table 2 – Window Type Current Transformer Openings

TYPE	RATIO	WINDOW SIZE INCHES	WINDOW SIZE METRIC
WINDOW	600/1200	5.75	14.6 CM
WINDOW	800/1600	5.75	14.6 CM
WINDOW	1500/3000	5.75	14.6 CM
WINDOW	1000/2000	5.75	14.6 CM
WINDOW	2000/4000	5.75	14.6 CM

METER SOCKET CONNECTIONS

Fig. 1 - 120/140 Volt 3-wire, Single Phase

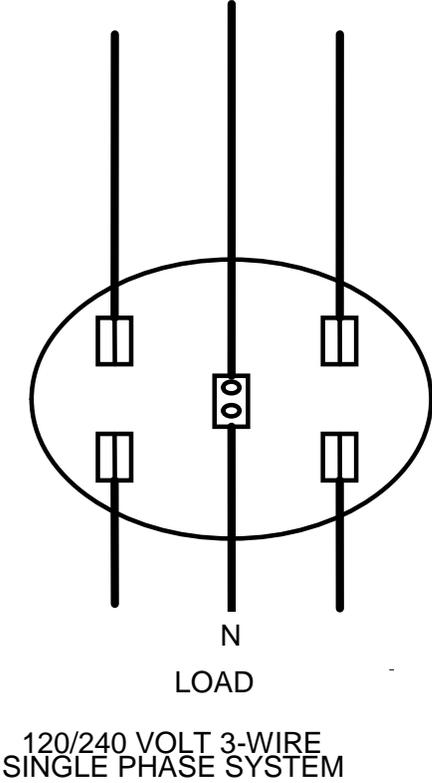


FIG. 1

FIGURES	METER SOCKET CONNECTIONS
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Fig. 2 – 120/208 Volt, 3-wire, Polyphase Network
Fig. 3 – 120/208 Volt, 3-wire, Polyphase Network

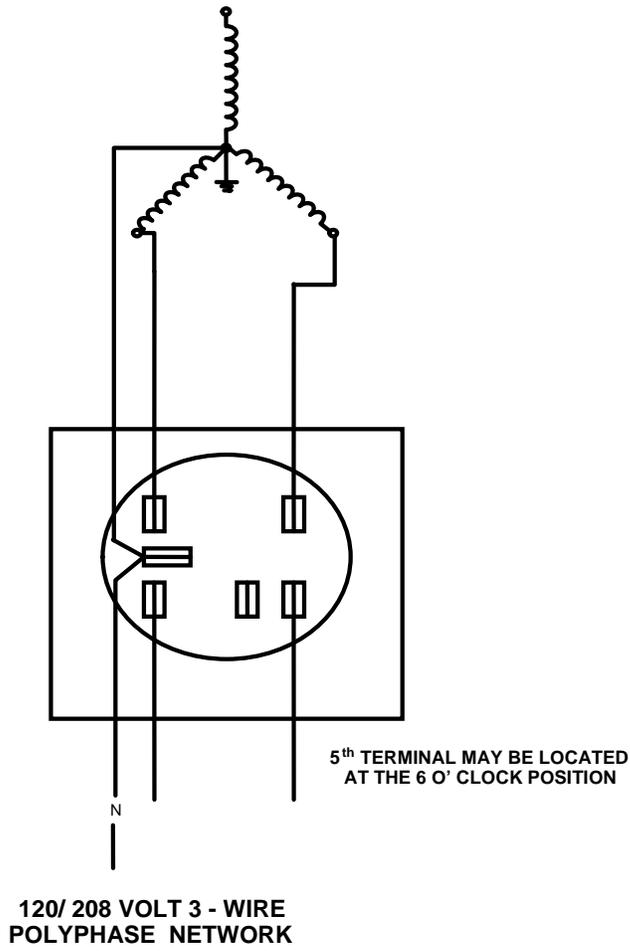


FIG. 2

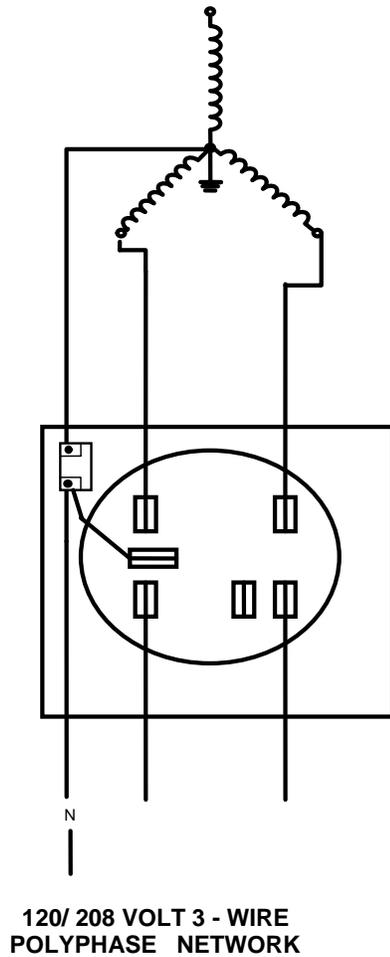
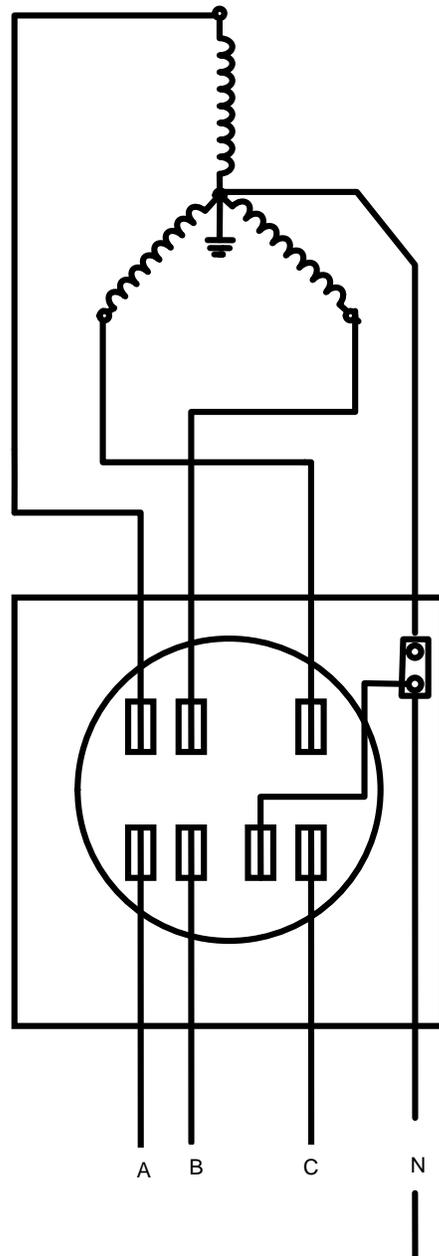


FIG. 3

Fig. 4 – 3-Phase, 4-wire WYE System

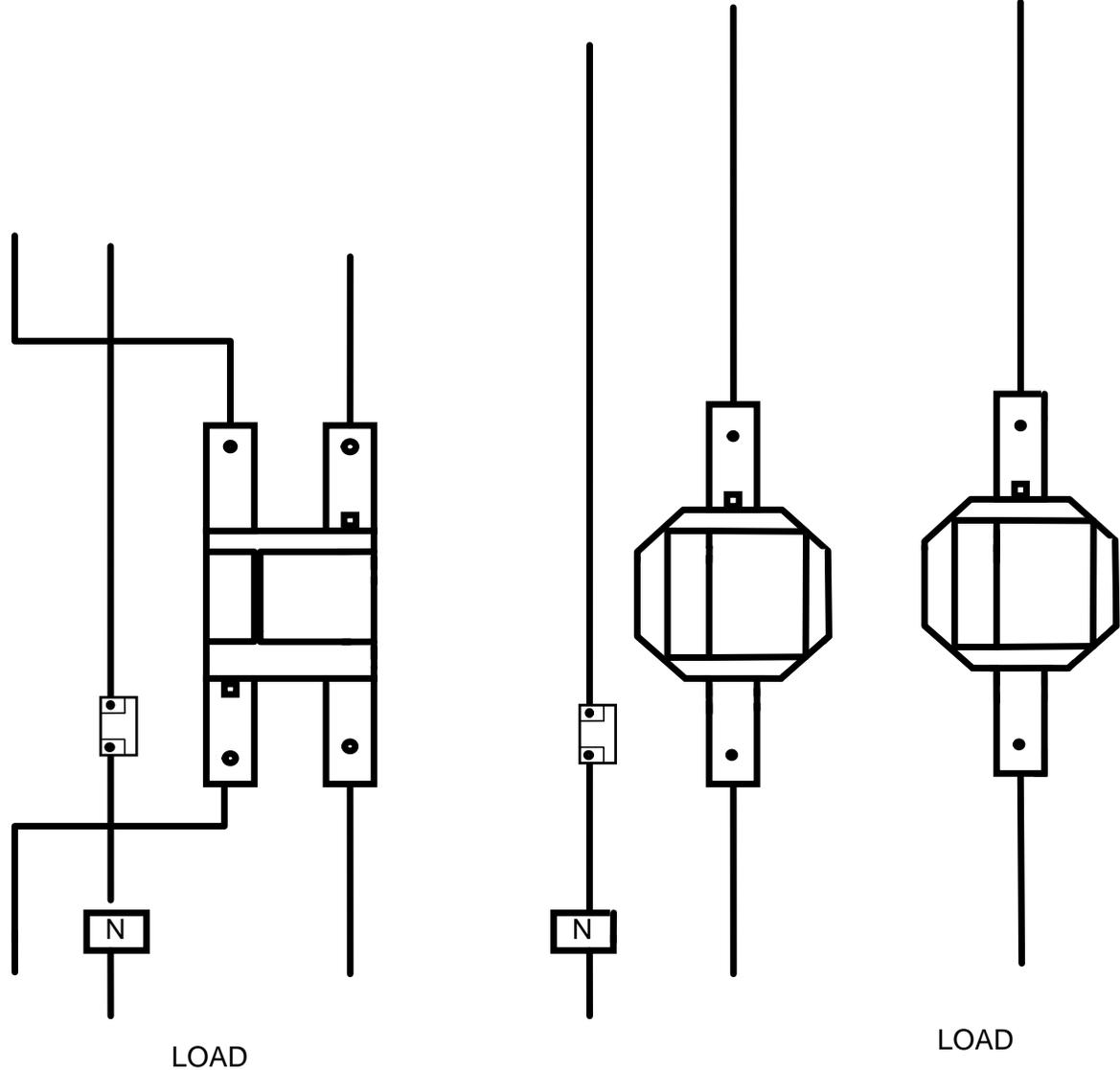


3-PHASE, 4 WIRE
WYE SYSTEM

FIG. 4

METERING TRANSFORMER CONNECTIONS

Fig. 5 – 120/240 Volt, 3-wire, Single Phase
Fig. 6 – 120/240 Volt, 3-wire, Single Phase



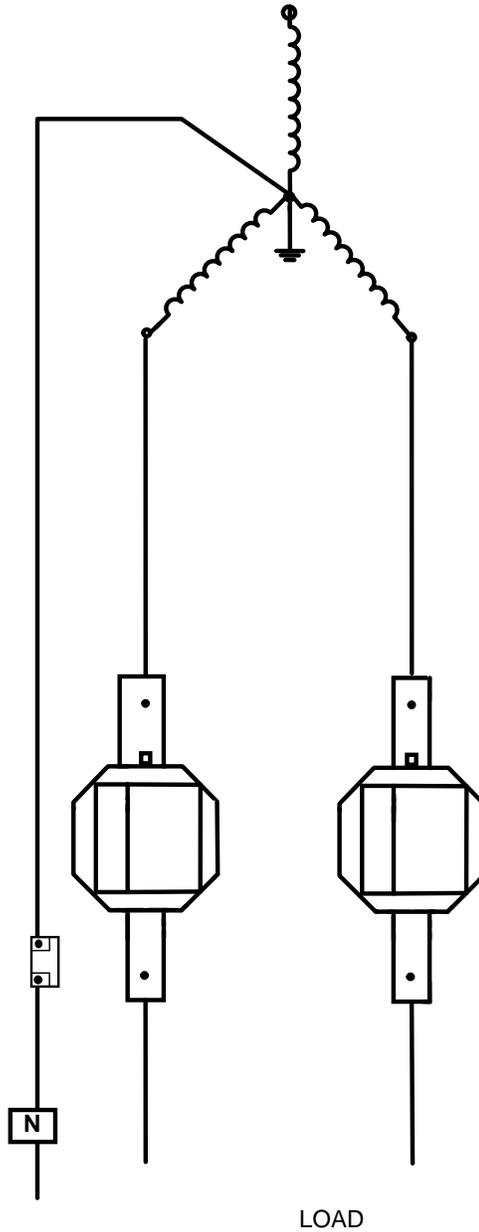
120/240 VOLT 3-WIRE SINGLE PHASE SYSTEM

FIG. 5

120/240 VOLT 3-WIRE SINGLE PHASE SYSTEM

FIG. 6

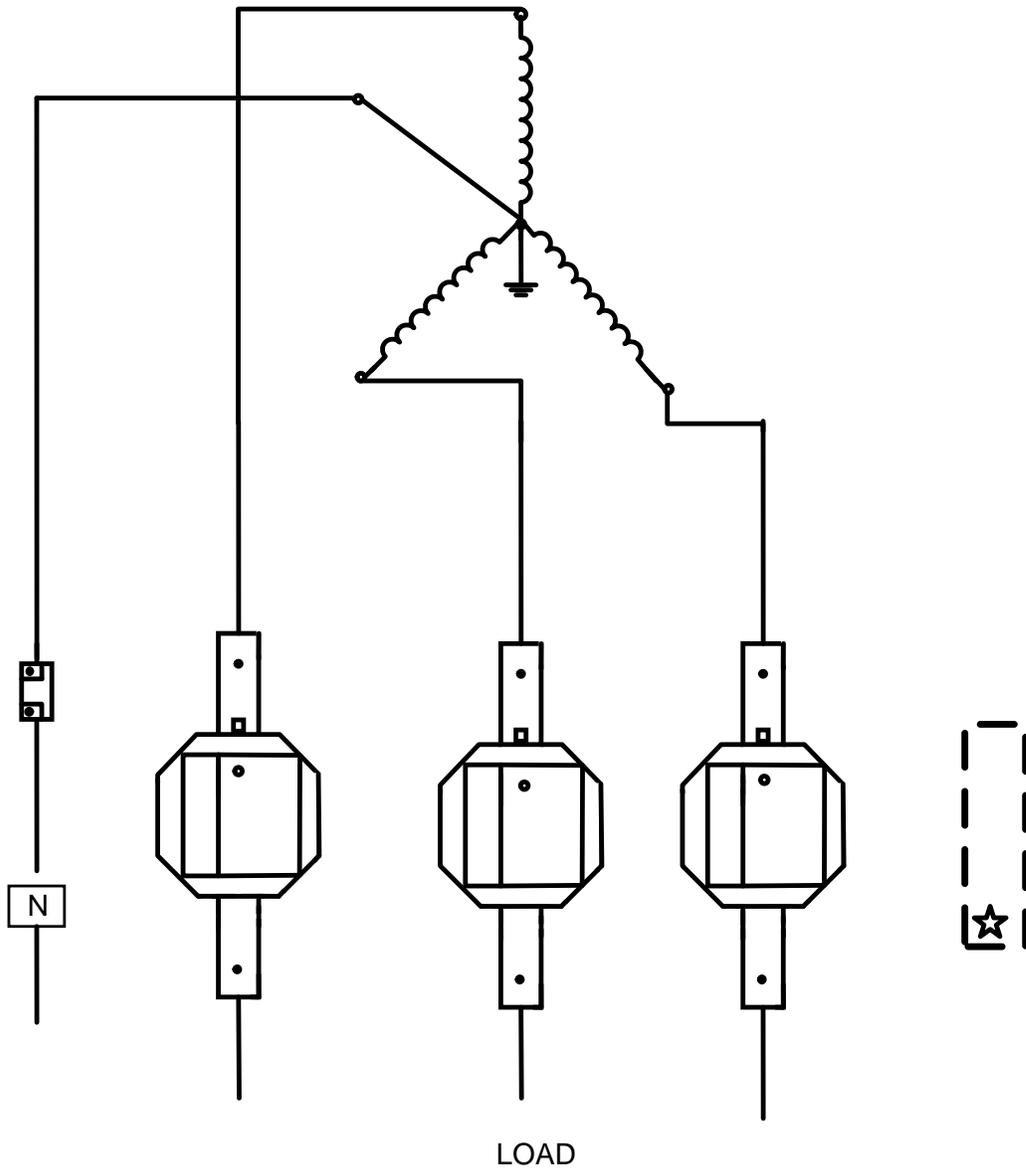
Fig. 7 – 120/208 Volt, 3-wire, Polyphase Network



120/208 VOLT 3-WIRE POLY
PHASE NETWORK

FIG. 7

Fig. 8 – 120/208 Volt, 347/600 Volt, 3-Phase, 4-wire, Wye System

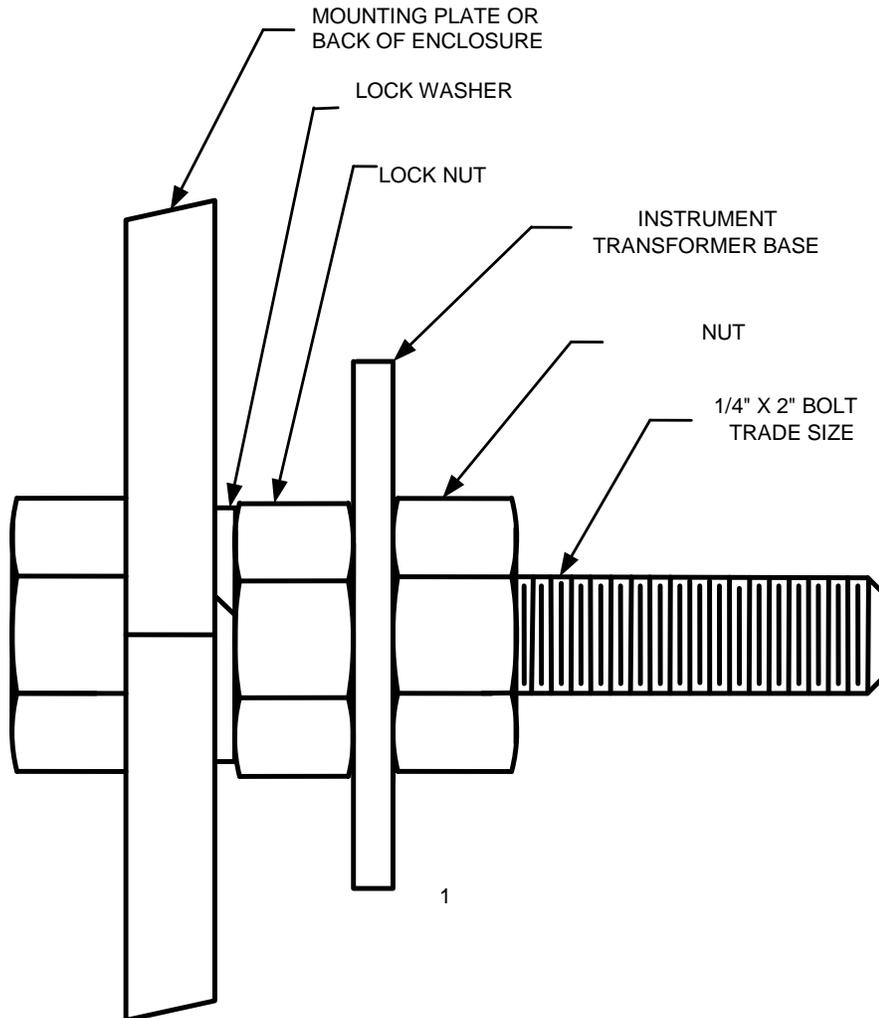


3-PHASE 4 WIRE WYE SYSTEM

FIG.8

DRAWINGS

Drawing 1 - Acceptable Method of Mounting Metering Transformers

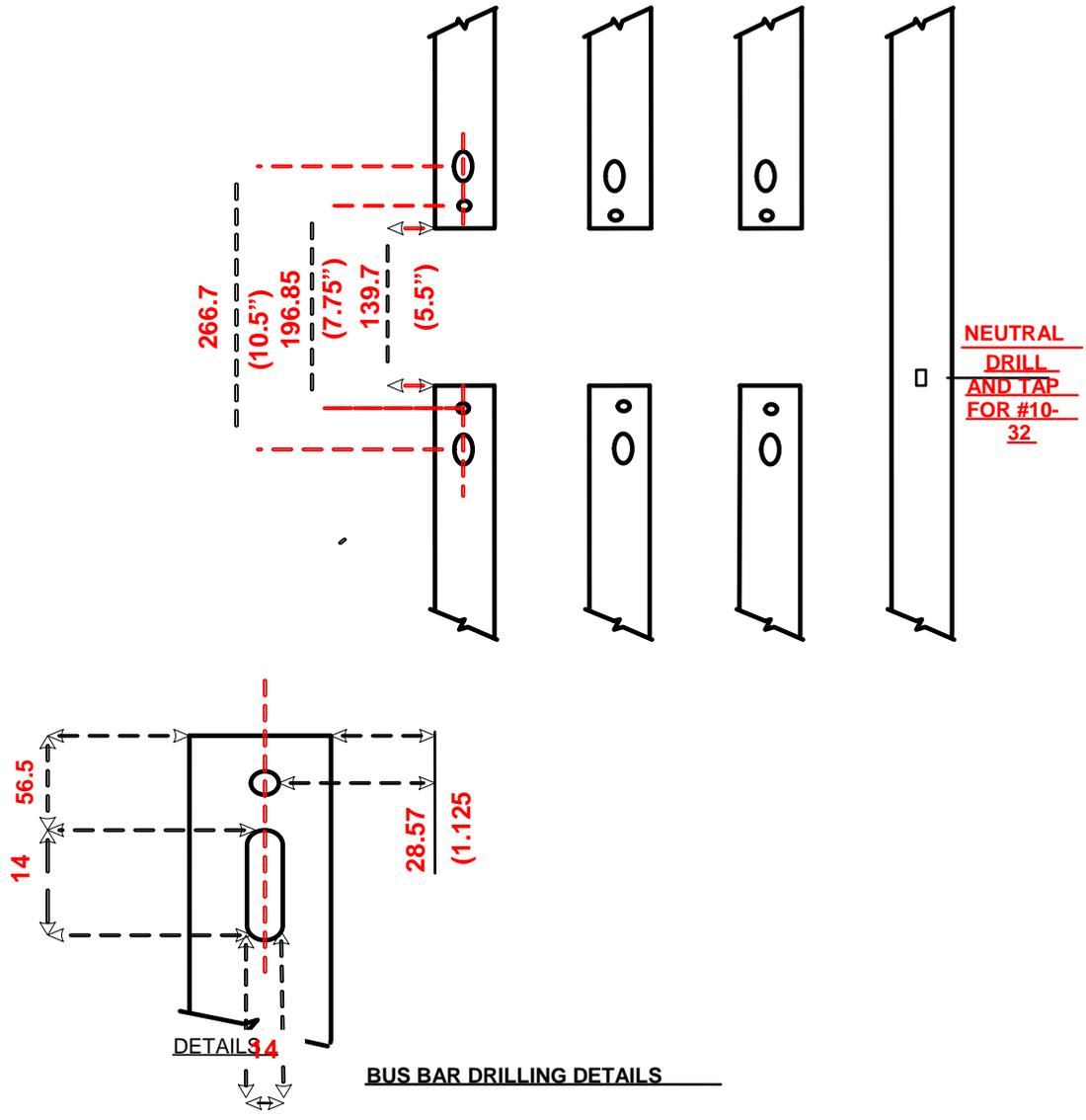


NOTE: INSTRUMENT TRANSFORMERS MUST BE MOUNTED USING ALL MOUNTING HOLES IN THE BASE PLATE.

NUMBER #10, SELF TAPPING SCREW IS ALSO ACCEPTABLE

DRAWING # 1

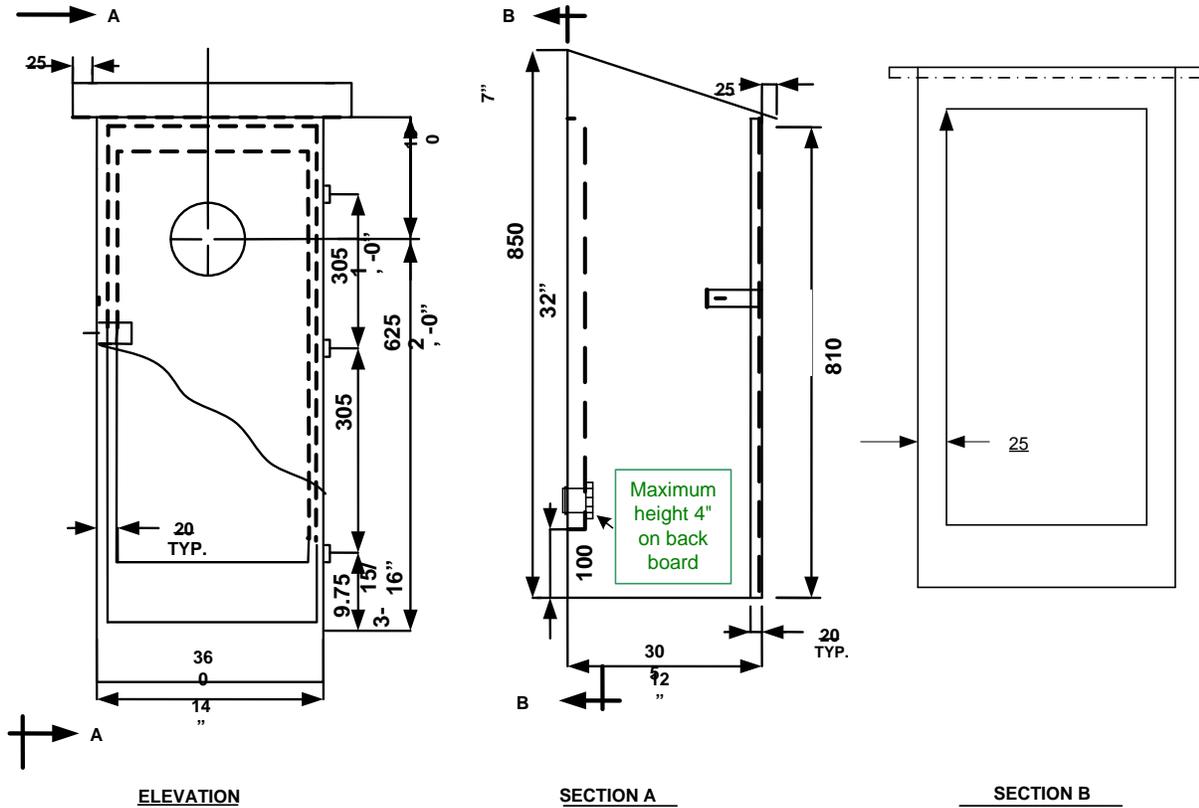
Drawing 2 – BUS Bar Drilling Details



NOTE: DIMENSIONS SHOWN ARE MILLIMETERS EXCEPT WHERE NOTED

DRAWING # 2

Drawing 3 – Outdoor Meter Enclosure



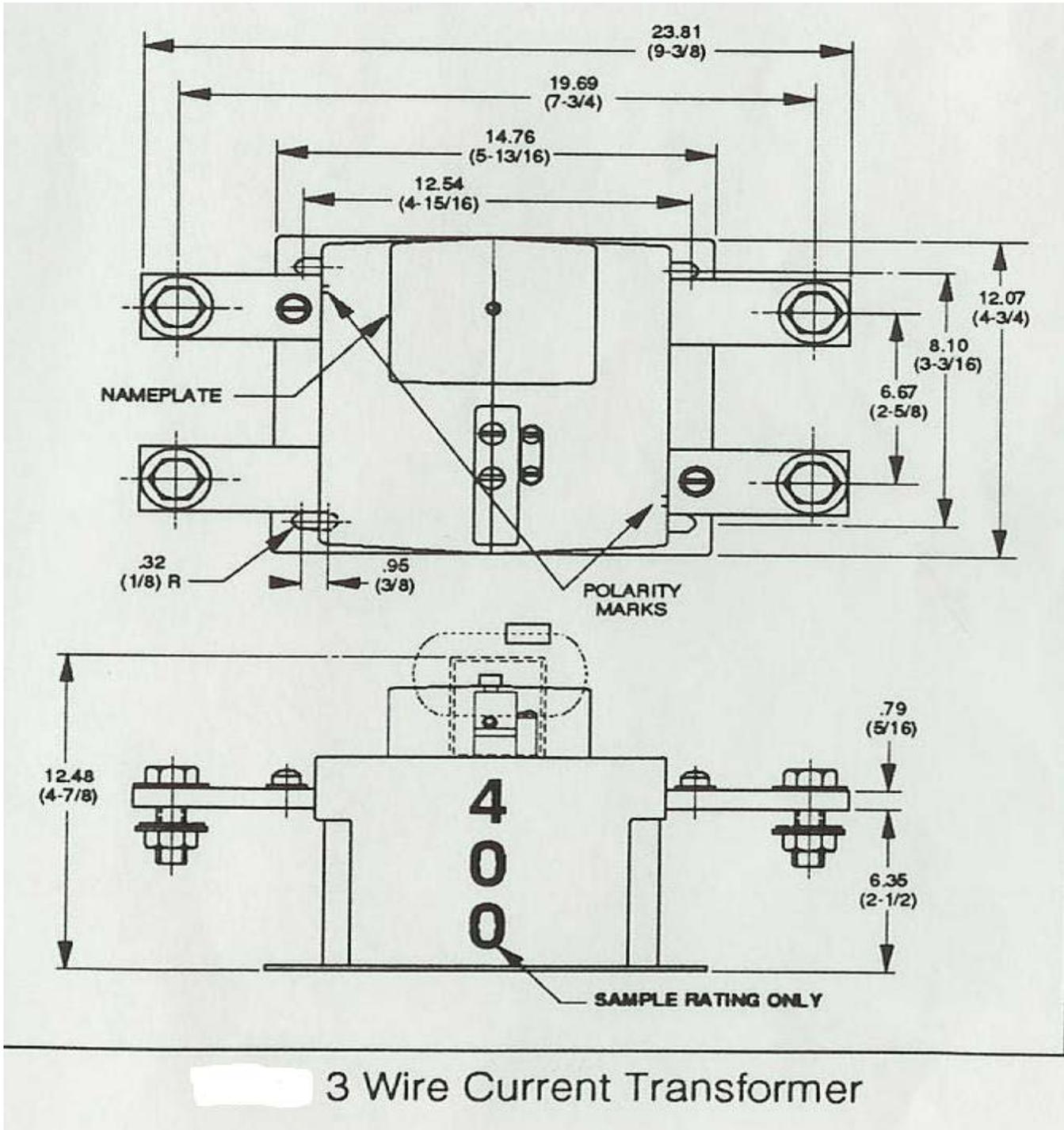
OUTDOOR METER ENCLOSURE

NOTES:

1. HASP AND HINGES SHALL HAVE BRASS PINS, AND SHALL BE FASTENED WITH # 10 STAINLESS BOLTS.
2. WINDOW SHALL HAVE A 6 X 200 X 200 CLEAR WIRE CRYSTAL GLASS FASTENED WITH 4 - 6 mm WELDED STUDS AND SEALED WITH 3 X 25 ADHESIVE NEOPRENE GASKET
3. 16 X 310 X 710 G.O.S. PLYWOOD PANEL SHALL BE FASTENED WHERE SHOWN, WITH 6 - 13mm LING # 10 F.H. SCREW.
4. DIMENSIONS SHOWN ARE IN MILLIMETERS EXCEPT WHERE SHOWN

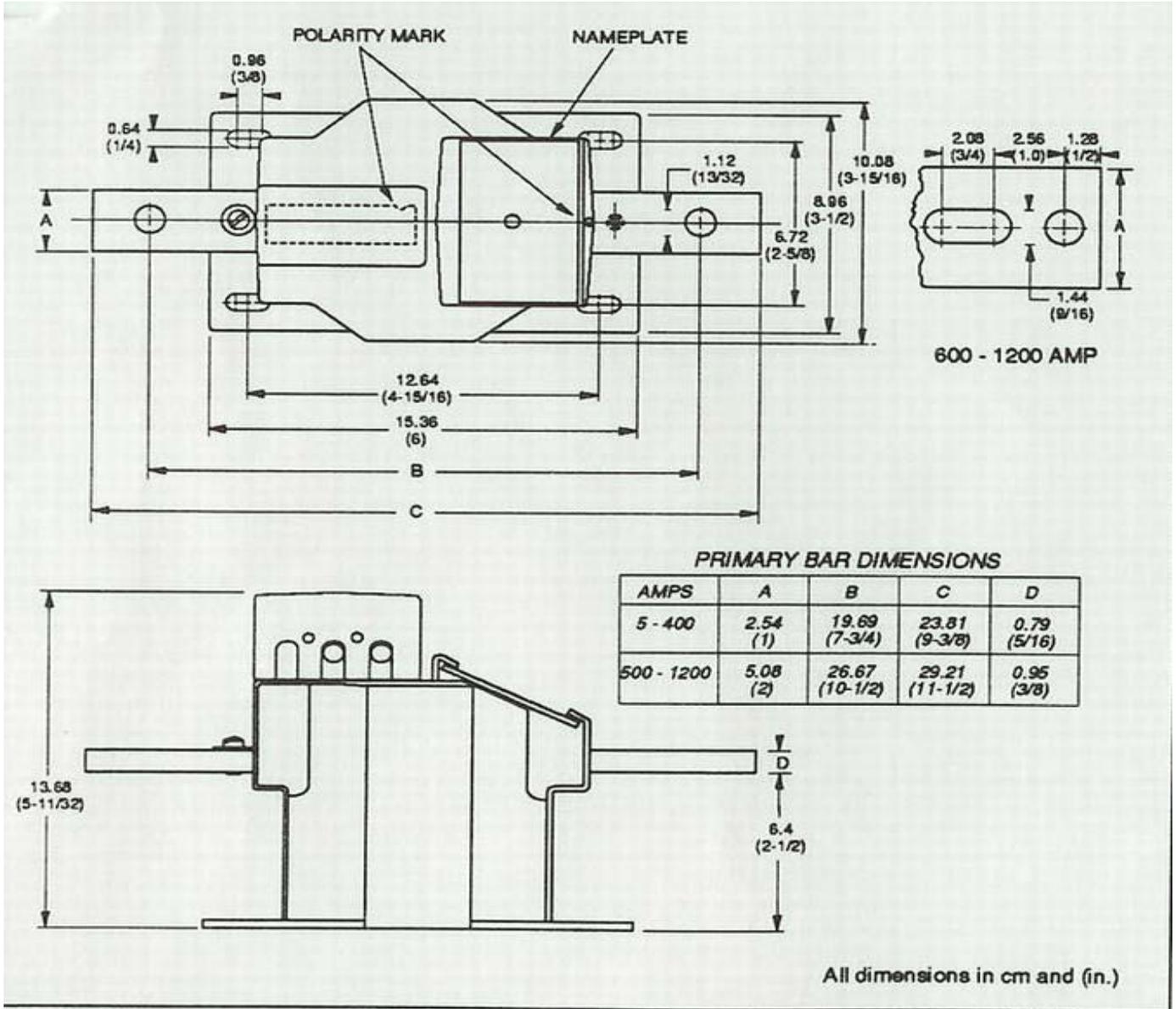
DRAWING # 3

Drawing 4 – 3-Wire Current Transformer



DRAWING # 4

Drawing 5 – 2-Wire Current Transformer

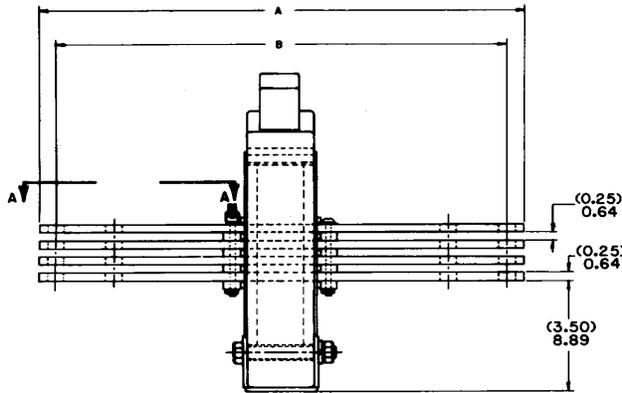


2 Wire Current Transformer

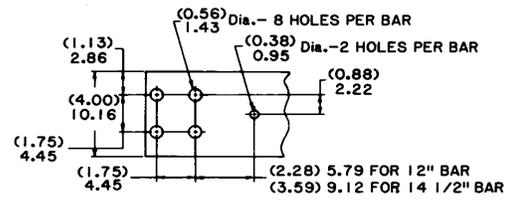
DRAWING # 5

Drawing 6 – Window Type, Indoor Current Transformer, 800 Amps to 4000 Amps

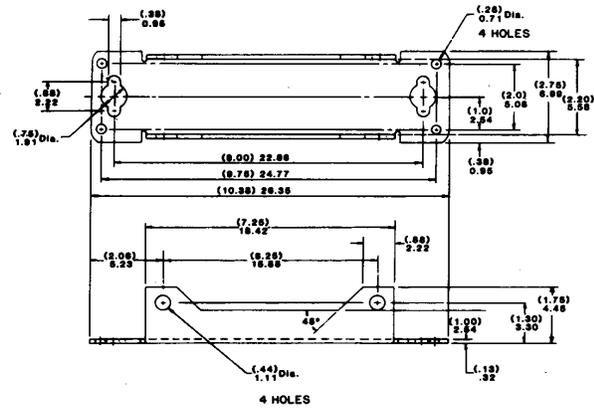
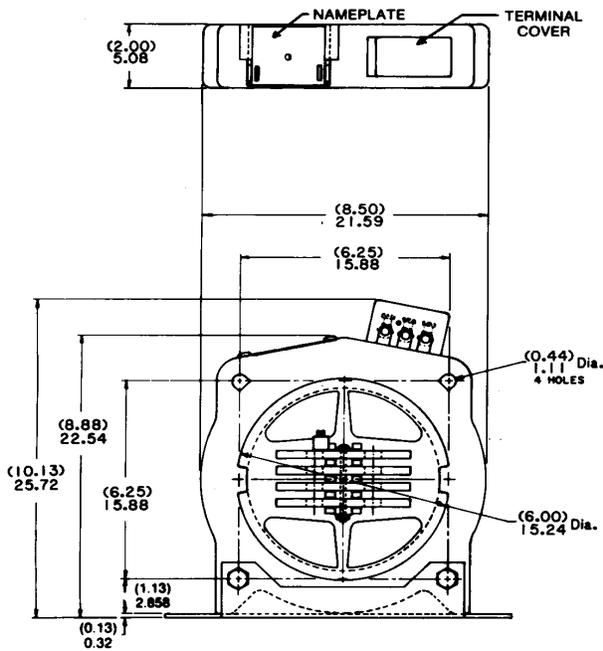
TYPE R6L



BAR DIMENSIONS		
BAR	DIM. A	DIM. B
(12.00) 30.48	(12.00) 30.48	(10.88) 27.64
(14.50) 36.83	(14.50) 36.83	(13.50) 34.29

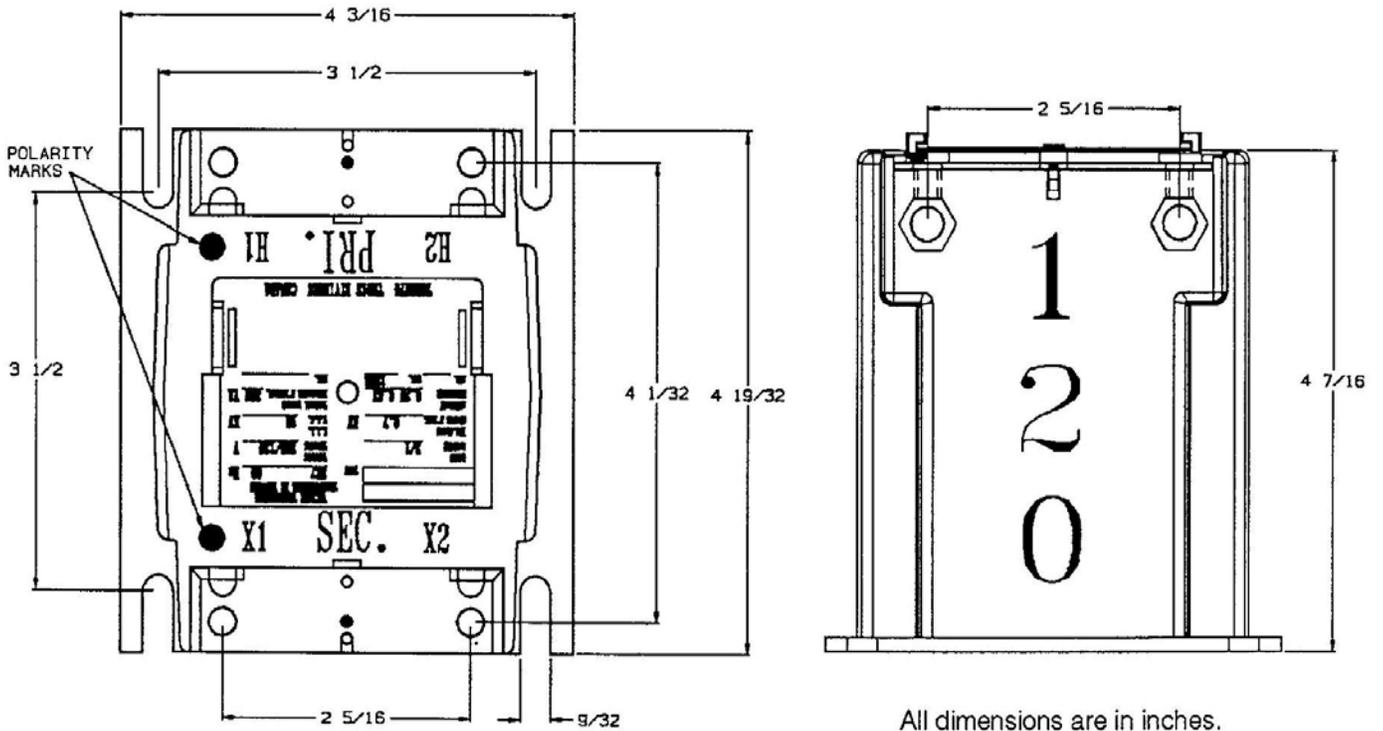


VIEW A-A
(TYPICAL)
14-1/2 OR 12 IN. BARS



DRAWING # 6

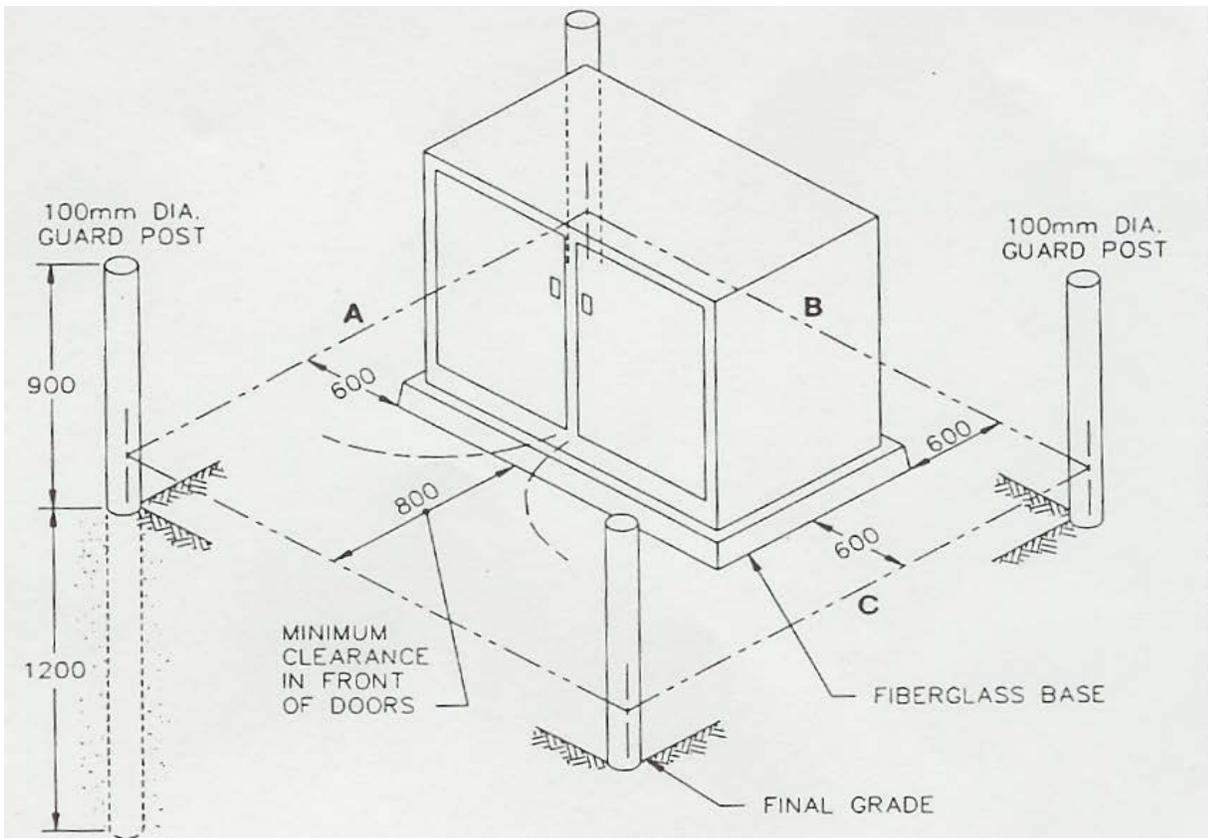
Drawing 7 – Indoor Potential Transformer, 2-Wire, 360/120 Volt



All dimensions are in inches.

DRAWING # 7

Drawing 8 – Location of Guard Posts

**LOCATION OF GUARD POSTS****NOTES:**

1. GUARD POSTS SHALL BE 100mm DIAMETER x 2100mm LONG, CAPPED STEEL PIPE. INSTALL 1200mm BELOW GRADE.
2. GUARD POSTS TO BE GALVANIZED OR PAINTED WITH RUST RESISTANT PAINT.
3. DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS SHALL BE DETERMINED BY EQUIPMENT TO BE INSTALLED.
4. TRANSFORMERS INSTALLED IN HIGH RISK TRAFFIC AREA MAY REQUIRE ADDITIONAL GUARD POSTS AT LOCATIONS A, B, & C. USAGE, NUMBER AND LOCATIONS OF GUARD POSTS TO BE DETERMINED BY DISTRICT SUPERVISOR
5. DIMENSIONS SHOWN ARE MILLIMETRES.

DRAWING # 8

APPENDIX A

Approvals:

- All metering enclosures must be approved for the location
- The CSTE must be constructed and approved in accordance with CSA 22.2 no 76 (splitters)
- The C.T. Cabinet must be constructed and approved in accordance with:
 - CSA 22.2 no 76 (splitter) and CSA 22.2 no 40 (cutout, junction and pull boxes if bus bar is required)
 - CSA 22.2 no 40(cutout, junction and pull boxes) if bus bar is not required

General:

- Plans, drawings and specifications of enclosures shall be submitted to Manitoba Hydro Electrical Codes and Standards Department prior to installation for acceptance in accordance with the Manitoba Electrical Code (MEC);
- Standard splitter boxes or troughs are not acceptable for use as a CSTE or C.T. Cabinet
- All enclosures shall have a bonding jumper installed sized to Table 16 of the Manitoba Electrical Code based on the ampere rating of the enclosure;
- Each enclosure shall have a hinged door or cover;
- Each C.S.T.E enclosure door shall be equipped with three point latching and shall incorporate a means for padlocking;
- The minimum acceptable standoff insulator arrangement for the securing/supporting of each section of bus bar shall be:
 - Two standoff insulators per section of bus bar; or
 - One standoff insulator that comes with two bolts to secure/support the section of bus bar
- The enclosure shall be marked as per 2-100 of the Manitoba Electrical Code to ensure it is

suitable for the particular installation. A permanent manufacturer's name plate shall be located on the outside of the enclosure.

- Each enclosure shall be provided with sufficient space for the installation and termination of all wires intended to be installed;
- The minimum enclosure size required is:

Single Phase	< or = to 400 amps	750mm(30")	750mm(30")	250mm(10")
Single Phase	> than 400 amps	900mm(36")	900mm(36")	300mm(12")
Three Phase	all	900mm(36")	900mm(36")	300mm(12")

Notes:

1. CSA 22.2 No 40 (cutout, junction and pull boxes) clause 4.5.1.4 states:

Where the width of a door opening exceeds 610 mm, double doors or doors in pairs shall be provided. The total width shall be the dimension measured across the door-opening at right angles to the hinged side of the door.

2. If you want to create a enclosure manufacturers name plate that would enable the enclosure to be acceptable for multiple use applications please submit a proposal to Manitoba Hydro's Electrical Codes and Standards Department for acceptance