

SPECIFICATION FOR **ELECTRICAL INSTALLATION**

GENERAL SERVICE CUSTOMERS



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1.0 SCOPE

This specification is supplemental to Brantford Power Inc.'s Conditions of Service and is intended to cover service(s) to Commercial, Industrial and Institutional developments. These General Services are henceforth referred to as 'Customer' and Brantford Power Inc., which is the supplier of these services, is referred to as 'BPI' in this document.

The service may be secondary or primary depending upon the availability from BPI distribution system, the service location of the Customer and whether it is in overhead or underground distribution area as determined by BPI. The service termination method will depend on load information supplied by the Customer to Brantford Power Engineering and Construction. All oversized service entrances must be fused back to ratings that are appropriate to the actual demand load.

When a new or change in service is desired, an application for service must be made well in advance to allow BPI adequate time to order material and equipment and to schedule the new service installation. Furthermore, the time required to complete the steps to electric power depends on how long it takes the Customer to complete the necessary applications, easements and other required documents.

2.0 ENERGIZATION REQUIREMENT

Prior to energization by BPI the following criteria must be met:

- a) A Request for Service must be submitted and approved by BPI. This should include all present and future load information together with the expected date of energization. The 'Request for Service' forms are included as Appendix-E.
- b) The installation must be approved by BPI Engineering and Construction and undergoes a successful ESA Inspection followed by a notification to the Customer Service Department.
- c) A Service Connection Application must be completed and approved by the Customer Services Department, located at 220 Colborne Street, Brantford. ON.

2.1 PRELIMINARY INFORMATION AND DESIGN

Prior to meeting with BPI, the Customer shall provide digital copies in AutoCAD or Microstation format, of electrical single line diagram, grading plan (if required) and a fully dimensioned site plan indicating property lines, building outlines, and detail of the preferred location for the electrical service equipment, transformer pad or room as well as other buried facilities.

For a specific installation, it is essential that the Customer or Customer's representative meet with BPI Engineering and Construction to mutually establish the arrangement and location of the proposed facilities. As a result of this meeting, BPI shall confirm the delivery voltage, transformer size, type and interrupting ratings of Customer's service equipment.

The information furnished by the Customer or their Contractor in regards to the proposed installation, shall be **in writing**. If significant changes are made to the design or scheduling

of the installation by the Customer, initial information furnished by BPI shall be subject to review and possible modification.

2.2 CONSTRUCTION DESIGN

After the initial meeting with the Customer, BPI shall designate the pole, transformer vault or switchgear, from which the primary or secondary cable will be extended including the route of the cable and locations of pull-boxes and manholes if required.

BPI shall advise the Customer of any and all costs involved based on economic evaluation of the project and the ensuing capital contributions that might be required from the Customer.

The Customer shall submit the final plans to BPI for approval before awarding contracts, ordering equipment or starting work to ensure that the proposed design of the electric service installation conforms to BPI requirements. One (01) digital copy in AutoCAD or Micro-station as well as two (02) hard copies, of the following documents shall be submitted to BPI for their approval:

- Architectural drawings and specifications related to the electric service equipment and transformer pad or room location. Design drawings pertaining to transformer and switch installation shall be uniformly prepared and sealed by the Customer's design professional.
- Manufacturer's proposed specifications for the electrical service equipment.
- Manufacturer's approved assembly drawings relating to the physical arrangement of the electrical service equipment.
- Electrical single line diagram illustrating the service connection up to the main service equipment, metering and any stand-by generation including transfer equipment.
- Grading Plan (for underground service only).

3.0 SERVICE ENTRANCE AND METERING

The Customer will provide, at his or her own expense, space and access to BPI for the installation of BPI's revenue metering equipment and shall be liable for damages to this equipment. All meters shall be grouped in a central location, which is readily accessible to and approved by BPI. The service entrance equipment must include a neutral block in the main and the splitter and a neutral wire shall be installed from the street to each metering installation.

When the Customer's load is 200A or less, self-contained metering is to be utilized. For loads greater than 200A, a CT cabinet is normally required for either single phase or three-phase delivery. Pre-wired or self-contained meters will be installed by BPI's Metering Department and these shall remain the property of BPI.

The metering requirements are outlined in our enclosed Metering Specifications. BPI will supply and install revenue meters, instrument transformers, test switches and all interconnecting wiring as required.

All locations accessible to the general public will have a lockable enclosure or room provided by the Customer, for the service equipment and meters as follows:

- a) an electrical room; or
- b) a metal metering cabinet, approved by BPI; or
- c) a metal enclosed switchgear approved by BPI and the Electrical Safety Authority.

All locations will be clear and safe, with working space of not less than 1.2 m (48") from the equipment. This space will be kept clear of obstructions at all times.

Where the possibility of danger exists to workers, or damage to equipment from moving machinery, vibration, dust, fumes or moisture, protective arrangements shall be provided by the Customer to the approval of BPI

If manufactured switchgear is used then current and/or potential transformers dedicated for metering will have to be installed during the manufacture of the switchgear. It will be the responsibility of the Customer to obtain these transformers either from BPI's Metering Department or purchase them directly from Brantford Power Inc. approved manufacturers after consulting with the Metering Department as to the size required and then bill BPI for only the purchase price of these transformers.

4.0 SERVICE IDENTIFICATION

Brantford Power Inc. requires that proper identification be supplied, installed and maintained for each building or unit where an electrical service exists in accordance with applicable municipal by-laws. The Customer or Customer's representative must contact BPI before changing or posting unit numbers.

For single service properties, the civic address must be permanently mounted and clearly visible from the street as long as there is an electrical service connected to that property.

When a building has more than one meter, each main disconnect, meter cabinet (or base) and the distribution panel in each unit shall be permanently marked with a unit number, and the number be affixed to the front entrance of that unit.

5.0 METERING ROOM REQUIREMENTS

Where the Customer is required to supply and maintain an electrical room as per the requirements of BPI Conditions of Service:

- a) it shall be of sufficient size to accommodate the Service Entrance and meter requirements of the tenants, and provide clear working space in accordance with the Electrical Safety Code.
- b) the Customer shall provide spare wall space for allowance of future load increases, so that at least 30 percent of the Customers supplied through meter sockets can accommodate meter cabinets at a later date.

- c) the electrical room must be separate from, but adjacent to, the transformer vault. It must be located to provide safe access from the outside or main hallway, and not from an adjoining room, so that it is readily accessible to BPI employees at all hours to permit meter reading and to maintain electric supply.
- d) a stairway to the room, built in accordance with the Ontario Building Code shall be installed, if the room is to be located above the main floor level. Please note that ladders are not acceptable.
- e) It shall not be used for storage or contain equipment foreign to the electrical installation within the area designated as safe working space.
- f) all stairways leading to electrical rooms above or below grade shall have a handrail on at least one side, as per Building Code, and shall be located indoors.
- g) the electrical room must be locked. The Customer shall install a pad bolt with mortise strike. BPI shall provide a secure arrangement so that a BPI padlock can be installed as well as the Customer's padlock.
- h) where outside doors are providing access to electrical rooms, they must have at least 150 mm clearance between final grade and the bottom of the door. Electrical rooms "on" or "below" grade must have a drain, including a "P" trap, complete with a non-mechanical priming device and a backwater valve connected to the sanitary sewer. The electrical room floor must slope 6mm/300mm, or 2% toward the drain.
- i) the electrical room shall have a minimum ceiling height of 2.2m clear, be provided with adequate lighting at the working level, as per I.E.S. standards, and include a 120 V convenience outlet.
- j) the lights, convenience outlet and any required vault circuit, shall be supplied from a panel located and clearly identified in the electrical room.
- k) the Customer shall identify each Customer's metered service by address and/or unit number in a permanent and legible manner. The identification shall apply to all main switches, breakers, and to all meter cabinets or meter mounting devices that are not immediately adjacent to the switch or breaker.
- l) The electrical room shall be permanently and visibly identified from the outside.

6.0 SERVICE FROM BPI DISTRIBUTION SYSTEM

6.1 SECONDARY SERVICE

Secondary service is available at the following voltages corresponding to the size of the main disconnect switch. The main disconnect may have to be sized to a smaller rating for overhead secondary services due to limitation on the size of overhead distribution transformers as discussed in Section 6.1.1.

- a. 120/240V secondary, main switch rated at 400A or less
- b. 120/208V secondary, main switch rated at 400A or less

- c. 347/600V secondary, main switch rated at 200A or less

For Brantford Downtown areas only the following secondary service size is available from the existing electrical system as per the requirements in BPI Conditions of Service. For any other service size, contact Brantford Power Engineering and Construction.

- a. 120/208V secondary and main switch is rated 400A or less

6.1.1 INSTALLATION IN OVERHEAD DISTRIBUTION AREAS

BPI will supply and install up to 30m (100 ft.) of overhead secondary wire only, over private property, measured from the street line. The Customer is responsible for the installation of portion of the service in excess of 30m (100 ft.) and all support poles on his property.

The service equipment (provided by the Customer) must be installed in the designated location described on the approved plan layout. The overhead service will come from an overhead pole either directly from a transformer or a secondary bus located outside the property. Overhead service is available for following service sizes:

- a. 120/240V, maximum demand of 100kVA
- b. 120/208V, maximum demand of 150kVA and main switch up to 400A.
- c. 347/600V, maximum demand of 150kVA

The service equipment shall have an overhead mast with the appropriate wires in place through a weather head, leaving a minimum 18" tails. If BPI is to support the service wires directly from the mast, it must be rated to withstand the tension of the service wires or must be adequately back-guyed. The installation must be inspected and approved by ESA before BPI installs the service and connects to the Customer wires.

The meter base or service disconnect shall be located on the same side of the building as BPI service entrance. An overhead allowance of 30m length of wire shall be provided to the Customer as per the Conditions of Service. Any additional cost for routing or additional service cable due to a route other than a straight line may have to be paid for by the Customer.

The neutral wire shall be identified at the weather head with a white tape or some other acceptable identification.

For metal, concrete, masonry or wood frame buildings (where the meter or disconnect is installed on the gable end of the building), the Customer must provide a suitable means of support to hold BPI service wires within 2' to the side of the weather head as per ESA.

If there is no support available for BPI overhead service near the service connection point, the Customer must install their own pole (or pole line if required) for the purpose complete with back guy(s) and anchor or some other means of supporting BPI overhead secondary wires as per Ontario Electrical Safety Code. BPI must be consulted to confirm requirements such as location and guying. The installation must be inspected and approved by ESA.

6.1.1.1 UNDERGROUND SERVICE IN OVERHEAD AREAS

At the Customer's request and where practical, secondary services may be installed underground to BPI overhead distribution system. In this case, the Customer at his or her own expense shall install the entire service from the service entrance to BPI's distribution pole. If there is no pole on the same side of street as the building, BPI may install an overhead service to a BPI pole on the street right-of-way subject to availability of space. In the absence of space, the Customer shall supply and install pole on private property and the service shall be brought overhead to this dip pole from BPI's overhead distribution system. In this instance the ownership demarcation point shall be at the Customer's dip pole. For pole installation details refer to section 6.2.2.1.

6.1.2 INSTALLATION IN UNDERGROUND DISTRIBUTION AREAS

For underground general services, BPI shall not install secondary on private property. However, there are exceptions to this if the property is located within Brantford Downtown and designated underground areas, refer to section 6.1.3. The Customer shall supply, install and maintain all secondary electrical conductors, conduits and equipment on private property from BPI transformers' secondary terminals to the service entrance. The installation shall be in accordance with the Ontario Electrical Safety Code.

The service equipment provided by the Customer must be installed in the designated location described on the approved plan layout. The underground service may be from a transformer on the street right-of-way and run underground to the customer meter/disconnect location or electrical room. For installation in the city right-of-way, a road-cut permit is required. For excavation and installation of buried structures refer to section 7 and section 8 of this document.

6.1.2.1 CUSTOMER OWNED SECONDARY CABLES

The quantity, size and specification of Customer owned secondary cables that can be terminated at BPI's transformer will be approved by BPI.

BPI has limitations on the number of secondary cables, and the length these cables can be run based on the anticipated Customer load. If a Customer requires more cables than the original design permits, as approved by BPI, the Customer may be required to provide suitable service equipment adjacent to the transformer, unless, advised otherwise by BPI:

- This equipment shall consist of an outdoor cubicle with bus of a capacity to meet the transformer load and braced for the full short circuit capacity.
- Each cable leaving this device shall have over-current protection.

The Customer is responsible to ensure that cable pull-tensions are satisfied for all underground service cables in either direction without the use of specialized tools. Contact Brantford Power Engineering and Construction for more information.

6.1.2.2 INSTALLATION OF SECONDARY CABLES AND DUCTS

Conduits shall be brought right up to the pad or terminated at the cable entrance to the transformer room where applicable. These ducts must terminate with their bell end placed flush with the inside wall of the structure through the knock-outs where knock-outs are provided and properly sealed on all sides. In the event of any damage to the vault structure during installation, the Customer/Contractor must restore the vault to its original form and strength.

The Customer and his Contractor are responsible for properly training the secondary cables inside the transformer vault to offer minimum pulling tension on the secondary terminals of the transformer and the cable ends shall be prepared for final connection with properly oriented 2-hole Copper cable lugs which shall be sized to conform to the secondary conductor dia. A length of individual cables shall be rested at the bottom of the vault, which shall be sufficient to support the weight of the tail above it. All cables shall be brought up vertically to the transformer terminals. The cable extensions must be long enough to rest at the bottom of the foundation and to extend at least 2m (6.5') above the top of the transformer pad.

If desired bending radii for the cables cannot be achieved inside the vault then adequate supports must be provided for these cables by installing support brackets. The type and specification of these brackets must be confirmed from BPI Engineering and Construction. BPI will inspect and approve the secondary cable connections to its transformer and the Customer shall be advised of any deficiency in this regard. Energization of service will not be authorized until the installation is approved by BPI.

BPI transformer shall be equipped with bushings that accept NEMA standard spade terminals mounted in the secondary compartment. The number of holes in these spades varies based on the size of transformation and the Customer must contact BPI to confirm their specification before finalizing plans or ordering secondary cables.

The Customer/Customer's contractor shall terminate the secondary cables at the transformer using Burndy type YA two-hole compression lugs with a long barrel for a minimum of two compressions. The width of the connector tongue shall not exceed 44.5mm (1-3/4"). Silicon-bronze bolts shall be used at the transformer terminals. The lugs and bolts shall be sourced by the Customer/Customer's contractor.

6.1.2.3 SECONDARY CABLE TESTING

All Customer-owned secondary cables connected to BPI transformer shall be tested upon completion of all terminations and grounding.

All secondary cables shall be meggerd and identified to verify the correctness of cable tags and the test result shall be communicated to BPI.

6.1.3 INSTALLATION IN BRANTFORD DOWNTOWN AND DESIGNATED UNDERGROUND AREAS OTHER THAN SUBDIVISIONS AND TOWNHOMES

For a detailed description of these areas refer to section 3.1.10 of the Conditions of Service. For primary services refer to section 6.2 of this document.

The ownership demarcation point for new or upgraded underground secondary services shall be the Customer's disconnect switch, dip pole or meter. BPI will attempt to accommodate supplies from existing transformation, where available. If the existing transformation capacity is not sufficient primary service shall be provided as per Section 3.2 of the Conditions of Service.

BPI may install its service cables and terminate at the Customer's disconnect switch or meter inside a building. This device must be located as per Ontario Electrical Safety Code requirements but shall not be located more than 2m from BPI service entrance at the building. BPI shall be responsible for the electrical repairs only of its service cables.

The Customer shall be responsible for the supply, installation and maintenance of all cable ducts and associated civil works from the property line up to the termination point. Customer's installation shall match BPI's service ducts at the property line, and approved by ESA. The Customer will also be responsible for trenching and backfilling on private property to BPI specifications. For excavation and installation of buried structures refer to section 7 of this document

BPI shall be responsible for electrical repairs only of its service cables inside the Customer's property. In the event of a fault and if required, all restorations beyond basic reinstatements shall be the Customer's responsibility as per BPI's Conditions of Service.

If the existing transformation capacity is not sufficient and regardless of the size and voltage of the service, where BPI determines that additional transformation is required, the Customer shall provide suitable space for a pad-mount transformer or space within a Customer's electrical vault and BPI shall supply primary service. Where transformation capacity is installed on a Customer's property, BPI will require a registered easement in accordance with the Conditions of Service. All details of BPI plant located on private property shall be subject to approval of BPI Engineering and Construction.

6.1.3.1 PROTECTION OF BPI OWNED CABLES ON PRIVATE PROPERTY

Where required by BPI, underground cables shall be provided with mechanical protection in the form of PVC DB2 ducts and couplings that, except where specified otherwise, shall be according to BPI standard 37-341-1 and 37-341-2.

6.2 PRIMARY SERVICE

Primary service to all Customers shall be three-phase four-wire at 27.6kV.

6.2.1 GENERAL SERVICE CUSTOMERS WITH BPI SUPPLIED TRANSFORMER

Customers with electrical loads 1000kVA or less at 120/208V or 1500kVA or less at 347/600V shall be provided with BPI supplied transformer and transformer protection (including a load break switch where required) as per the capital contribution model of the Distribution System Code, whether the service is located in an overhead or underground distribution area. BPI shall supply and install its own dip poles and primary cables except in situations where the service is through an extended pole line on private property to BPI transformer. For details on this exception refer to Section 6.2.1.2. The following voltage and size restriction applies on the Customer service entrance equipment at the secondary:

- a. 120/208V secondary, main switch rated at 2500A or less (1000kVA)
- b. 347/600V secondary, main switch rated at 1600A or less (1500kVA)

The Customer shall provide the necessary easements to BPI to operate and maintain its equipment (transformer, protection, cables, pole etc.) on private property as per the Conditions of Service.

6.2.1.1 UNDERGROUND SERVICE TO TRANSFORMER

Under this scenario, the service is by means of underground cables either from a BPI dip pole or its underground distribution system, to the transformer on private property. BPI will supply, install and maintain its own primary cables, pole, terminations and load break switch (if required). The ownership and operational demarcation point shall be located at the secondary terminals of the transformer.

The Customer shall supply, install and maintain all primary ducts; base or room for transformer and primary switch and all associated civil works and grounding on private property.

6.2.1.1.1 UNDERGROUND STRUCTURES FOR BPI OWNED PRIMARY CABLES

Unless otherwise specified, all ducting and civil works associated with the installation of primary cables on private property shall be supplied, installed, owned and maintained by the Customer and shall conform to CSA standard C.22-2 No. 211.1 – MI 984 (DB2 / ES2 PVC conduit). The duct bank shall be concrete encased and consist of four 100mm (4") ducts (this is for lateral feed only. For loop-in and loop-out feed situations a minimum of seven 100mm (4") dia. ducts may be required as directed by BPI). These shall be installed as per BPI standards 37-343 to 37-345. 75mm (3") High Density Polyethylene (HDPE) may be accepted for the entire run for directional bore / rebuild situations. Each duct shall have a 6mm (1/4") polypropylene pull rope in one continuous length from point of supply to the transformer and with 3m (10') extra left at each end of the duct.

Standard 37-190 indicates the configuration of the duct bank at the riser pole, which also specifies the type of duct to be used. It should be noted that the installation would be subject to ESA Inspection and approval.

The duct(s) shall be laid end-to-end in as straight a line as possible to facilitate pulling in of the cable. Bends and turns in a duct shall be accomplished by a gradual sweep. All changes in direction shall be made of 1.5m(60") radius elbow. The angle and number of bends on a single run between pull points (i.e. Manholes, hand holes, transformer bases etc.) shall be determined based on pull calculations. On tight locations, a 900mm radius may be allowed upon approval by BPI. All primary cable ducts must be concrete encased as per standard 37-341-1 and 37-341-2. Where tie-ins are made to ducts left for future plant these ducts shall be continued to the next structure.

All ducts that are to terminate within a structure must terminate with a bell end placed flush with the inside wall of the structure. Where these ducts enter the vault care should be taken to maintain a seal that will not allow sediment into the structure.

Trenching, all materials, installation of the duct bank and backfilling are to be carried out and paid for by the Customer.

6.2.1.1.1.1 PULLBOXES / MANHOLES

One or more masonry or concrete pull boxes or manholes may be required for cable pulling or conduit drainage. Where splicing of BPI service cables is found necessary in a duct structure, manholes shall be used. These shall be supplied by the Customer according to the following requirements:

- Pull boxes shall have inside dimensions of 1m(3') wide x 1.85m(6') long x 1.2m(4') deep and shall have a full-length, three-section cover.
- The minimum size of any manhole required shall be determined by BPI. All manhole covers shall have a 1m(36") min. diameter with provision for lifting device. The top of the cover shall be at finished grade.
- Where the pull box and manhole contain BPI owned and serviced cables, their design shall be approved by BPI. All pull boxes / manholes and their covers shall be designed to withstand a H-20 or equivalent loading.
- The pull box or manhole shall be constructed of non-conducting material such as PVC. Metallic knockouts and/or linings for cable entries shall not be used in the ducts under any circumstances.

- Conduits shall enter the pull box / manhole directly opposite each other on the smaller end walls and shall be at a minimum distance of 6 inches from the longer end walls and 15 inches from the bottom of the pull box or manhole.

6.2.1.1.2 SERVICES REQUIRING 150 KVA TRANSFORMER OR LESS

In overhead distribution areas, if BPI determines that transformation of 150 KVA or less is all that is required for a higher demand class Customer, BPI will supply pole-mounted transformation. In these cases the Customer shall supply and install a transformer vault complete with steel plate over the opening, and a duct bank for future primary cables, all as specified in this document.

The Customer shall supply and install the secondary cables and neutral wire from the main switch through the transformer vault and primary ducts to and up the service pole.

In the future, if the actual load on the service indicates that more than a 150 KVA transformer is required, BPI will supply and install the primary cables complete with terminations. BPI will then supply and install a pad-mounted transformer at no cost to the Customer.

Customer will be responsible to redirect and terminate the secondary cables to the new pad mount transformer.

6.2.1.1.3 SERVICING FROM BPI POLE

In most cases a BPI pole line exists only on one side of the street.

In the case where the property is on the same side of the street as the pole line, BPI may approve the customer service attachment to its pole and allow cable riser ducts to be installed on the pole.

In the case where attachment cannot be made to BPI's pole on the City right-of-way due to its use of the pole, or where the property is on the opposite side of the street to the pole line, the Customer shall, in consultation with BPI, provide a suitable location and space on the property to supply and install a BPI owned dip-pole including cross-arm, dead-ends, complete with back guys and anchor(s). This pole shall generally be located within 3m of a paved roadway with vehicular right-of-way and shall be back guyed for all unbalanced loads, irrespective of loading tensions. In case of installation on dead-end access, at least 5m length of the roadway shall be extended beyond the pole location to allow adequate clearance to BPI service trucks and personnel.

If there is an existing Customer owned pole on the property, which meets current BPI standards in terms of class, condition and height, and can be used as a dip pole to connect BPI overhead service, as determined by BPI, this pole may be used to connect the overhead service wires and the

Customer will have to transfer the ownership of this pole to BPI at no cost to BPI. The Customer shall provide BPI with easements for BPI owned pole on his/her property as well as for all supporting structures for future maintenance as per the Conditions of Service.

6.2.1.2 OVERHEAD SERVICE TO TRANSFORMER

If an extended pole line (more than one pole) is required on private property for connecting the transformer to BPI distribution system, then the entire pole line including, overhead primary wire, terminations, conduits, civil works, underground primary cable(s) and other attachments as required, to BPI transformer shall be supplied, installed and maintained by the Customer.

The pole line shall be designed to be completely self-supporting and all installations forming part of the pole line shall meet or exceed the design requirements of Ontario Electrical Safety Code (OESC) and the construction shall be verified by ESA. In addition to this, the first pole in the pole line supporting BPI overhead service wires shall carry BPI-approved cross-arm, terminal connections and insulators. BPI shall provide the necessary loading tensions of its overhead wires. The pole shall match the installed height of BPI service pole on the boulevard. BPI may be contacted to confirm requirements such as location and/or guying. The pole line must be installed and pass ESA inspection before service connections are made available from BPI service pole.

The transformer protection supplied by BPI shall be the operational demarcation point and shall be located on one of the Customer's pole as determined by BPI. The Customer shall supply, install and maintain the transformer base or room including all associated civil works, cable ducts and grounding on the property.

BPI will supply and install up to 30m (100 ft.) of overhead high voltage primary wire only, over private property, measured from the street line.

The Customer is responsible for the installation of portion of the service in excess of 30m (100 ft.) and all support poles on his property.

The Customer pole supporting BPI overhead wires, shall generally be located within 3m of a paved roadway with vehicular right-of-way. In case of installation on dead-end access, at least 5m length of the roadway shall be extended beyond the pole location to allow adequate clearance to BPI service trucks and personnel.

If an existing Customer-owned pole line is available on the property, which may be used to support the new service, the entire pole line shall be redesigned to accommodate the new service wires as per the OESC.

6.2.1.2.1 CUSTOMER OWNED PRIMARY CABLES TO BPI SUPPLIED TRANSFORMER

For their own installation, the Customer must employ a qualified contractor approved by BPI.

The cable shall be 1/0 copper conductor as per BPI standard specification. The load break elbows shall be of the 200 Amp posi-break design and in accordance with ANSI/IEEE 386-1977. The load break elbows may be left on de-energized transformer bushings to aid in storage of elbows.

High voltage dead-end caps, plugs, standoff bushings shall be as specified in the list of approved materials in Appendix B. For underground terminations, a fault indicator (Catalog # STHI in Appendix B) shall be installed on the test point of the load side load break elbow at each transformer, switch or junction location.

Customer-owned primary cable installation shall be by a BPI approved contractor. For primary cable installation at the dip-pole refer to BPI standard 37-190.

Where the Customer is installing primary cables, these shall be submitted to a standard Hi-pot test and the standard test form shall be completed as witnessed by BPI Inspector. This form can be obtained from BPI Engineering and Construction, upon request.

Primary cable rating and testing shall be in accordance with regulations outlined in the Canadian Electrical Safety Code and I.P.C.E.A. Standard No. S-66-524. Primary cable(s) shall be tested continuously for a period of 15 minutes. The test shall start at 25 KV for the first 5 minutes, then 50 KV for another 5 minutes, then 75KV for the final 5 minutes. All tests must be done in dry conditions. Acceptance of the tested cables shall be subject to approval by BPI inspector. Cables, whose test results are inconsistent or not satisfactory to BPI or have not been witnessed by BPI Inspector, shall be replaced with new ones and re-tested. Re-testing of tested cables is not acceptable.

6.2.1.3 TRANSFORMER

6.2.1.3.1 TRANSFORMER LOCATION

The transformer shall be located on grade level and as close as possible to the Customer's load center. The clearances to building and property lines shall be selected to achieve the necessary space separation for oil-insulated transformers installed outdoors in accordance with Current Electrical Safety Code requirements for the Province of Ontario.

An area measuring 10 feet from each inner edge of the transformer oil containment shall be kept free from all buried water lines, gas lines, sewer lines, other electric lines, storage tank etc.

Where these space separations cannot be achieved, additional safeguards such as transformer room, fire-resistant barriers and or fire-suppression systems may be required and shall be installed and maintained by the Customer.

The transformer shall be accessible to BPI's or their contractor's service truck equipped for the installation and removal of heavy transformer. The Customer shall build and maintain a permanent road access on site for this purpose and the transformer shall not be placed more than 3m from this road. If extra measures such as appropriate fill material or steel plating are required by BPI to access its transformer sites, the Customer shall be responsible for any and all associated costs of such extra measures deemed necessary and advised by BPI.

6.2.1.3.2 TRANSFORMER CLEARANCES AND PROTECTION

In addition to the Electrical Safety Code requirements for clearances, a minimum distance of 1.1m (3-1/2') shall be maintained between the transformer pad and any obstruction such as building, fence, etc. If a barrier wall is to be constructed, the wall must be more than 1.1m (3-1/2') from the edge of transformer pad.

- Clearances shall be measured from the outermost metal part of the transformer body.
- If the building has an overhang, the distance to the transformer shall be measured horizontally from the outer edge of the overhang.
- All or part of metal structures that are within the transformer ground grid shall be continually bonded to the grid in a minimum of two places on each side. If they are within a perimeter of 3m of the transformer pad they shall have their own ground grid complete with ground rods, which shall be bonded, in at least two places, to the transformer ground grid.

The Customer will be required to submit plans of the transformer location to BPI for approval.

Where BPI installations are exposed to vehicular traffic, grass cutting or snow plowing equipment, concrete filled, galvanized steel bollards shall be supplied and installed by the Customer. These shall be supplied and installed as per BPI Standard 37-318 (see Appendix) and grounded to the transformer ground grid. The bollards shall generally be installed prior to the placement of BPI equipment on the pad, unless specified otherwise by BPI.

The ground rods of the ground grid shall be bonded to the bushings provided on the transformer for this purpose. The neutral bushing(s) of the transformer shall be connected by BPI with full-size neutral conductor(s) and bonded to the transformer ground.

6.2.1.3.3 TRANSFORMER ROOM

If the Customer is constructing a transformer room on his property OR if an existing room is identified for the purpose of stationing a new transformer,

this room must be built or located on grade level and shall meet the requirements of ESA and Building Code and the following specifications.

The final layout of the transformer room shall be approved by BPI. The following room sizes are only meant as a guide:

- 1) 750 KVA and under 6.7m (22') by 4.5m (15')
- 2) 1000 KVA to 1500 KVA 8.0m (26 ft.) by 6.0m (20 ft.)

All rooms are to have minimum headroom of 3.0m (9.8'). The room must be constructed in such a fashion as to contain the total volume of oil contained in the transformer(s) without penetrating the floor of the room or seeping through doorways and walls. The actual construction of the room shall comply with the ESA Code and the Ontario Building Code.

Ventilation shall be provided for cooling of the transformer. The room shall be designed for an airflow of $5.3\text{m}^3/\text{min}$. (190 c.f.m.) per KVA of transformer. Mechanical ventilation (fans etc.) will not be allowed unless approved by BPI after reviewing the design and calculations for the mechanical system, which must be submitted beforehand by the Customer.

Access to the room shall be restricted to BPI personnel only and provided through locked exterior doors. The doors shall be 1.83m (6') by 2.1m (7') double doors. The room shall be directly accessible to BPI or their contractor's service truck and a minimum 3m (10') wide road access shall be provided on the property for this purpose.

A minimum of 10 feet clear working area shall be maintained in front of the doors for operating and maintenance of the transformer. Brantford Power Inc. will supply and install at the Customer's expense, an Abloy lock for the transformer room door.

At least two fluorescent light fixtures with switches located near the door and two 120/240V outlets shall be provided inside the room. They shall be installed in accordance with the ESA and Building Code.

Brantford Power Inc. shall supply three single-phase transformers or a single 3-phase transformer as appropriate, to a maximum total capacity as specified earlier in this document.

6.2.1.3.4 REQUIREMENTS BEFORE DELIVERY AND INSTALLATION

If it is determined that BPI transformation is required for a service, then the Customer or Customer's representatives should take into consideration, the delivery time of the transformer which might take up to 40 weeks after the Request for Service Application is approved. The following sequence of steps shall be followed for the supply and installation of transformer or switchgear on Customer's property:

- Customer / Contractor must have a signed copy of the commercial connection agreement with BPI and have provided BPI with a cheque or purchase order (if required).
- Customer's Engineer shall provide a drawing to BPI which shall be then marked up and returned to the Customer indicating transformer/switch and duct location for primary cables or termination and dip-pole with primary taps and main primary circuit location on the street. Based on these drawings, the Customer or his contractor shall install the transformer and/or switch foundation, vault (or room) and ducts or BPI dip pole (or Customer owned pole as the case may be) and ground grid according to this specification. BPI shall be contacted to inspect the installation on site and before pour-in of concrete where pour-in is required. Compaction test result when requested, shall be forwarded to BPI.
- Location of ducts / foundations shall be verified by BPI on site.
- The Customer / Contractor shall advise BPI in writing once all civil work including final grade, is completed and all Customer-owned secondary cables (and Customer owned poles, primary cables, where required as per section 6.2.2), installed, coiled and placed in the bottom of the transformer foundation and prepared for termination.
- BPI shall install its own dip pole, primary cables, transformer, install transformer protection equipment (including load break switch if required) and make primary connections on the transformer. The Customer or contractor shall make secondary terminations on the transformer and bolt to secondary paddles hand tight. The Customer or his Contractor must inform BPI prior to training and terminating secondary cables inside the transformer vault. If required BPI may assist the Customer in this process.
- If the Customer installs primary cable(s) as per section 6.2.2, a High Potential test will be performed which shall be witnessed by BPI Inspector.
- Once ESA notification for connection is received, BPI shall torque the secondary terminations to the required strength, check the phasing on the cables and energize the service.

6.2.1.4 SYSTEM GROUNDING

At each transformer, switchgear and pole located on private property, the case and all other non-current carrying metallic parts shall be grounded, including metal fences or bollards installed within 3m of transformer foundation. Grounding conductors of other utilities in the area shall be bonded to the utility system ground.

Grounding at all primary voltage equipment shall consist of four (04), 19mm (3/4") x 3m (10') copper clad steel ground rods, 'figure-8' or 'C' type copper compression connectors, and sufficient 2/0 AWG bare copper conductor to completely encircle the equipment pad or manhole with a clearance of 1.0m, and connect the ground rods to the equipment ground bushings. Additional grounding provisions may be required if rock is encountered. The ground conductor shall be buried to a depth of at least 0.3m below finished grade.

6.2.2 GENERAL SERVICE CUSTOMERS WITH THEIR OWN TRANSFORMER

Primary service available for these Customers shall be at 27.6kV, three-phase, four-wire. These are Customers with electrical loads greater than 1000kVA at 120/208V or greater than 1500kVA at 347/600V. They shall supply, install and maintain their own transformers, primary cables, protection, and other attachments as required as well as civil structures on the load side of ownership demarcation point as described below. The only situation where BPI may provide transformation if the loads are distributed at different locations within the property; fed from a single delivery point and the individual serviced Customer load is less than the above thresholds. The transformers shall be looped together if possible, at the primary voltage and shall not be interconnected at the secondary voltage. BPI supplied cables shall be installed as per Section 6.2.1.

The ownership demarcation point shall be at the supply terminals of the Customer's main primary disconnect load break switch, which shall be located at a suitable sectionalizing point. It shall be of a rating approved by BPI and protected by suitably sized surge arrestors on the supply side, where required by BPI. This switch shall be under BPI operating control with our padlocks installed on it.

6.2.2.1 CUSTOMER OWNED POLE (OR POLE LINE)

If the Customer is supplying a dip pole, which is stand alone or part of a pole line, this pole or pole line shall be designed to be completely self-supporting and meet or exceed the safety requirements of OESC and the construction shall be verified by ESA. In addition to this, the first pole in the pole line connecting to BPI overhead wires from its service pole on the boulevard shall carry BPI-approved cross-arm, terminal connections and insulators. BPI shall provide the necessary loading tensions of its overhead wires to the Customer. The pole shall match the installed height of BPI service pole on the boulevard. BPI may be contacted to confirm requirements such as location and/or guying. The pole line must be installed and pass ESA inspection before service connections are made available from BPI service pole.

The Customer pole connecting to BPI overhead wires shall generally be located within 3m of a paved roadway with vehicular right-of-way. In case of installation on dead-end access, at least 5m length of the roadway shall be extended beyond the pole location to allow adequate clearance to BPI service trucks and personnel. This pole must be adequately back-guyed and anchored as required for unbalanced forces on the pole and the installation verified by ESA before service connections from BPI dip pole are made.

If an existing Customer-owned pole or pole line is available on the property, which may be used to support the new service, the entire pole line (or pole) shall be redesigned to accommodate the new service wires and the design shall meet or exceed the safety requirements of OESC.

6.2.2.2 CUSTOMER OWNED TRANSFORMER REQUIREMENTS

Customer owned transformers connected to BPI distribution system shall be built in accordance with CAN/CSA-C88-M90 (Power Transformers and Reactors), latest edition. As a general guideline, these transformers shall meet CSA C802 standard specifications with respect to impedances and efficiencies. The Customer must submit the following for review and approval by BPI before purchasing and installing there transformation assets:

- a. specification of the transformer, including but not limited to, kVA capacity, short-circuit rating, manufacturer's performance curves, primary and secondary voltages, configuration, tap positions and bushing design, core and winding construction details, cable termination details, basic impulse levels, insulation class, operating temperature and cooling details;
- b. any non-standard loading conditions (e.g. harmonic loading etc.);
- c. all certified factory and field acceptance test results including but not limited to resistance measurements, no-load loss at rated voltage, exciting current at rated voltage, impedance and load loss, applied potential tests, induced potential tests, polarity and phase relation tests, ratio test, low frequency test and chopped wave and full wave impulse tests (Losses shall be corrected to 85⁰C);
- d. a coordination study, which demonstrates co-coordinated protection between BPI's over-current protection installed at the point of primary supply (where applicable), the transformer's (or substation's) high-voltage over-current protection and the transformer's (or substation's) low-voltage over-current protection;
- e. one set of as-built name plate and outline drawings of the transformer and any high-voltage (and where applicable, medium-voltage) switchgear; and
- f. one set of design and as-built site plan of the transformer station showing the equipment layout, proposed primary connections, grounding and fence details, where applicable;
- g. Location and design of the underground structures, vault or transformer room shall generally follow the same guidelines as described in Section 6.2.1.3 above.

6.2.2.3 CUSTOMER OWNED PRIMARY CABLES

The specification and installation of Customer owned primary cables shall either conform to the requirements in OESC or as per Section 6.2.1.2.1 of this document.

6.2.2.4 CUSTOMER OWNED PRIMARY SWITCH

6.2.2.4.1 OVERHEAD PRIMARY SWITCH

Customer shall supply and install a 3-phase (or single-phase) gang operated primary switch maintained by the Customer but shall have BPI lock on it. The minimum rating for the Customer supplied switch shall be 34.5kV, 200kV BIL, 600A rated with 4000A momentary and 2000A fault closing, one-time, duty cycle. This primary switch shall be under the operational control of BPI. The switch shall be located on Brantford Power pole at the ownership demarcation point or the Customer pole located within the property as determined by BPI.

6.2.2.4.2 PAD MOUNTED PRIMARY SWITCH

In underground installations or if a pole-mounted switch is not practical to install, a pad mounted load break switch with locking mechanism, shall be required at a location within the property as determined by BPI. The switch shall have the same minimum rating as described above. The switch shall be operated and maintained by the Customer but under the operational control of BPI with our lock on it. Foundation, duct support and associated structures for the switch shall be installed and maintained by the Customer and shall be constructed using the same standards as described earlier in this specification.

7.0 CONSTRUCTION GUIDELINES

7.1 EXCAVATION

The following installation standards shall be followed on all Customer installations outside the property line, in particular and all Customer installations carrying BPI services and connecting to BPI owned equipment and/or services inside the property line in general.

All underground services shall be installed with a minimum 1 m. depth of cover over the top of a direct buried cable or conduit. The Customer/Contractor shall note that in some areas underground sewer mains and services, storm drains, telephone or communications cables, gas lines, and other below ground utilities may exist in close proximity to the work. Excavation around other utilities, pipes, culverts, and similar installations shall be done with extreme care.

It shall be the Customer or Contractor's responsibility to contact the Customer/operator of each utility encountered, and obtain information relative to location and depth before excavating in the area. In the event of a conflict with the location of work, the encountered

utilities shall not be disturbed before approval is obtained from the utility's owner. Private utilities encountered shall be brought to the attention of BPI. The Customer or his/her Contractor shall promptly notify the utility concerned in the event of damage occurred during construction, whether caused by him/her or others.

Where existing or proposed pipes, conduits, culverts, cables, wires, etc. interfere with laying at this depth, services may be installed at greater depth to clear the obstruction by at least twelve (12) inches, where practical.

Excavation shall be kept free of water and precautions shall be taken to prevent entry of water, mud or other foreign substances into the line. Temporary caps shall be installed over all openings at the end of each day, when the work is suspended for periods of 30 minutes or more (including lunch hours), or whenever necessary to protect the work in progress.

Underground Customer-owned cable installations outside the property shall generally be made in poly pipes using directional drilling and pulling the secondary using pull ropes to the demarcation point, unless otherwise directed by BPI. Where open-cut trenching is allowed by BPI, concrete-encased DB2 type ducts shall be installed. Conduits shall be carefully lowered into the excavation and guided into proper position, separated by spacers and joined to the preceding length or fitting. The joints in adjacent ducts shall be staggered by at least 200mm. Suitable excavated material (i.e. free of stones and capable of being properly compacted) or borrow shall be placed and tamped under and around the conduit, taking care to maintain equal depth on both sides and to prevent movement from its proper alignment. Where directed by the BPI, due to soft or otherwise unsuitable bottom conditions, bedding shall be placed in accordance with BPI requirements.

All excavated areas shall be adequately shored and braced so that the earth will not slide or settle, and so that all existing installations of any kind are duly protected from damage. All damage resulting from inadequate bracing or shoring will be the responsibility of the Customer/Contractor.

Special precaution shall be taken when excavating near road curbs. Should it become necessary to remove curbing, the Customer/Contractor shall, at their own expense, replace the curbing to the City of Brantford Construction Specifications.

7.2 CONCRETE FOR FOUNDATIONS AND DUCTS

Concrete shall be poured in place or pre-cast in accordance with BPI standard details. Poured in place sections shall be constructed by pouring concrete between the fitting and the undisturbed wall of the trench. Care shall be exercised to ensure that the concrete is clear of joint accessories, bolts, nuts etc.

Concrete shall be composed of Portland cement, water, fine and coarse aggregate no larger than 13mm (1/2"), and an air-entraining, low-sump mixture. Accelerating or anti-freeze admixtures will not be permitted. No above-grade pour shall be allowed when forecasted ambient temperature is above 25°C or below 5°C within 72 hours of the pour-in. Below-grade poured concrete shall be provided with adequate coverage to protect against thermal damage. Cement shall be of Type II conforming to ASTM C150 or ASTM C175. Preferably, water used in mixing and curing concrete shall be potable (heated and

cooled seasonally). Non-potable water shall be fresh, clean and free from injurious amounts of sewage, oil, acid, alkali, salt, or organic matter. Air entraining admixtures shall conform to the Specifications for Air Entraining Admixtures for Concrete (ASTM C260).

Unless otherwise shown on drawings, concrete used for load bearing foundations (such as pad mounted transformer, switches, roadway crossings etc.) shall have a 28-day minimum compressive strength of 30 Mpa. Vaults shall be pre-cast with smooth-finish tops formed with a #3 Hi-bond reinforcing steel rebar design (minimum diameter of 3/8", centred at 6" in both directions to cover the entire area) and tested for heavy wheel loading. All other underground concrete structures shall have a 28-day compressive strength of 20 MPa or more without rebar. Duct openings in concrete structures shall be flared and recessed with poly-seals.

The slump of concrete for foundations shall be the minimum that is practicable such that the concrete may be easily shaped into the desired form. Segregation of materials in the mixture shall not be permitted. When poured in place on site, forming, and placing of concrete may be inspected and shall be subject to approval by BPI.

Curing and form removal for concrete sections, and requirements due to air temperature and weather conditions shall follow proper construction practices and shall be subject to approval by BPI.

7.3 VAULTS FOR TRANSFORMER AND SWITCHGEAR

The Customer shall supply and install a concrete pad for BPI owned transformer or switchgear in a location acceptable to BPI and shall provide BPI with a registered easement on his or her property for the purpose. Drawings showing typical transformer pre-cast vaults are included with this specification.

The top surface of the concrete pad must be 50mm(2") to 75mm(3") above the surrounding finished grade. The earth beneath the foundation shall be un-disturbed or well tamped. Smooth clear stone of size 19mm (3/4") shall be laid to a depth of 300mm (1') under the entire structure and shall extend 200mm (8") beyond the outer walls of the concrete vault. The grade of the area surrounding the pad shall be sloped in such a manner that run-off is directed away from the pad. The earth material around the pad shall be prepared and maintained to prevent formation of sinkholes.

Where poured-in foundations are used, placement of the transformer on pads shall not be made before the foundations have reached full strength, which shall not be less than 7 days in all circumstances and shall be determined by the Customer. Any resulting damage to the transformer or switchgear after placement, shall be the responsibility of the Customer or Contractor and may delay energization of service by BPI.

8.0 TEMPORARY POWER

If it becomes necessary to provide temporary power facilities, it is understood that all costs for installation and removal of installation will be borne by the Customer. Prepayment and/or purchase order will be required in advance to cover the cost of service.

Temporary service shall be sanctioned by BPI for a period of 12 months and the Customer will be required to obtain ESA approval of its installation and submit it to BPI together with the application for temporary power. Upon the expiry of the 12-month period, the service may be renewed for another 12-months at the discretion of BPI and the Customer would require re-inspection and approval of its installation by ESA, which shall be made available to BPI. The application and all required documentation must be submitted to Customer Services department, 220 Colborne Street.

9.0 IN-SERVICE DATE

It is important that the Request For Service Form be filled out and returned to Brantford Power Inc. The actual required in-service date must be known well in advance to allow BPI to prepare the work. Failure to provide adequate notice to BPI may result in delay of energization on the requested date(s).

APPENDIX - A

APPROVED CABLE SPECIFICAITONS

**BRANTFORD POWER INC.
OF THE CITY OF BRANTFORD**

SPECIFICATION NO. 05-1/0-C-XL

**GENERAL SPECIFICATION FOR 1/0 28kV
CONCENTRIC NEUTRAL POWER CABLE**

STANDARDS

All insulated power cable manufactured under this specification will conform to standards of materials, construction and testing as required by the latest revision of IPCEA Standard and CSA Standard C68.2 most recent issue.

OPERATING CONDITIONS

Power cable manufactured under this specification shall be capable of continuous operation at 60 cycle A.C. at 90o C at voltage as specified and must be suitable for installation at minus 40o C and must be suitable for operation direct buried, in underground duct or exposed to ambient air in direct sunlight in wet or dry locations.

CABLE CONSTRUCTION

Conductor:	Annealed compressed strand copper with strand block
Strand Shield:	Extruded semi-conducting cross linked polyethylene
Insulation:	Cross-linked polyethylene tree retardant
Insulation Shield:	Semi-conducting polyethylene or cross-linked polyethylene
Concentric Neutral:	Annealed copper wires, 100% capacity
Jacket:	Polyvinyl chloride

TESTING

Completed cable test reports shall be submitted to the Brantford Power Inc. of the City of Brantford prior to shipment.

PACKAGING

Cable manufactured under this specification shall be shipped in minimum lengths of 650 M and maximum lengths not to exceed the capacity of 130 cm. diameter reel size.

Approved:

George Mychailenko, P. Eng.
CEO
Brantford Power Inc.
August 26, 2005

**BRANTFORD POWER INC.
OF THE CITY OF BRANTFORD**

SPECIFICATION NO. 05-UG-SEC

**GENERAL SPECIFICATION FOR
DIRECT BURIED SECONDARY CABLE**

1. SCOPE

This specification covers the requirements for direct burial secondary cable for 600 Volt underground distribution system.

2. STANDARDS

All cable manufactured under this specification will conform to standards of materials, construction and testing as required by CEA Specifications WCW-04 USC 90, except as modified by this specification.

3. CONSTRUCTION

The finished cable shall consist of one, two or three (as required) insulated and jacketed conductors. Two and three conductor cables shall be twisted with a right-hand lay not less than 25 and not more than 60 times the diameter of the finished cable. Three conductor cable shall be reduced neutral as per table 1.

4. COLOUR CODE

The two phase conductor shall be coloured black and red and the neutral conductor shall be coloured white.

Cable Sizes to be Triplexed

Phase (2 conductors)		Neutral (1 conductor)	
2	AWG	4	AWG
1/0	AWG	1/0	AWG
3/0	AWG	3/0	AWG
250	AWG	3/0	AWG
500	AWG	250	AWG

Approved:

George Mychailenko, P. Eng.
CEO
Brantford Power Inc.
August 26, 2005

APPENDIX - B

APPROVED EQUIPMENT CATALOGUE

CATALOG NUMBERS OF APPROVED EQUIPMENT

EQUIPMENT	MANUFACTURER	CAT NO.
Loadbreak Elbow with Test Point	Cooper/RTE	PLE228F06TC
Bushing Well Insert	Cooper/RTE	LBI228
Feedthru Insert	Cooper/RTE	LFI228
Portable Feedthru	Cooper/RTE	2637167-C-01-MC
Loadbreak 2-way Junction	Cooper/RTE	2637160-B-01-MG
Loadbreak 3-way Junction	Cooper/RTE	2637160-B-02-MG
Loadbreak 4-way Junction	Cooper/RTE	2637160-B-03-MG
Insulated Stand Off Bushing	Cooper/RTE	ISB228
Protective Cap	Cooper/RTE	PLPC228
Splice	3M	5456A / CI-CSA-1/0A
TPR Fault Indicator with 800 Amp Trip Rating	Cooper/RTE	STHI
Overhead Fault Indicator	Cooper/RTE	SDHI2
Cold Shrink O/H Cable Termination Kit	3M	5646
Elbow Type Lightning Arrestor	Cooper/RTE	3238019C21-M
Secondary Connector	CMC/ESP	14ABV350MS-2SLI
34 KV 100 Amp Load Break Cutout	ABB	Y4JCBNTA12
O/H Lightning Arrestor 21 KV	Ohio Brass	217617-8741
ETP40 Sure-Guard O/H Current Limiting Fuse 40 K	General Electric	GE9559UBD134
EMS Marker	3M	1256
Fiberglass U-guard	Bel-Volt	8314FX8' FLARED
3 PHASE CUTOUT BRACKET	Bel-Volt	G3HAA16022DD

NOTE: Elbow and splices are sized for use with 1/0-compressed cable with insulation diameter of 0.98 - 1.05 inches.

APPENDIX - C

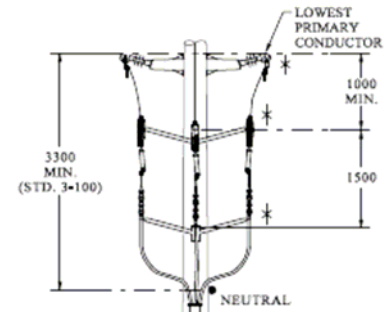
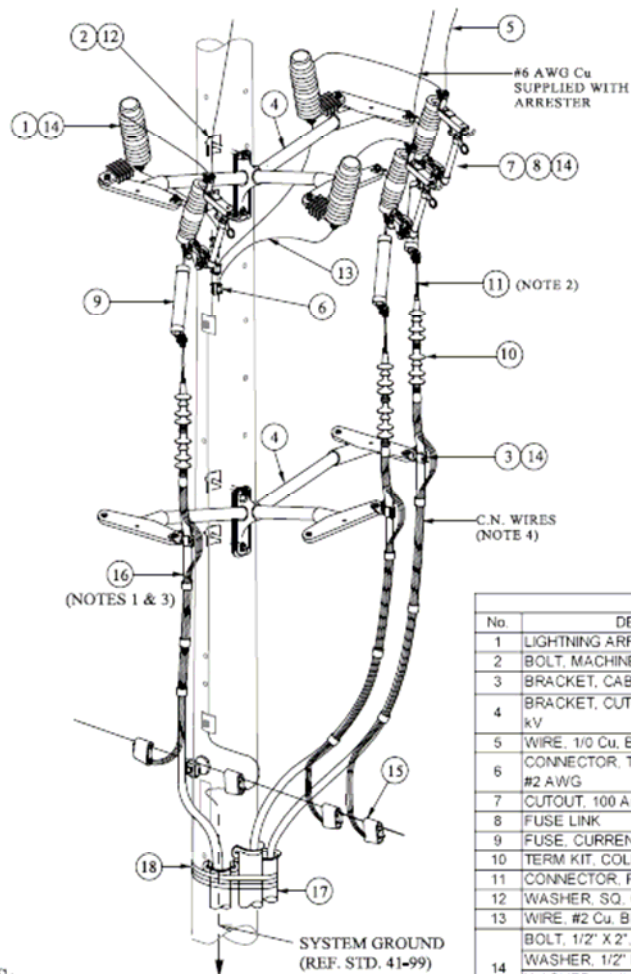
APPROVED DRAWINGS

METRIC

LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-103

(JUNE 13, 2008)

FOR CONNECTION TO CIRCUITS
SEE STD. 7-139 TO 7-139C & 7-140**DETAIL 1**3 PHASE TERMINATION
MOUNTING CLEARANCES**NOTES:**

1. POSITION OF CABLES SHOULD NOT BLOCK CUTOUPS OPERATION.
2. BEND PIGTAIL CONNECTOR, AS REQUIRED, AT 90° MAXIMUM WHEN POSITIONING THE CABLE.
3. TO PREVENT MECHANICAL STRESSES PROVIDE APPROPRIATE SLACK ON CABLES.
4. ALL C.N. WIRES SHALL BE BONDED TO SYSTEM NEUTRAL. TIE TO OR WRAP AROUND CABLE.

* - POINT OF ATTACHMENT

BILL OF MATERIALS			
No.	DESCRIPTION	QTY.	PART NO.
1	LIGHTNING ARRESTER, 21KV	3	0023B1
2	BOLT, MACHINE, 5/8" x L	4	MB5816-MB5818
3	BRACKET, CABLE MOUNTING, 1/0 28kV	3	MB-4
4	BRACKET, CUTOUP, 3PH, UP TO 27.6 kV	2	3BRACK
5	WIRE, 1/0 Cu, BARE, 19 STRAND	++	1BRAID
6	CONNECTOR, TAP, WEDGE, Cu, 1/0 - #2 AWG	3	AMP601
7	CUTOUP, 100 Amp, 34kV	3	00019G
8	FUSE LINK	3	STD. 19U-554
9	FUSE, CURRENT LIMITING	3	STD. 19U-554
10	TERM KIT, COLD SHRINK	3	00624A
11	CONNECTOR, PIN (PIGTAIL)	3	006243
12	WASHER, SQ. CURVED 2" x 2"	4	00118A
13	WIRE, #2 Cu, BLACK	++	00351A
14	BOLT, 1/2" X 2", HEX HEAD PLATED	9	12X2BT
15	WASHER, 1/2" LOCK	9	12LOWA
16	WASHER, 1/2" FLAT, PLATED	9	WAS102
17	NUT, 1/2", COURSE 13	9	NUT102
18	CONNECTOR, TAP, WEDGE	3	STD. 7-737
19	CABLE, Cu, 1/0, 28 Kv	++	00341B
20	CABLE GUARD - 3-1/4" FIBERGLASS 8' LENGTHS, FLARED	9*	UGUARD
21	TIE-CABLE RISER-BLACK, FARGO GJ 856-8, (02C04)	**	003554

* Three lengths of cable guards per conduit on average

++ - LENGTH TO SUIT

** - QUANTITY TO SUIT

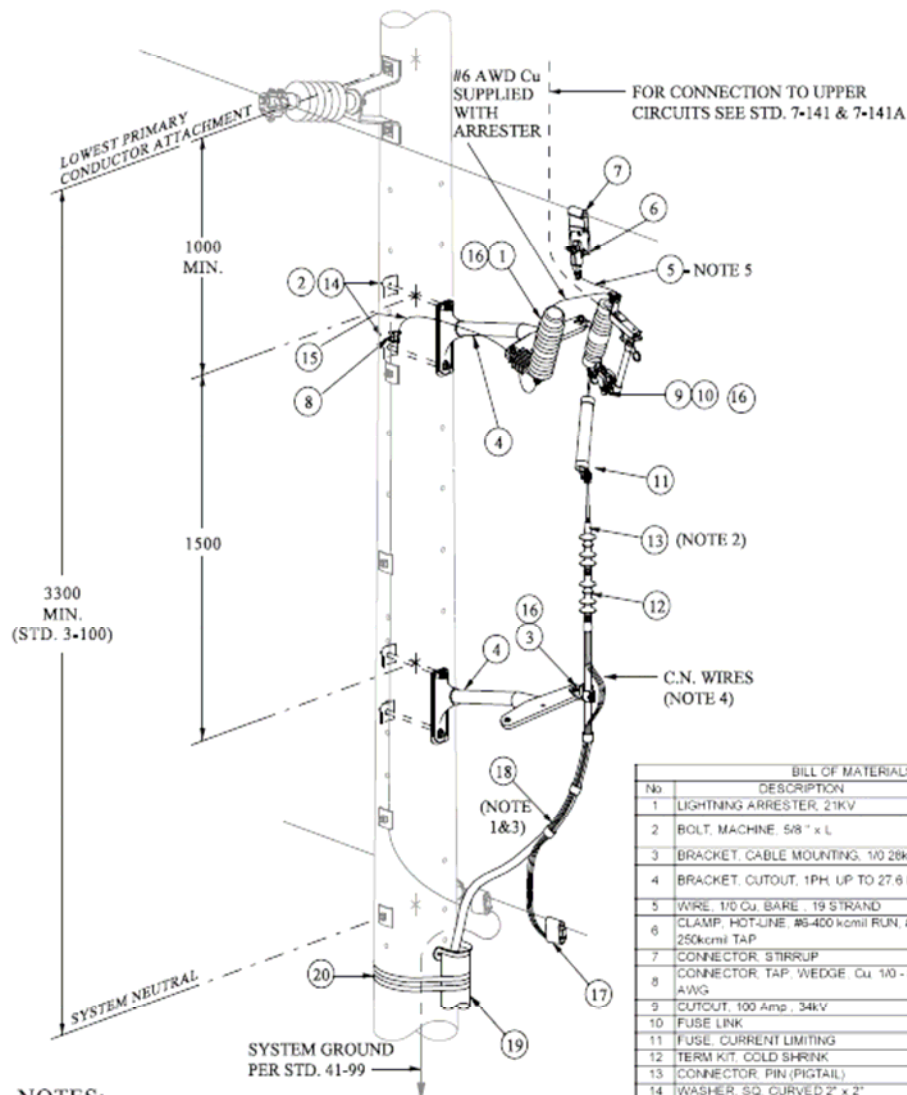
**27.6 kV THREE PHASE, FUSED
UNDERGROUND TERMINATION POLE**

METRIC

LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-104

(JUNE 13, 2008)

**NOTES:**

1. POSITION OF CABLES SHOULD NOT BLOCK CUTOUPS OPERATION.
2. BEND PIGTAIL CONNECTOR, AS REQUIRED, AT 90° MAXIMUM WHEN POSITIONING THE CABLE.
3. TO PREVENT MECHANICAL STRESSES PROVIDE APPROPRIATE SLACK ON CABLES.
4. ALL C.N. WIRES SHALL BE BONDED TO SYSTEM NEUTRAL. TIE TO OR WRAP AROUND CABLE.
5. RED, WHITE OR BLUE PHASE PRIMARY TAP CONNECTION PER CONSTRUCTION DRAWING.

† POINT OF ATTACHMENT

BILL OF MATERIALS			
No.	DESCRIPTION	QTY	PART NO.
1	LIGHTNING ARRESTER, 21KV	1	0025B1
2	BOLT, MACHINE, 5/8" x L	4	MB5816-MB5816
3	BRACKET, CABLE MOUNTING, 1/0 28kV	1	MB-4
4	BRACKET, CUTOUP, 1PH. UP TO 27.6 kV	2	1BRACK
5	WIRE, 1/0 Cu. BARE, 19 STRAND	**	1BRAID
6	CLAMP, HOT-LINE, #6-400 kcmil RUN, #6-250kcmil TAP	1	HOTLIN
7	CONNECTOR, STIRRUP	1	STD. 7-737
8	CONNECTOR, TAP, WEDGE, Cu. 1/0 - #2 AWG	1	AMP601
9	CUTOUP, 100 Amp, 34kV	1	000150
10	FUSE LINK	1	STD. 19U-554
11	FUSE, CURRENT LIMITING	1	STD. 19U-554
12	TERM KIT, COLD SHRINK	1	00624A
13	CONNECTOR, PIN (PIGTAIL)	1	006243
14	WASHER, SQ. CURVED 2" x 2"	4	00118A
15	WIRE, #2 Cu. BLACK	**	00351A
16	BOLT, 1/2" X 2", HEX HEAD PLATED	3	12X2BT
17	WASHER, 1/2" LOCK	3	12LOWA
18	WASHER, 1/2" FLAT, PLATED	3	WAS102
19	NUT, 1/2", COURSE 13	3	NUT102
20	CONNECTOR, TAP, WEDGE	1	STD. 7-737
21	CABLE, Cu., 1/0, 28 Kv	**	00341B
22	CABLE GUARD - 3 1/4" FIBERGLASS, 6' LENGTHS, FLARED	3	UGUARD
23	TIE CABLE RISER-BLACK, FARGO GJ 856-8 (02C04)	**	003554

** - LENGTH TO SUIT
** - QUANTITY TO SUIT

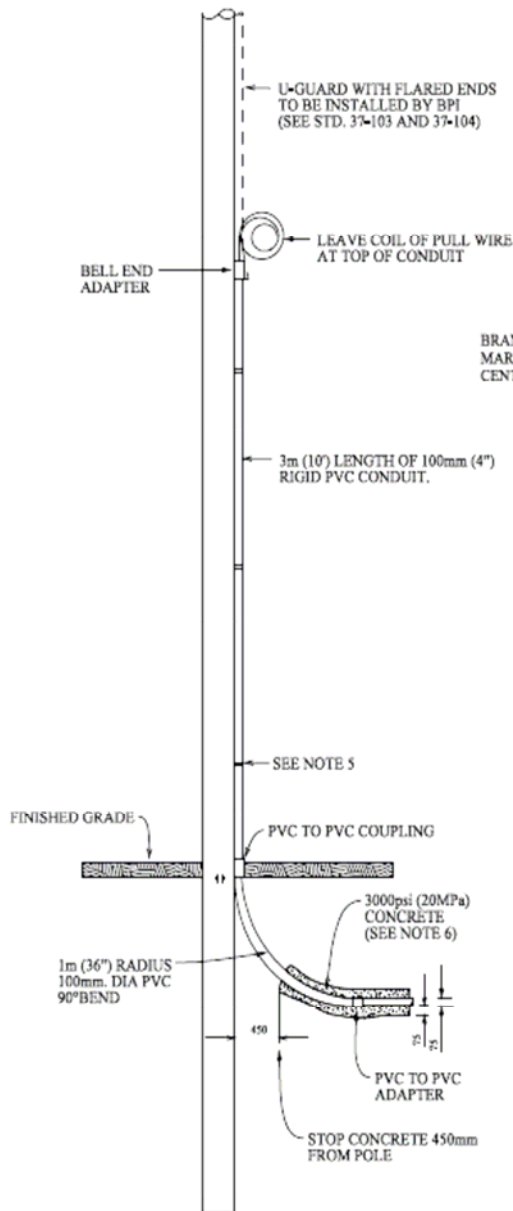
**16kV SINGLE PHASE, FUSED
UNDERGROUND TERMINATION POLE**

METRIC

LINEAR DIMENSIONS SHOWN IN MILLIMETRES

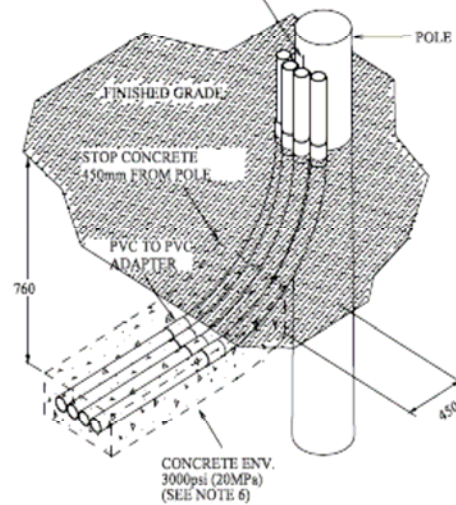
37-190

(JUNE 13, 2008)



SIDE VIEW

BRANTFORD POWER WILL PLACE
MARK ON POLE. CONDUIT SHALL BE
CENTERED ABOUT THIS MARK



NOTES:

1. CONDUIT BENDS, RISERS AND FITTINGS SHALL BE CSA APPROVED, SCHEDULE 40 HEAVY WALL, RIGID PVC WITH A MINIMUM WALL THICKNESS OF 0.213".
2. SPARE DUCTS SHALL BE TURNED UP POLE & PLUGGED AT TOP OF 3 METRE (10') LENGTH OF CONDUIT.
3. ALL CONDUITS SHALL BE INSTALLED ON THE FIELD SIDE OF THE POLE UNLESS OTHERWISE APPROVED BY BPI.
4. POLE MUST BE IN PLACE BEFORE INSTALLING 90 DEGREE BENDS.
5. CONDUIT SHALL BE CLAMPED OR STRAPPED TO THE POLE USING "BANDIT" OR APPROVED EQUIVALENT STRAPS WITH A MAXIMUM SPACING OF 1524 (5') BETWEEN SUPPORT POINTS.
6. CONCRETE ENCASUREMENT REQUIRED IF MORE THAN TWO DUCTS ARE INSTALLED.

PRIMARY DIP POLE CABLE INSTALLATION

2.4/4.16kV TO 16/27.6kV

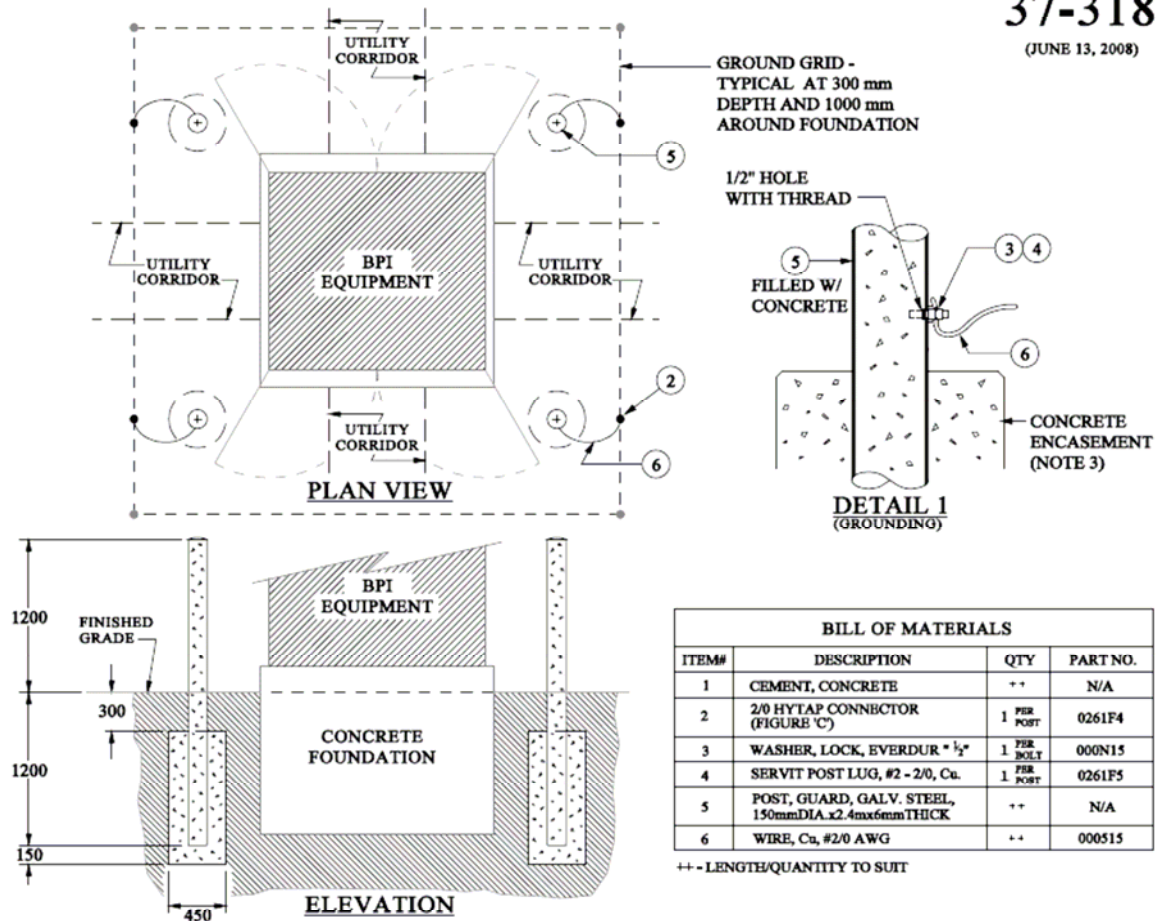


METRIC

LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-318

(JUNE 13, 2008)

**NOTES:**

1. GUARD POSTS SHALL BE 150 mm DIA. x 2.4 m LONG x 6 mm THICK GALVANIZED STEEL PIPE FILLED WITH CONCRETE.
2. LOCATION AND NUMBER OF GUARD POSTS SHALL BE DETERMINED AND FINALIZED BY BPI INSPECTOR TOGETHER WITH THE FOLLOWING CRITERIA:
 - 2.1. MUST ALLOW EQUIPMENT'S DOORS (INCLUDING SUB-COMPARTMENT'S DOORS) TO BE OPENED THROUGH ITS FULL RANGE.
 - 2.2. MUST ALLOW BPI PERSONNEL UNIMPEDED ACCESS TO THE EQUIPMENT AND PERMIT COMPLETE AND SAFE OPERATION OF THE EQUIPMENT.
 - 2.3. 500 mm MINIMUM CLEARANCE BETWEEN THE GUARD POST'S CONCRETE ENCASEMENT AND THE UTILITY CORRIDOR.
 - 2.4. 100 mm MINIMUM CLEARANCE BETWEEN THE GUARD POST'S CONCRETE ENCASEMENT AND THE GROUND GRID.
3. THE GUARD POSTS SHALL BE CONCRETE ENCASED IN 20 MPa CONCRETE WITH 10 mm PEA GRAVEL AGGREGATE.
4. WHERE GUARD POSTS ARE INSTALLED IN BACKFILL OR DISTURBED EARTH, ENSURE BACKFILL MATERIAL IS THOROUGHLY COMPACTED.
5. GUARD POSTS SHALL BE PAINTED WITH SAFETY STRIPES TO CITY OF BRANTFORD MUNICIPAL STANDARD. FOR PROPER ADHESION OF PAINT, GUARD POSTS MUST BE CLEANED (FREE FROM DIRT, GREASE/OIL AND EXHAUST FUMES) AND PRIMED PRIOR TO PAINTING. PRETREATMENT PRIMER MUST BE COMPATIBLE WITH GALVANIZED COATING, SUCH AS MODIFIED ACRYLIC WATER-BORNE PRIMERS. FOR HIGH ADHESION OF PAINT, BRUSH OR SWEEP BLAST THE GALVANIZED POSTS IMMEDIATELY PRIOR TO PAINTING.

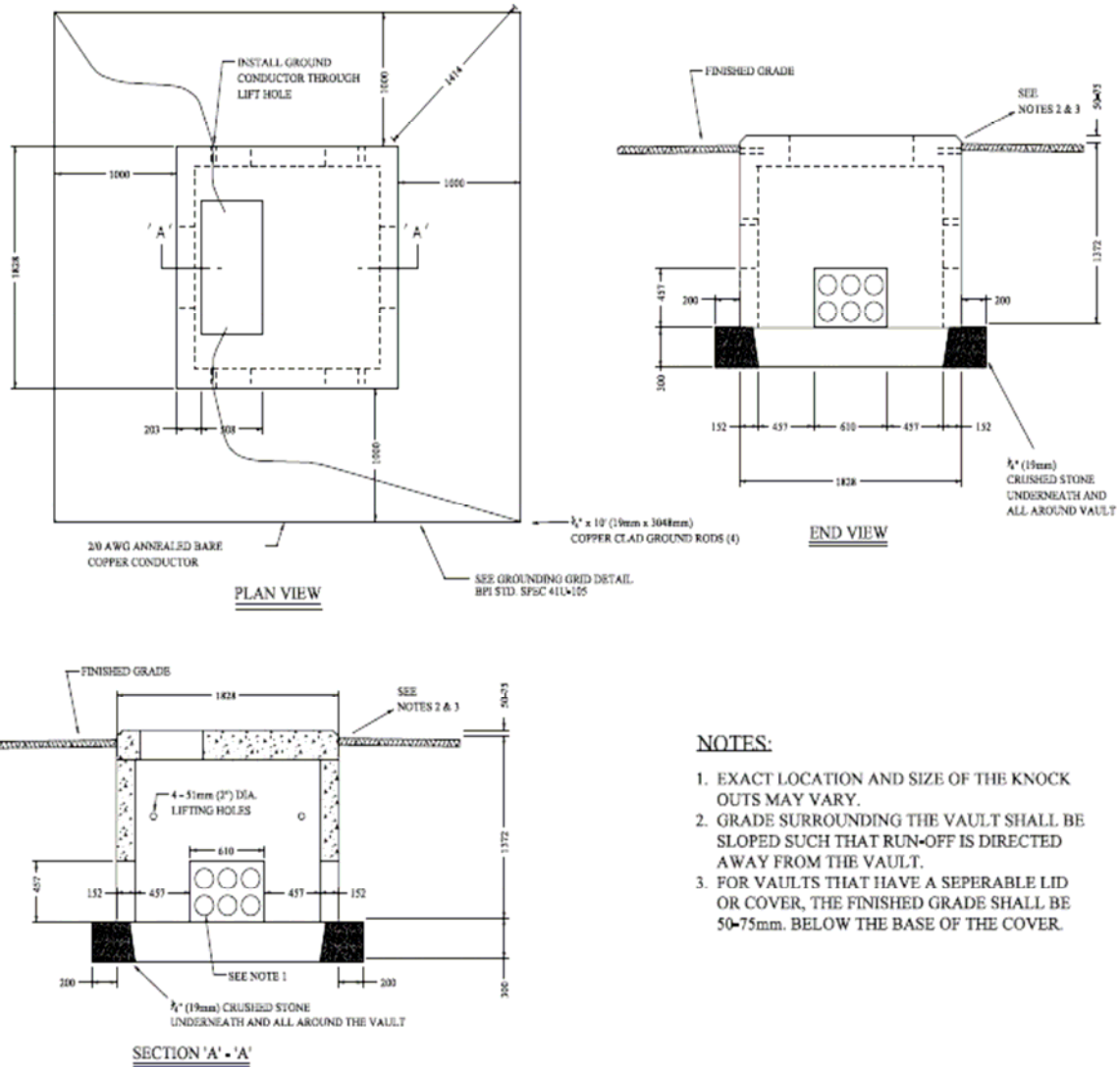
TYPICAL GUARD POST INSTALLATION

METRIC

LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-329A

(JUNE 13, 2008)



NOTES:

1. EXACT LOCATION AND SIZE OF THE KNOCK OUTS MAY VARY.
2. GRADE SURROUNDING THE VAULT SHALL BE SLOPED SUCH THAT RUN-OFF IS DIRECTED AWAY FROM THE VAULT.
3. FOR VAULTS THAT HAVE A SEPERABLE LID OR COVER, THE FINISHED GRADE SHALL BE 50-75mm. BELOW THE BASE OF THE COVER.

THREE PHASE TRANSFORMER VAULT
1.83m (72") x 1.83m (72") X 1.45m (57") D



METRIC

LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-341-1

(JUNE 13, 2008)

1. DESIGN CONSIDERATIONS

1.1. BENDS AND TURNS IN A DUCT RUN SHALL BE ACCOMPLISHED BY A GRADUAL SWEEP. ALL 90 DEGREE CHANGES IN DIRECTION SHALL BE MADE OF 1.5 m (60") RADIUS ELBOW. THE ANGLE AND NUMBER OF BENDS ON A SINGLE RUN SHALL BE DETERMINED BASED ON PULL CALCULATIONS. ON TIGHT LOCATIONS. A 900mm TURN RADIUS MAY BE ALLOWED UPON APPROVAL BY BPI.

1.2. DUCT BANKS SHALL BE BURIED WITH A MINIMUM COVER OF 760 mm ABOVE CONCRETE. AT ROAD CROSSINGS THE MINIMUM BURIAL DEPTH SHALL BE 1000mm.

TRENCH RESTORATION SHALL BE MADE UP OF CLEAN BACKFILL ON DUCT BANKS INSTALLED UNDER LAWNS AND PARKWAYS. DUCT BANKS ALONG BOULEVARDS OR ACROSS ROADS SHALL HAVE BACKFILL MATERIALS AND TRENCH RESTORATION TO CONFORM WITH THE MUNICIPAL OR REGIONAL AUTHORITY, AS REQUIRED.

1.3. CUSTOMER'S DUCT BANK SHALL HAVE A MINIMUM SLOPE OF 1% AWAY FROM THE BUILDING. CONSULT BPI INSPECTOR WHERE THE ABOVE REQUIREMENT CANNOT BE MET.

1.4. DUCT BANK SHALL BE TERMINATED IN A LANDSCAPED AREA AT THE LOCATION GIVEN BY BPI.

1.5. DUCT CONFIGURATIONS NOT COVERED BY STD. 37-343 TO 37-345 SHALL BE ARRANGED IN A SIMILAR MANNER SUBJECT TO BPI APPROVAL.

DUCT BANK CONSTRUCTION

2.

2.1. THE DUCT SHALL BE 100 mm (4") DIAMETER, PVC TYPE DB2/ES2 (SOLID WALL ONLY) C/W BELL END AND SHALL BE APPROVED AS PER C.S.A. STANDARD C22.2 No. 211.1 (LATEST REVISION) AND BY BPI.

2.2. ALL FITTINGS AND BENDS SHALL BE PVC TYPE DB2/ES2. APPROVED SOLVENT CEMENT SHALL BE USED TO JOIN ALL DUCTS, FITTINGS AND BENDS AT MINIMUM 30 MINUTES PRIOR TO POURING CONCRETE.

2.3. ALL DUCTS AT THE FACE OF THE DUCT BANK SHALL BE ORIENTED AND TERMINATED WITH EITHER BELL ENDS SUPPORTING CABLES OR PLUGS FOR SPARE DUCTS.

2.4. DUCTS SHALL BE SUPPORTED WITH BPI APPROVED SPACERS EVERY 1.5 m (5 ft) AND BE ANCHORED SO AS NOT TO FLOAT DURING CONCRETE POURING.

2.5. UNLESS SPECIFIED OTHERWISE BY BPI, ALL DUCT BANKS SHALL BE REINFORCED WITH NON PRE-STRESSED 15 mm (5/8") DEFORMED STEEL REINFORCING BARS - GRADE 400 AND CONFORMED WITH C.S.A. G30.12 (LATEST REVISION). STEEL REINFORCING BARS SHALL BE INSTALLED CONTINUOUSLY, MINIMUM 300 mm OVERLAP AND TIED, AND BE LOCATED AS PER BPI STANDARD 37-343 TO 37-345.

CONCRETE ENCASED DUCT BANK REQUIREMENTS



2. DUCT BANK CONSTRUCTION (CONT'D)

- 2.6. UNLESS DIRECTED OTHERWISE BY BPI, STEEL REINFORCING BARS AND DUCTS SHALL BE EXTENDED 300mm BEYOND THE CONCRETE FILL OF THE BANK FOR FUTURE DUCT BANK EXTENSION. REINFORCING BARS SHALL BE PASSED CONTINUOUSLY FROM ONE DUCT BANK TO THE OTHER.
- 2.7. DUCTS SHALL BE ENCASED IN 20MPa CONCRETE WITH 10 mm PEA GRAVEL AGGREGATE. SLUMP MUST NOT EXCEED 100 mm (4") UNDER STANDARD SLUMP TEST. EARTH UNDER DUCT BANK SHALL BE UNDISTURBED OR THOROUGHLY COMPACTED PRIOR TO DUCT BANK INSTALLATION TO ELIMINATE SETTLING OF FINISHED DUCT BANK.
- 2.8. ALL DUCTS SHALL BE MANDRELLED AND BE CLEANED AFTER DUCT BANK INSTALLATION.
- 2.9. ALL SPARE DUCTS SHALL BE EQUIPPED WITH 10 mm (3/8") DIAMETER POLYPROPYLENE ROPE. ALL DUCTS SHALL HAVE THE ENDS SEALED WITH AN APPROVED DUCT PLUG IMMEDIATELY AFTER DUCT BANK INSTALLATION.
- 2.10. END OF DUCT BANK AND ROAD CROSSING SHALL BE MARKED WITH 3M CAT. #EMS 1256 ELECTRONIC MARKER AS PER STD. 37-349.

3. CUSTOMER OBLIGATIONS

- 3.1. CUSTOMER'S DUCT BANK INSTALLATION SHALL BE SUBJECT TO INSPECTION AND ACCEPTANCE BY BPI PRIOR TO POURING OF CONCRETE OR ANY BACKFILL MATERIAL, OR MAY NOT BE PASSED. CUSTOMER SHALL CONTACT BPI INSPECTOR TO ARRANGE FOR INSPECTION 48 HOURS IN ADVANCE OF POURING CONCRETE.
- 3.2. THE CUSTOMER SHALL FOLLOW DIRECTIONS GIVEN BY BPI INSPECTOR FOR ANY SITUATION NOT COVERED IN THIS SPECIFICATION.
- 3.3. DUCTS SHALL BE PROBED PRIOR TO CABLE INSTALLATION. CABLE SHALL NOT BE INSTALLED IN DUCT WHICH DOES NOT ALLOW PASSAGE OF A TEST MANDREL SIZED TO 95 % OF THE DIAMETER OF THE PVC TYPE DB2/ES2 DUCT.
- 3.4. LANDSCAPING, PAVING ETC. SHALL NOT BE COMPLETED UNTIL BPI CABLE INSTALLATION IS COMPLETE. OTHERWISE, ALL RESTORATION SHALL BE DONE BY THE CUSTOMER AT THEIR EXPENSE.

CONCRETE ENCASED DUCT BANK REQUIREMENTS

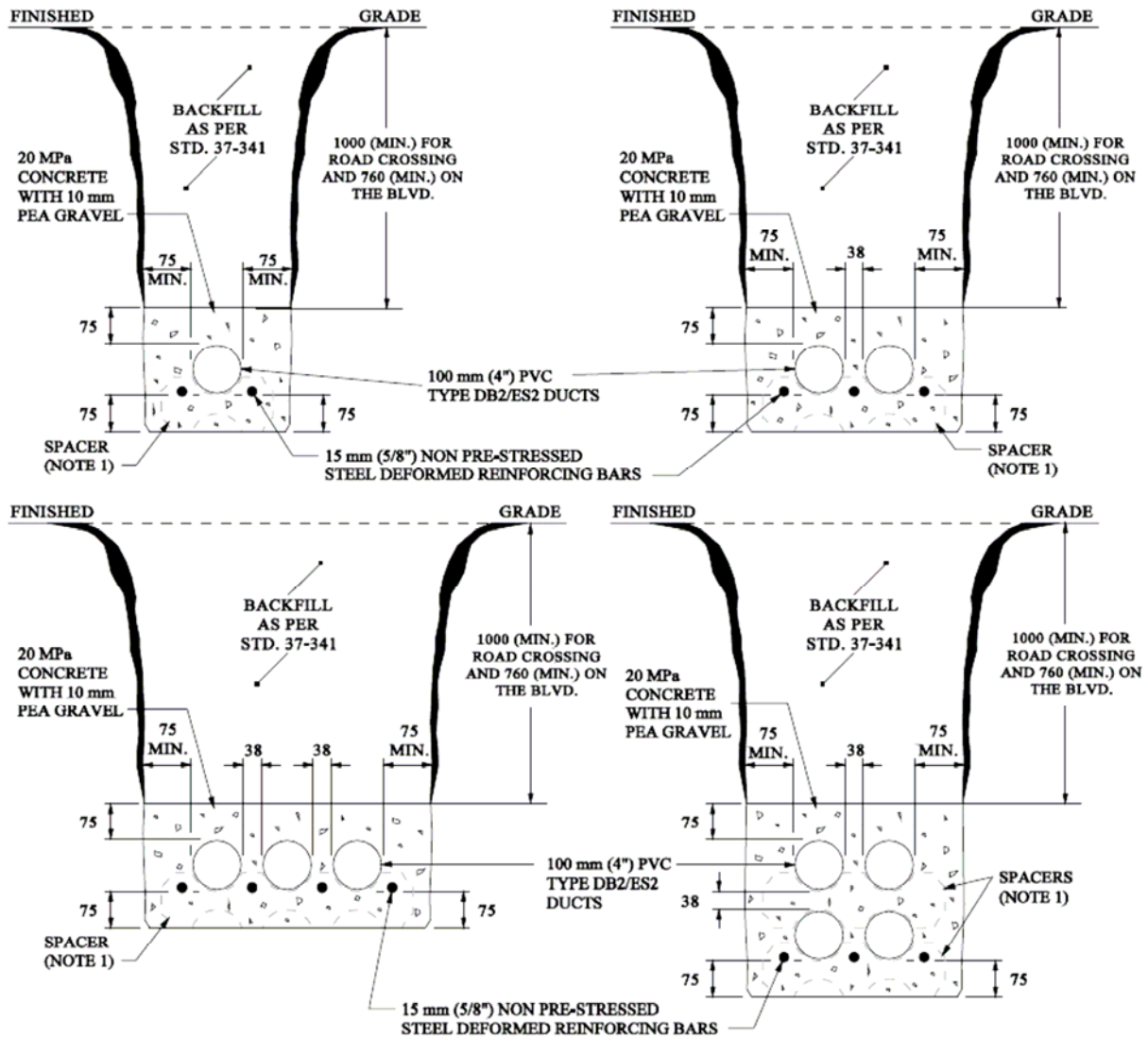


METRIC

LINEAR DIMENSIONS SHOWN IN MILLIMETRES

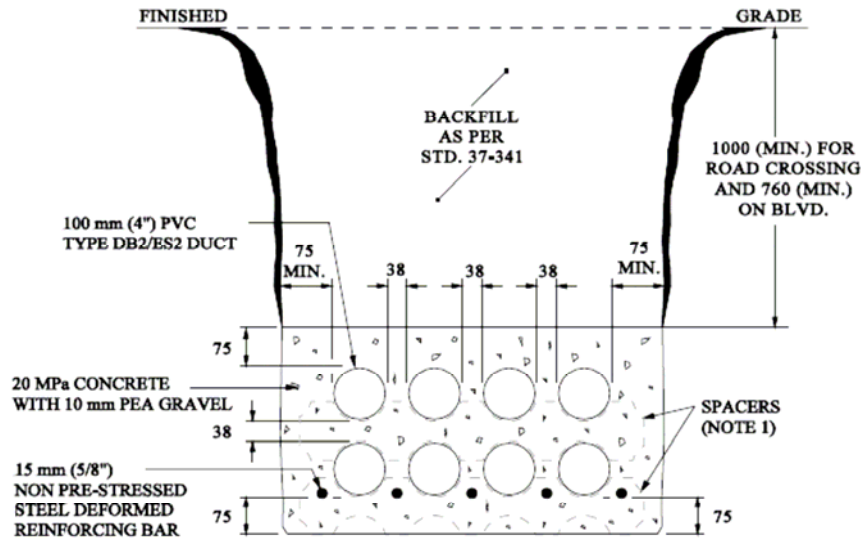
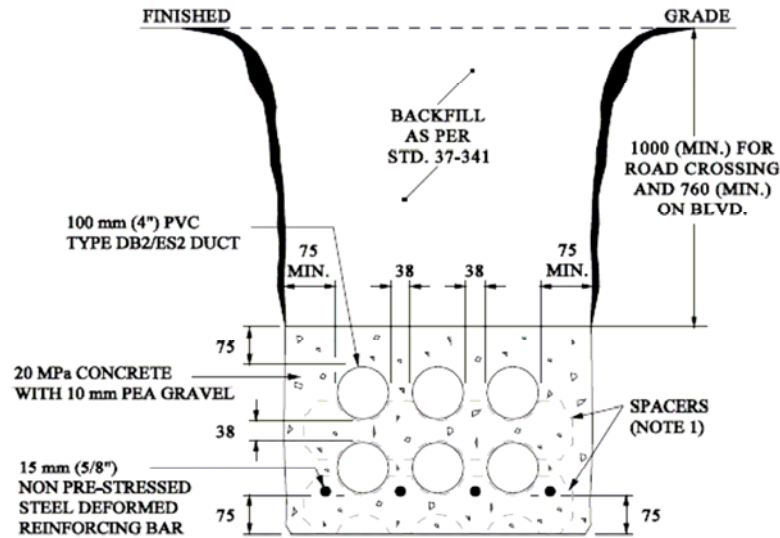
37-343

(JUNE 13, 2008)

**NOTE:**

1. REFER TO STD. 37-341 FOR CONCRETE ENCASED DUCT BANK REQUIREMENTS.

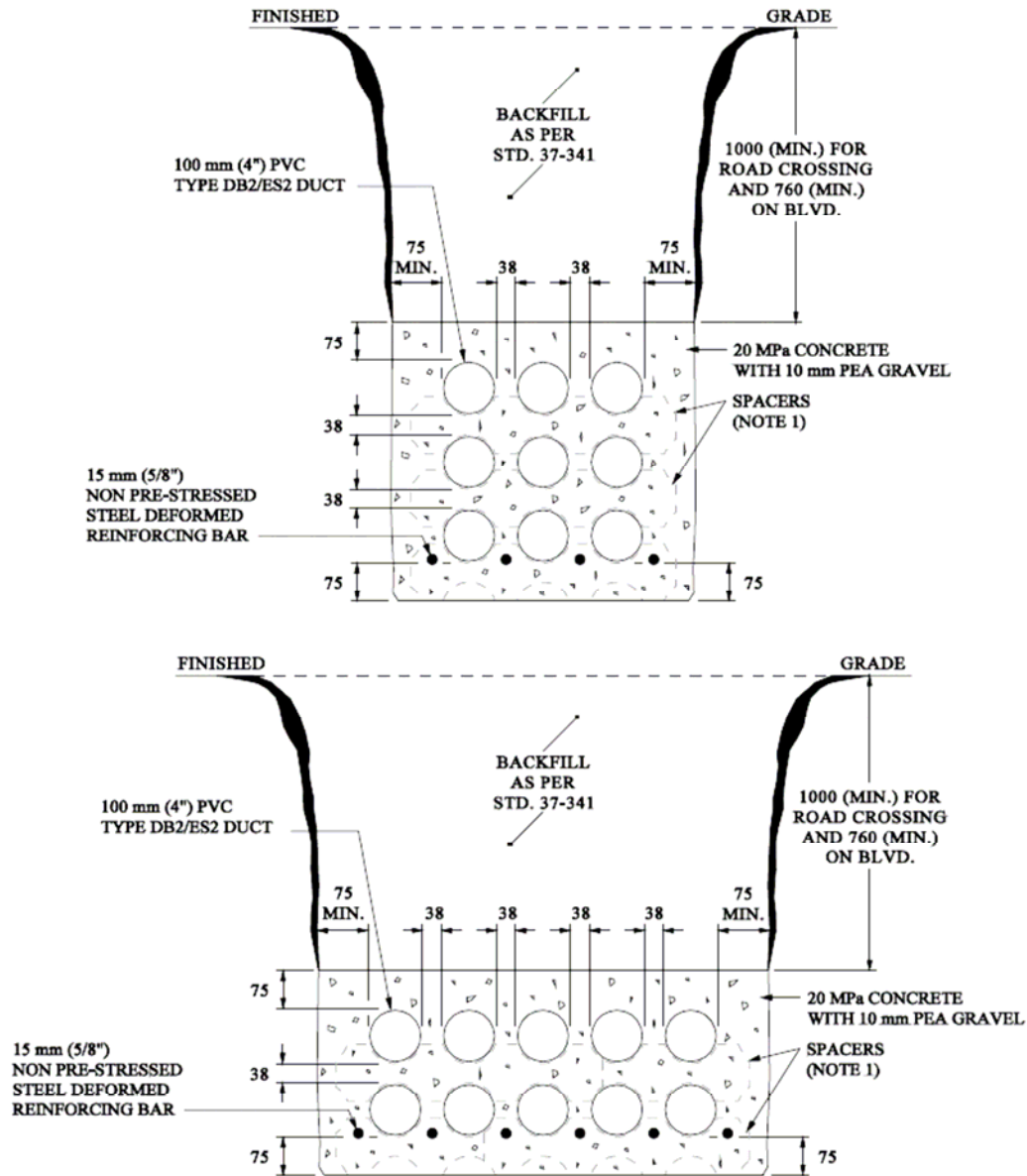
**TYPICAL ARRANGEMENT FOR DUCTS ENCASED IN CONCRETE
FOR 1, 2, 3, 4 DUCTS**



NOTE:

- 1. REFER TO STD. 37-341 FOR CONCRETE ENCASED DUCT BANK REQUIREMENTS.**

**TYPICAL ARRANGEMENT FOR DUCTS ENCASED IN CONCRETE
FOR 6, 8 DUCTS**



NOTE:

1. REFER TO STD. 37-341 FOR CONCRETE ENCASED DUCT BANK REQUIREMENTS.

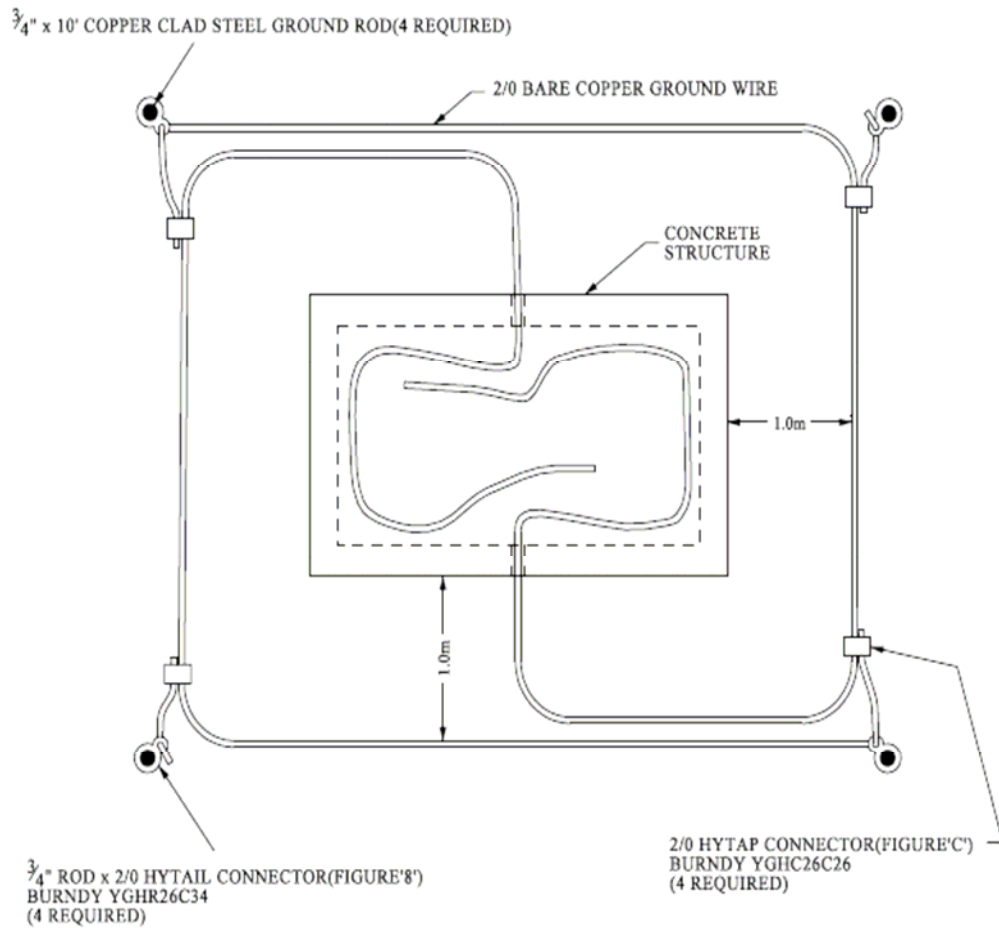
**TYPICAL ARRANGEMENT FOR DUCTS ENCASED IN CONCRETE
FOR 9, 10 DUCTS**

METRIC

LINEAR DIMENSIONS SHOWN IN MILLIMETRES

41U-105

(JUNE 13, 2008)

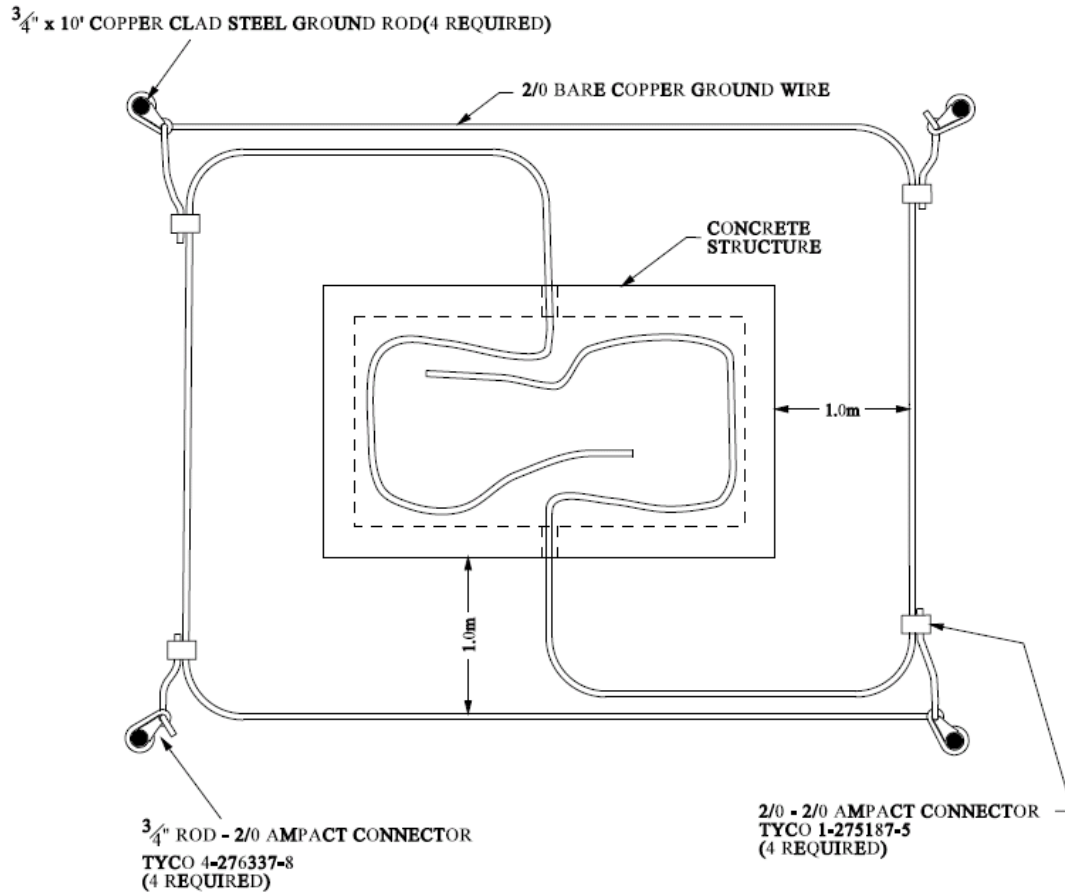


NOTES:

1. LEAVE 1.5m MIN. PER TAIL INSIDE STRUCTURE
2. INSTALL GROUND GRID 1m DEEP
3. INSTALL GROUND ROD PRIOR TO INSTALLING HYTAIL CONNECTOR
4. INSTALL GROUND RODS TO DEPTH BEFORE INSTALLING ANY COMPRESSION CONNECTORS.

**TYPICAL GROUNDING GRID
AROUND CONCRETE STRUCTURES**





NOTES:

1. LEAVE 1.5m MIN. PER TAIL INSIDE STRUCTURE
2. INSTALL GROUND GRID 1m DEEP
3. INSTALL GROUND RODS TO DEPTH BEFORE INSTALLING ANY CONNECTORS.

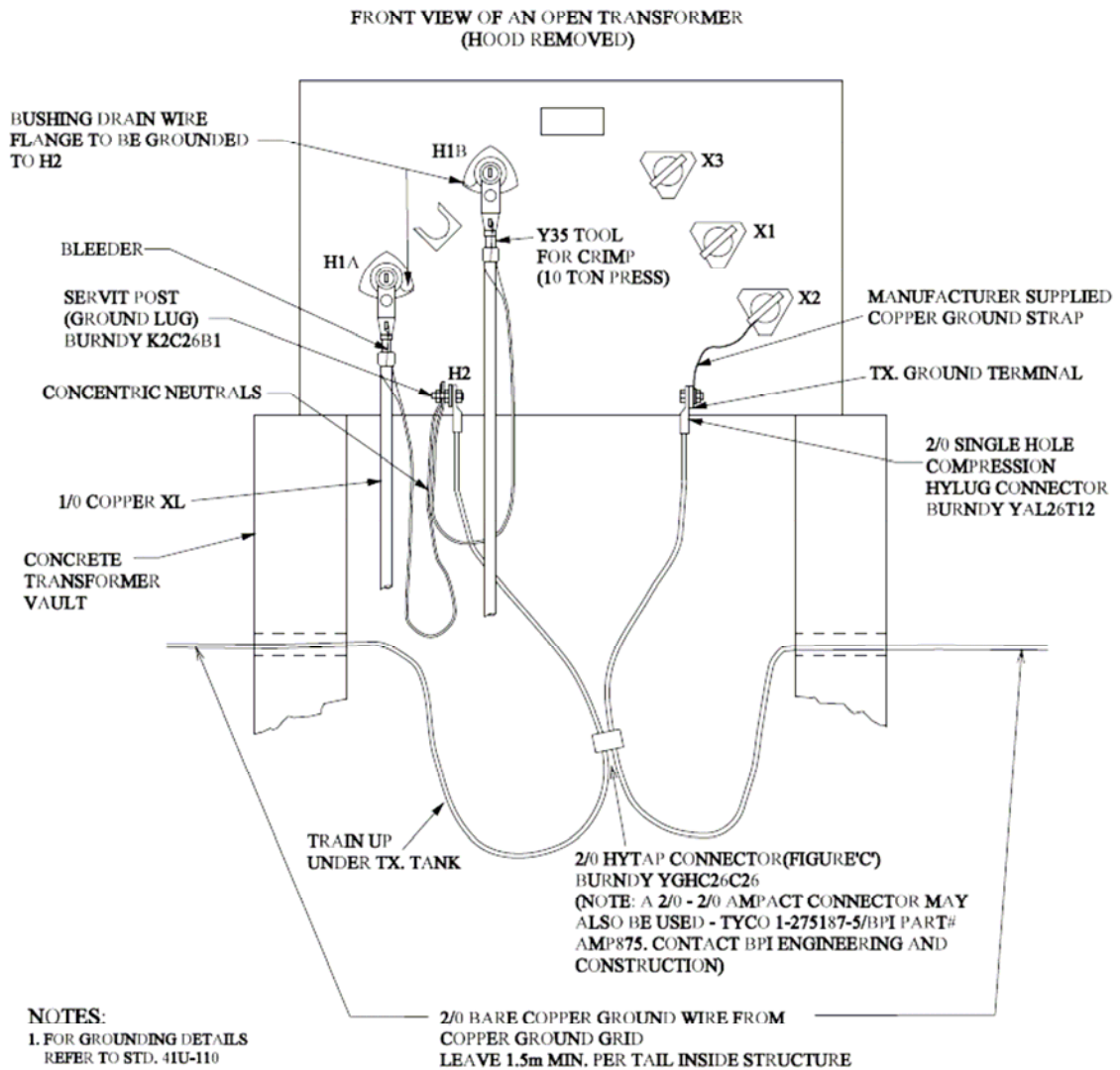
**TYPICAL GROUNDING GRID WITH AMPACT CONNECTORS
AROUND CONCRETE STRUCTURES**

METRIC

LINEAR DIMENSIONS SHOWN IN MILLIMETRES

41U-200

(APRIL 15, 2009)



**16 kV PADMOUNTED SINGLE PHASE TRANSFORMER
GROUNDING DETAIL**

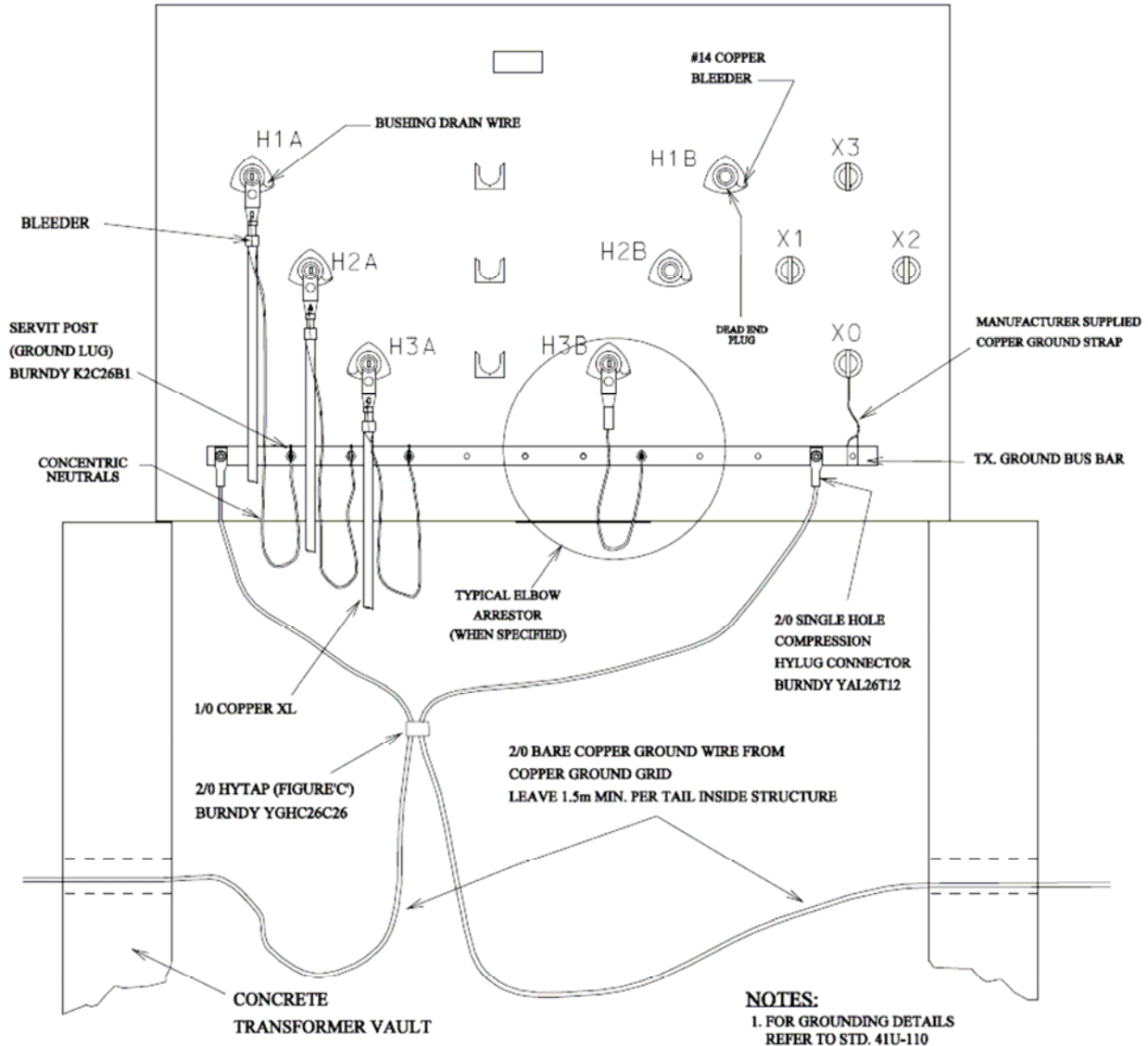


METRIC

LINEAR DIMENSIONS SHOWN IN MILLIMETRES

41U-200A

(JUNE 13, 2008)

FRONT VIEW OF AN OPEN 3 PHASE TRANSFORMER**27.6 kV PADMOUNTED THREE PHASE TRANSFORMER
GROUNDING DETAIL**

APPENDIX - D

METERING SPECIFICAITONS

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Scope of Metering Specification

- This Metering Specification applies to all Brantford Power Inc. (BPI) metering locations as noted:
- Overhead and underground Residential services, and
- Overhead and underground Commercial and Industrial services up to and including 800A;

Where the service voltage is one of the following:

- 120/240V, single phase, 3-wire,
- 120/208V, single phase, 3-wire,
- 120/208V, three phase, 4-wire, or
- 347/600V, three phase, 4-wire.

For services greater than 800A, contact BPI Metering & Settlement at 519-751-3222. Ext. 3287 for metering requirements.

Meter Socket Requirements**120/240V, single phase, 3 wire services up to and including 200A:**

- Require 4 Jaw, square type, 200A meter socket base for any underground service. The minimum size for a 200A meter socket base shall be 17" x 10" x 5" (432mm x 254mm x 127mm).
- 4 Jaw, square type, 100A meter socket base may be used for an overhead, 100A service.

120/240V, single phase, 3-wire services greater than 200A up to 400A:

- Require 5 Jaw, 20A transformer type meter socket base, complete with self-shorting device on the left side, 400:5 current transformers and twin covers suitable for 120/240V single-phase service.
- The current transformers shall be located on load side of main disconnect switch.

120/208V, single phase, 3 wire services up to and including 200A:

- Require 5 Jaw, square type, 200A meter socket base where the 5th Jaw located in the 9 o'clock position.
- Meter sockets shall be installed inside of the building on the load side of the disconnecting switch supplying the service.

120/208V, 3 phase, 4 wire services up to and including 200A:

- Require 7 Jaw, square-type, 200A meter socket base complete with an isolated neutral connection.

- Poly-phase meter sockets shall be installed inside of the building on the load side of the disconnecting switch supplying the service.

347/600V, 3 phase, 4 wire services up to and including 200A:

- Require 7 Jaw, square-type, 200A meter socket base complete with an isolated neutral connection.
- Poly-phase meter sockets shall be installed inside of the building on the load side of the disconnecting switch supplying the service.

General notes on meter socket requirements:

- Meter mounting height shall be 5'8" (1.7 m) from final grade to centre of meter.
- Meter sockets shall use screw type lugs only.
- The Customer/contractor shall permanently and legibly identify all metered services with respect to municipal address and/or unit number. The identification shall be applied to all disconnect switches and meter sockets. BPI will not connect services/install meters unless service identification on the disconnect switches and meter sockets correspond to the appropriate addresses and unit numbers. Owners of multiple unit buildings are required to inform BPI of any changes made to municipal address and/or unit numbers.

Commercial and Industrial Metering Requirements

Where required by this Metering Specification, the owner shall supply, install and maintain a Meter Cabinet to BPI specifications.

120/208V, 3 phase, 4 wire services over 200A:

- Require Remote Meter Socket and Instrument Transformer Cabinet, as outlined in this section, or
 - Require Remote Meter Socket and provision for current transformers in switchgear.
 - Require a full size neutral available from an isolated terminal block in the Instrument Transformer Cabinet, or
 - Require a #12 AWG neutral available from an isolated terminal block in the Utility section of the switchgear.
 - Require a ground wire connection point, bonded to the system ground, in the Instrument Transformer Cabinet or in the Utility section of the switchgear.
 - Where the expected power consumption may reach or exceed 200 KVA, the Customer/contractor shall supply a voice-grade telephone line from the Customer's main telecommunication panel to the Remote Meter Socket for BPI to perform remote interrogation of the meter. Telephone details are outlined in the Interval Metering and Data Acquisition Requirements section of this Metering Specification.
-

347/600V, 3 phase, 4 wire services over 200A:

- Require Remote Meter Socket and Instrument Transformer Cabinet, as outlined in this section; or
- Require Remote Meter Socket and provision for current transformers and potential transformers in the switchgear.
- Require a full size neutral available from an isolated terminal block in the Instrument Transformer Cabinet, or
- Require a #12 AWG neutral available from an isolated terminal block in the Utility section of the switchgear.
- Require a ground wire connection point, bonded to the system ground, in the Instrument Transformer Cabinet or in the Utility section of the switchgear.
- The Customer/contractor shall supply a voice-grade telephone line from the Customer's main telecommunication panel to the Remote Meter Socket for BPI to perform remote interrogation of the meter. Telephone details are outlined in the Interval Metering and Data Acquisition Requirements section of this Metering Specification.

Remote Meter Socket

- The Customer/contractor shall supply a 13 Jaw, transformer rated meter socket complete with test switch compartment.
- The Customer/contractor shall install a 1¼" (32mm) conduit from the instrument transformers to the Remote Meter Socket complete with a minimum of ¼" poly pull rope.
- The Remote Meter Socket location shall be less than 50' (15.2m) from the current transformers.

Instrument Transformer Cabinet

- Services up to 800A require a 36" (914mm) w x 36" (914mm) h x 10" (254mm) d, CEMA / NEMA-1 Instrument Transformer Cabinet. The cabinet is to be complete with the provision for padlocking/utility sealing and a removable steel back plate.

Contact BPI Metering & Settlement at 519-751-3222. Ext. 3287 for the requirements for services greater than 800A.

General notes on Instrument Transformer Cabinets:

- Instrument Transformer Cabinet shall be installed indoors on the load side of the main disconnect switch.
 - The top of Instrument Transformer Cabinet shall be mounted at a height of 6' (1.8m) from final grade.
 - Instrument Transformer Cabinet location shall be less than 50' (15.2m) from the Remote Meter Socket.
 - The location of the Instrument Transformer Cabinet shall be readily accessible to, and approved by, BPI
 - The Customer/contractor shall supply, install and connect conductor termination lugs onto current transformers.
-

- For Instrument Transformer Cabinets, BPI will install the Instrument Transformers. The Customer/contractor shall contact BPI Metering & Settlement at 519-751-3222. Ext. 3287 at least ten (10) working days prior to the date of energizing to arrange a site visit for the Meter Technician with the Customer/contractor. During the site visit, the back plate shall be marked top, line and load for current transformer polarity.
- For instrument transformers to be mounted in switchgear, shipping instructions shall be provided to BPI at least ten (10) working days prior to the construction of the switchgear at the manufacturer's location. Otherwise, the Customer/contractor shall be responsible for the mounting of the instrument transformers in the switchgear.
- The Customer/contractor shall install a 1¼" (32mm) conduit from the Instrument Transformer Cabinet to the Remote Meter Socket, complete with a minimum of ¼" poly pull rope.
- Cabinets shall be C.S.A. approved for their location and conditions; constructed from sheet steel, minimum 12 AWG; and have a baked enamel paint finish.

The following table indicates typical Meter Cabinet sizes required. Contact BPI Metering & Settlement at 519-751-3222. Ext. 3287 for the requirements for services greater than 800A.

Metering Cabinet Dimensions

Service Size Amps	Voltage Volts	Phase	Wire	Cabinet size
> 200 & ≤ 400	120/240	1	3	30x20x8
> 200 & ≤ 800	120/208	3	4	36x36x10 with remote meter socket
CTs in switchgear	120/208	3	3	Remote Meter Socket
> 200 & ≤ 800	600/347	3	4	36x36x10 with remote meter socket
CTs and PTs in switchgear	600/347	3	4	Remote Meter Socket

Meter Requirements

The following tables indicate typical metering used by BPI. In all cases the type, number, size and location of metering must be approved by the utility. Contact BPI Metering & Settlement at 519-751-3222. Ext. 3287 for the requirements for services not listed in the tables.

120/240-Volt Meters

Service Amp rating	Voltage	Phase	Wire	Meter Requirements
≤200	120/240	1	3	200A – 4 Jaw socket meter base
400	120/240	1	3	20A – 5 Jaw, transformer rated socket meter base: EATON TCC5-4; HYDEL CT4-4; Thomas & Betts JS4A; or approved equivalent.

120/208-Volt Meters

Service Amp rating	Voltage	Phase	Wire	Meter Requirements
≤200	120/208	1	3	200A – 5 Jaw socket meter base. The 5th jaw is to be located at the 9 o'clock position and bonded to the neutral lug via #12 AWG.
≤200	120/208	3	4	200A – 7 Jaw socket meter base
> 200	120/208	3	4	Metering cabinet and remote meter socket. Remote Meter Socket shall be a 13 Jaw, transformer rated type with provision for test switch: EATON TSU13, HYDEL CTS130PW, Thomas & Betts CT113 or approved equivalent.

600/347-Volt Meters

Service Amp rating	Voltage	Phase	Wire	Meter Requirements
≤200	600/347	3	4	200A – 7 Jaw socket meter base.

> 200	600/347	3	4	Metering cabinet and remote meter socket. Remote Meter Socket shall be a 13 Jaw, transformer rated type with provision for test switch: EATON TSU13, HYDEL CTS130PW, Thomas & Betts CT113 or approved equivalent.
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Totalized Metering Requirements

Customer-owned distribution systems with more than one transformer require totalized metering. A dedicated telephone line is required for interrogation of the meters. Contact BPI Metering & Settlement at 519-751-3222. Ext. 3287 for details.

Metering Pulses

BPI will make available pulse outputs, excluding a timing signal, only if in the utilities opinion it is technically feasible. The Customer making the request shall be responsible for 100 % of the actual labour and material costs incurred to provide this service. To acquire this service the owner or contractor shall make application to BPI for the supply of metering signals. Contact BPI Metering & Settlement at 519-751-3222. Ext. 3287 for details.

Interval Metering and Data Acquisition Requirements

BPI performs Interval Metering data collection over a telephone line.

BPI requires a telephone line for the purpose of interval metering where:

The total power required may reach or exceeds 200 KVA,
The Customer wants to initiate Interval Metering; or
The metering installation requires totalized metering as required by this Metering Specification.

- The Customer will be responsible for the installation and ongoing monthly costs of operating the telephone line required to communicate with the interval meter.
- BPI requires a dedicated analogue telephone circuit to a demarcation point located within 3 feet (1 metre) of the meter socket. Where the meter socket is located outside the building, a ½" conduit is required from the demarcation point to the meter socket.
- If the service location has an automated telephone attendant (voice mail system), the telephone line can easily be provided via their telephone switch. When using an automated telephone attendant the new extension must be directly accessible for inbound telephone calls using a "back door" number with a unique extension.
- If an automated telephone attendant is not available, it may be feasible to share the analogue telephone circuit for an existing fax line with the use of a line-sharing device (often called a "Stick").

- In either case, the Customer's telephone contractor must supply and install the necessary programming services and equipment including a telephone circuit from their main telephone room (telephone switch) to the new meter cabinet/base. The telephone circuit must be terminated at an RJ11 modular telephone jack.
 - BPI normally, uses this telephone circuit to contact its meter once daily for less than two (2) minutes. This call is usually made between the hours of midnight and 6AM. BPI may, on occasion, attempt to contact the meter during normal business hours to troubleshoot a problem with either the meter or the telephone equipment.
-

APPENDIX - E

REQUEST FOR SERVICE FORM

REQUEST FOR SERVICE APPLICATION

The Customer shall complete and submit the following to Brantford Power Customer Services, Fax 519 753-9884, E-mail customerservices@brantford.ca. For more information contact Brantford Power Engineering,. 519-751-3522. All information below must be provided with the submission. If requested Brantford Power will meet with the customer, for a preliminary review prior to submitting a formal request for service. The application will be return to the contact person if incomplete.

CONTACT INFORMATION - THE PERSON TO CONTACT REGARDING THE SERVICE.

Name	Address		
Telephone number	Fax number		
E-Mail	Location of Service		
Required in-service date: D	M	Y	
Service Entrance	Capacity	Amps	Volts

SERVICE INFORMATION

1. Estimated total initial maximum demand kW (Provide load calculations)
2. Estimated total future maximum demand kW (Provide load calculations and approximate date of expansion, (D M Y)
3. Electrical site plan, to scale, showing the following: **(Check Yes or No if on site plan, if no explain why the information is not provided)**

Yes No

- | | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Electrical room |
| <input type="checkbox"/> | <input type="checkbox"/> | Number and size of the services to individual units |
| <input type="checkbox"/> | <input type="checkbox"/> | Preferred location of the service conductors and service entrance equipment with respect to public rights-of-way and lot lines |
| <input type="checkbox"/> | <input type="checkbox"/> | Location of the metering equipment |
| <input type="checkbox"/> | <input type="checkbox"/> | Indication of how Brantford Power personnel will gain access to the meter(s) |
| <input type="checkbox"/> | <input type="checkbox"/> | Shop drawings of any primary equipment supplied by the owner |

Reason Information is missing

4. Schematic of the main primary and secondary distribution system, showing the following:
(Check Yes or No if on schematic, if no explain why the information is not provided)

Yes No

- | | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Voltage |
| <input type="checkbox"/> | <input type="checkbox"/> | Size, number and material of the service entrance conductors |
| <input type="checkbox"/> | <input type="checkbox"/> | Main disconnect switch including size |
| <input type="checkbox"/> | <input type="checkbox"/> | Metering equipment |
| <input type="checkbox"/> | <input type="checkbox"/> | Disconnect switches for each metered sub-feed |

Reason Information is missing

The Request for Service Application will be reviewed once Brantford Power has received all of the required information. The customer will then be advise as to whether or not their request has been accepted or denied. If the request is denied, Brantford Power will give reasons for denying the request and offer assistance in modifying the proposed service.

The customer or Brantford Power may request a site meeting to review the service.

In consultation with the customer, Brantford Power will make the final determination of where the service will connect to the Utility distribution system, the route the service will take and the location of the service entrance at the building.

The information submitted will be used to evaluate and coordinate the installation of the electrical service as well as determining the proper transformer size. If it is determined that a smaller transformer will be used compared to the service size because of total calculated loads, the developer will be required to fuse back the service to BPI requirements.

The customer must contact Brantford Power Customer Service at 519-756-1360 to arrange energization and account setup.

Customer Signature: