SPECIFICATION FOR

ELECTRICAL INSTALLATION

SUBDIVISION AND TOWNHOME DEVELOPMENTS

Revision	Date	Description	
1.0	March 2011	Original	
1.1	March 2020	Appendix C: Transformer Specification Updated	
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1.0 SCOPE

This specification is supplemental to the City of Brantford Agreements with developers of Subdivisions and / or Townhomes, as well as Brantford Power Inc.'s Conditions of Service and is intended to cover underground service(s) to detached, semi-detached or row units on blocks of land where primary service is available only at the edge(s) of the land containing these development properties.

The supply point(s) of power shall be from Brantford Power Inc.'s designated source(s). All facilities beyond this (these) point(s) towards the load, including lines, shall be installed, and paid for by the Developer through a capital contribution model as prescribed by the Ontario Energy Board. The subsequent ownership and maintenance of Electrical Plant up to the Residential Customer(s) meter base(s) shall remain with Brantford Power Inc. as per the provisions in our Conditions of Service.

This specification covers Subdivisions and Townhomes sites serviced with a primary voltage of 27.6 /16 kV only. The Developer or his representative must contact Brantford Power Inc. Engineering and Construction department regarding any other special requirements. In the case of a conflict between this specification and drawing approved by Brantford Power Inc., the approved drawing shall prevail, unless advised otherwise by Brantford Power.

2.0 DEFINITIONS

"Development" shall include all parcels of land that have been approved by the City of Brantford as a Subdivision or Townhomes site.

"Owner" shall include the applicant for the approval of a Subdivision or Townhomes Development and the registered owner or owners in fee simple of the lands for which the Subdivision or Townhomes Development is proposed, and/or their respective heirs, executors, administrators, and assigns and in addition to its accepted meaning, shall mean and include an individual, an association, a partnership, or an incorporated company.

"Consulting Engineer" shall mean the person or persons, registered with the Association of Professional Engineers of Ontario, who for the time being, are employed to provide engineering services on behalf of the Owner.

"BPI" shall mean Brantford Power Inc.

"Electrical Plant" shall mean the total electrical distribution system, and appurtenances owned and maintained by BPI, from its designated point(s) of supply to the ownership demarcation point(s) at the meter base.

"Inspector" shall mean the person appointed by Brantford Power Inc. to inspect and/or approve the owner's installations in the subdivision.

"Contractor" shall mean a person or a group of persons or companies hired by the Owner or his Consultant to carry out the construction of Electrical Plant

"Contract" shall mean the Subdivision or Townhomes Development Contract between the Owner and the City of Brantford

3.0 GENERAL CONDITIONS

The Owner shall be responsible for hiring the Consulting Engineer and Contractor(s) to carry out the work including design, installation and commissioning of Electrical Plant. Any action, decision or intent with regards to the Electrical Plant, taken by such person(s) shall be deemed by BPI to be that of an Owner's agent at all times. The Owner or the Owner's agent(s) shall be responsible for letting and administering the contract covering the installation of the Electrical Plant.

3.1 EASEMENTS

The Owner shall grant easements, if required and as specified by BPI.

The Owner shall be responsible for the expense, preparation and registration of all necessary easement documents.

The Owner shall forward one copy of each registered easement document to BPI.

3.2 CONSULTING ENGINEER

- a) The Owner shall employ a competent and qualified Consulting Engineer approved by BPI prior to appointment. This Consulting Engineer shall employ an Electrical Engineer qualified in the design of underground electrical plant with a professional qualification of a P.Eng. from the Province of Ontario and is hereafter designated as the Electrical Consulting Engineer. The required documentation to verify the qualification of these personnel shall be made available to BPI before the start of the project.
- b) The Owner and the Consulting Engineer shall be responsible for:
 - preparing detailed plans and specifications for the Electrical Plant, based on the requirements provided by BPI, and submit detailed plans and specifications to BPI for approval prior to the installation of such works. These plans shall conform to all relevant BPI specifications;
 - arranging for all approvals by a P.Eng. as per the requirements of Ontario Regulation 22/04 and/or the Electrical Safety Authority.
 - obtaining all the necessary approvals and permits prior to the construction of the Electrical Plant, as required by BPI and the City of Brantford;
 - supervising construction of the Electrical Plant and arrange for adequate inspection by qualified representative. BPI Inspector must be informed forty eight (48) hours in advance of any work being performed on site.;
 - maintaining all records of construction of the Electrical Plant. BPI, through its Inspector, may assist in the up-keep of these records;
 - supplying all drawings in hard copy and in an electronic form acceptable to BPI, of all the Electrical Plant installed. These plans are to conform to the specifications in

this document;

- obtaining details regarding the form and scale of these drawings from BPI prior to their submission;
- arranging for final inspection by BPI, of the said works at the conclusion of the guarantee period and before the assumption of the Electrical Plant by BPI; and
- > supervising the construction of any remedial work that BPI may direct.
- c) The Electrical Consulting Engineer shall arrange to co-ordinate the design prior to final approval and installation of the Electrical Plant with other utilities, services, landscaping, roadways, etc. and resolve all conflicts to the mutual satisfaction of all parties concerned. Such conflicts shall be resolved at no expense to BPI.

3.3 CONTRACTOR

Any Contractor employed by the Owner or Consulting Engineer, and before commencing installation of Electrical Plant, shall be approved by BPI. Unless otherwise advised by BPI, a list of personnel trained in high-voltage and low-voltage cable termination and splicing work employed by the Contractor shall be provided to BPI, together with verification of experience and qualification. These shall be the only persons allowed to terminate and connect the cables and on de-energized plant only.

3.4 DESIGN REQUIREMENT

- An overall plan for feeding the subdivision/townhome sites from the designated electric utility supply points, shall be prepared in consultation with BPI and submitted to BPI for their final approval before commencing with the detail design. This plan must be revised as staged construction continues, wherever applicable.
- Once the overall conceptual plan is complete and approved by BPI, the Owner through the Consulting Engineer shall submit a copy of the base plan to BPI. This plan shall show the street lines and property lines in relation to the location of the existing and proposed switches, junctions, overhead circuits, high voltage cables or other Electrical Plant, which shall be determined in consultation with BPI. This plan will be returned to the Consulting Engineer by BPI after review for final design.
- The final detail plans shall be duly signed and stamped by the Electrical Consulting Engineer who shall also provide a signed Certificate of Approval to confirm that the installation meets the safety requirements of Ontario Regulation 22/04. Seven (7) hard copies and one electronic copy of the same shall be submitted to BPI, in the latest version of AutoCAD together with a pen table and using NAD83 world coordinate system. BPI shall provide a layer-table for these plans. The plans shall include:
 - Overall distribution layouts for both primary and secondary circuits as well as the schematic drawings (primary, secondary and streetlight).
 - When the proposed Subdivision / Townhome complex is joining into an existing one, the Consulting Engineer must submit drawings of the overall Subdivision / Townhomes including the existing and proposed electrical plant on one schematic.

Where required, BPI may provide the Consulting Engineer with the primary schematic of the existing subdivision to be incorporated into one drawing. In multiphase Developments, care must be taken in the second and subsequent phases to ensure all as-built information from prior and new phases is included in the final plan.

- No later than one week, prior to construction, the Owner or the Consulting Engineer shall supply BPI with the requested number of hard copies and one electronic copy of the plans for use by its employees. Any alterations in the designing criteria must be pre-approved by BPI.
- Unless otherwise permitted by BPI, the standard single-phase pad-mounted transformer size shall be 50kVA or 100kVA, but shall <u>not</u> be more than 167kVA and it shall be supplied as per BPI specifications and from approved vendors.
- The maximum number of secondary service connections to a single-phase 50kVA transformer shall be twelve (12) based on 200A residential services. The actual number of services will be determined from calculations with the assumption that all homes will be electrically heated.
- The maximum number of single-phase 50kVA pad-mounted transformers per-phase on a continuous run between any two (02) disconnect locations (dip pole, switch etc.), within a Subdivision or a Townhome site shall be eight (8), unless otherwise approved by BPI.
- Pull calculations showing acceptable pulling tensions without the use of specialized tools, for pulling primary and secondary cables in either direction, shall be submitted to BPI for approval.

3.4.1 SPECIFICATION FOR DRAFTING

3.4.1.1 DISTRIBUTION DRAWINGS

- The Electrical Distribution System for the entire subdivision shall be shown on one drawing if possible. This drawing shall be 610mm (24") or 762mm (30") wide with a maximum length of 1067mm (42").
- > Drawings shall use a scale ratio of 1:500, unless otherwise approved by BPI.
- Only those symbols shown on the Plan View Legend Standard 37-508 in Appendix B shall be used.
- The road crossing and service trench details shown on Standard 37-349 and 25U-202 as well as the Standard Legend in Appendix B shall be on each drawing.
- > A sample plan drawing is shown on standard 37-509 in Appendix B

3.4.1.2 SCHEMATICS

Same size restrictions as in 3.4.1.1 above.

- Only those symbols shown on the Schematic Legend Standard 37-506 in Appendix B shall be used.
- > A sample Schematic is shown in Standard 37-507 in Appendix B.

3.4.1.3 REPRODUCIBLE COPIES

- In addition to the duly signed and stamped hard copies of the above drawings, the Owner or the Consulting Engineer shall also supply BPI with an electronic copy of these drawings (Plan and Schematic).
- The electronic copy shall be in AutoCad or Microstation format. If using AutoCad, a copy of the pen table is also required;

3.5 PRECONSTRUCTION REQUIREMENT

Prior to the construction of Electrical Plant, the Owner or the Consulting Engineer shall, submit all final engineering drawings, designs and specifications for the Electrical Plant, prepared in accordance with BPI standards for review and approval by BPI.

At least fifteen (15) working days prior to construction of any part of the plant, the following shall be submitted to BPI:

- A proposed schedule of construction for the Electrical Plant for BPI's approval. BPI shall provide a written conformation of this approval to the Owner or the Owner's agent. Once approved, this schedule shall only be modified with prior consent from BPI.
- Proof of adequate insurance coverage as set out in the Subdivision / Townhome Agreements with the City of Brantford.
- Proof of security of performance, labour and material payment bond and the cash deposit for the estimated charges as specified in the relevant Agreements with the City of Brantford.
- Any request for access to existing energized plant along with an estimated date and duration this access is required.

3.6 INSPECTOR'S AUTHORITY

An Inspector shall be appointed by BPI to oversee that the quality of material used and installation of the Electrical Plant is in accordance with BPI standards and good construction practices and shall have the authority to suspend any worker of the Owner or Owner's agent or cancel the work performed, for incompetence, drunkenness, negligence or disregard of orders. An Inspector may stop the work entirely if there is not a suitable quantity of approved material or personnel on site to carry the work properly or for any reasonable cause.

Any work done in the absence of the Inspector shall, upon request, be opened up for thorough examination and must be replaced or rebuilt, as directed by the Inspector, at the

Owner's or the Contractor's sole expense. No approval by any inspector shall be taken as, or construed to be, an acceptance of improper work or material, which must, in every case, be removed and properly replaced whenever discovered at any stage of the work.

The Contractor must carry out instructions given by the Inspector immediately, but the Inspector shall not have the authority to set out work or give any stakes, lines, gauges, levels or grades.

Scheduling an appointment with BPI Inspector must be arranged two (2) working days in advance by contacting BPI Engineering Department via email <u>bpieng@brantford.ca</u> or by calling 519-751-3522 between the hours of 8:30am and 4:00pm, Monday to Friday. Access to energized plant shall be confirmed and arranged with the inspector and BPI Operations staff.

3.6.1 ON-SITE INSPECTION AND TESTING

- The Owner / Contractor shall provide full site access to BPI Inspector at all times and shall be responsible for his/her safety on site.
- In all cases, the work shall be inspected by the Inspector before being covered up and / or backfilled, unless otherwise directed by BPI.
- All manholes, transformer vaults, switch pads, foundations and duct structures shall be inspected by the Inspector prior to pouring concrete or the Contractor committing any ducts or cables to them.
- All on-site testing of material and / or sub-systems of the Electrical Plant shall be carried out only in the presence of the Inspector.
- Any or all testing or installation of Electrical Plant or material deemed necessary at any stage of the work and carried out by BPI shall be charged back to the Owner / Contractor.

3.7 REMEDIAL WORK

The Owner / Contractor shall take immediate corrective action to remedy any deficiencies noted by BPI Inspector.

If the Owner / Contractor fails to remedy any deficiencies and complete such repairs within a reasonable time period as stipulated by BPI, BPI reserves the right to remedy any such deficiencies and complete such repairs on its own and charge any and all costs to the Owner.

Any remedial work undertaken by BPI personnel will not relieve the Owner or the Owner's representative of any obligations pursuant to the Agreements with the City of Brantford.

3.8 ORDERING AND HANDLING MATERIAL

The Owner or owner's agent shall be responsible for ordering and obtaining all material required for the installation of the Electrical Plant.

All material must conform to the requirements set out in this document including the associated standards, schematics and plan drawings. Any deviation from this must have written approval from BPI, prior to ordering. Material installed, which is not approved by BPI shall be removed and replaced at the Owner's expense.

Work on any part of the Electrical Plant shall not commence until all approved material necessary for the completion of that part, has reached and been safely stored at the construction site. The Contractor shall be responsible for the security of all said material on site.

The Contractor shall use proper material handling methods and equipment at all times.

Where required, BPI will supply, standard locks for equipment enclosures at the Owner's / Contractor's expense.

3.9 SERVICE INSTALLATION AND METERING ON RESIDENTIAL LOTS

All new and renewed meter installations for single-family residences including town homes shall be installed outdoors.

Meter socket, all service conduit and conductor, load side of the meter socket shall be supplied and installed by the builder in new developments or by the owner of the serviced property in in-fill lots. All service entrance sleeves through the building wall must be a minimum of 300mm (12") **<u>above</u>** finished grade. All external installations shall have a unobstructed clearances as per Ontario Building Code, from the meter or gang meter installations. Meter bases shall be permanently labelled with unit and/or house numbers.

No meters shall be installed by BPI on meter bases where the structure is not adequate to provide proper support for the meters or poses unsafe installation conditions for BPI personnel. All meter bases shall generally be located on the same side of the house where the secondary service enters the property line and the following criteria shall be considered:

- a) If the residence/unit has no garage, then the meter location shall be on the side opposite to the driveway.
- b) If the residence/unit has a garage and the secondary service enters the property line on the driveway side, then the meter shall be located on the side of the garage.
- c) Townhouse Development;
 - i. Private Townhomes: For private townhomes, the secondary service shall enter the property line at end of a block of attached townhomes to a 'ganged' metering location, unless otherwise approved by BPI.
 - ii. Freehold Townhomes: For freehold town homes, the secondary service may enter the property line at each individual unit. Where meter bases cannot be installed on the side of garages, a specific location and installation details must be verified from BPI prior to installation.
- d) BPI standards 25U-202-1, 25U-202-2, 25U-205-1 and 25U-205-2 in Appendix A shall act as minimum standards for service layout.

<u>NOTE</u>: In situations where a meter base is located on the side of a residence opposite the locations where the secondary service enters the property line, it is the responsibility of the builder to have the secondary service extended or shortened in the 'common trench' to the side of the meter location before service to the property is connected.

Service crossing(s) under driveways and across other permanent structures on the property may involve under-digging / over-digging other utilities and shall only be allowed if carried out by qualified contractor and duly inspected and approved by BPI. The services shall be installed in a DB2 conduit of a minimum 100mm (4") diameter. Only one secondary splice shall be allowed on any secondary service.

Trenching, sand bedding and backfilling from BPI's point of entry at a residential property to the meter base location shall be the responsibility of the owner. The owner shall provide sand bedding in the open trench to a depth of 75mm (3") below the electrical service. The owner shall also provide a stockpile of sand beside the trench for its full length. This sand shall be used by BPI Personnel to place the initial layer of sand over the cable/duct. The sand must be provided as specified prior to the cable being installed. After BPI's Personnel have finished, the owner shall place more sand so that there is a minimum of 150mm (6") of sand over the cable (or duct, as required). All the sand must be placed before the end of the day on which the cable is installed.

BPI shall install the cable in the open, clean, dry trench provided by the owner to the line side of the meter socket and inspect and backfill sufficient to temporarily protect the cable. All trenching must be complete, sand bedding ready, and the meter socket and the conduit line side of the socket must be installed before the service conductor will be provided.

BPI will assume responsibility for electrical repairs only, of the service conductor up to the line side of the outdoor meter socket, including basic restoration. The owner shall be responsible for excavating, backfilling and restoring surfaces as may be required on private property for future maintenance of the underground service.

3.10 LOCATION OF TRENCHES

The main trench, service trench and service lateral shall be located as per Standards 37 – 505-1, 37-505-2, 25U-202-1 and 25U-202-2. All trenching shall conform to CSA Standard C22.3 No. 1 Sections 8, 9 and 10 as a minimum unless specified by BPI.

3.11 LOCATION OF EQUIPMENT

The location of transformers, pedestals etc. shall, in general, be in accordance with the Standards 37-505-1 and 37-505-2 or the site plan as approved by BPI, with the latter having precedence.

Any above ground metal structure such as fence, bollards, junction boxes etc., which are located within 1m of a pad-mounted transformer/switch, shall be bonded to the ground grid of that transformer/switch in at least two (02) locations. If the same is located between 1m and 3m of a pad-mounted transformer/switch it shall have its own ground grid complete with ground rods, which shall be continuously bonded with the ground grid of that transformer/switch in at least two (02) locations. A 2/0 bare Copper conductor shall be

used to ground and/or bond with the ground grid. Pad-mounted communication pedestals (eg. Bell or Rogers) shall be bonded directly to the ground terminal of BPI pad mounted equipment using grounding cable of appropriate size as per Ontario Electrical Safety Code.

3.12 LOCATION OF ROAD CROSSINGS

Road crossings must not terminate under driveways. A minimum clearance of 1m shall be maintained from the edge of driveway to the road crossing. The location of the road crossings with reference to a fixed point (eg. Property line, transformer etc.) must be indicated on construction drawings. Changes to approved crossings or crossings at an angle with respect to the boulevard shall not be carried out without written consent of BPI.

3.13 PRE-ENERGIZATION REQUIREMENT

Energization shall be carried out by BPI personnel only. Energization will only be done on the entire phase only, partial energization will not be allowed without prior approval in writing by BPI. Prior to energization of any part or parts of the Electrical Plant and prior to the release of the plan for approval:

- BPI shall be in receipt of the results of all inspections and tests carried out on the part or parts of the Electrical Plant to be energized, and the results of all such inspections and tests shall be satisfactory to BPI.
- Unless the Owner is informed otherwise by BPI, The Owner shall be responsible for submitting as-built drawings as per BPI design requirements relating to the construction of the part or parts of the Electrical Plant to be energized.

In addition to the above, secondary services to individual lots within the Development, shall not be energized unless:

- > roll-ins or lot-line splices, where required, have been completed by BPI;
- payment has been received for all fees;
- > service installation including meter base, duct structures etc. have been approved by BPI;
- meter base connections for that service have been completed;
- > the municipal address is clearly visible on the house; and
- the service has passed Electrical Safety Authority inspection

3.14 SITE SAFETY

All work performed by the Owner through the Consulting Engineer and Contractor shall be in accordance with the most current revisions of the Occupational Health and Safety Act of Ontario and Regulations for Construction Projects.

The Consulting Engineer is expected to exert primary controls through his or her line

supervision to obtain desired performance from employees, contractors, sub-contractors, vendors etc. As a minimum, the following must be implemented:

- Housekeeping. Orderliness is a basic requirement for all jobs and the job site must be well maintained at all times. Special attention shall be given to maintaining clear walkways and roadways, removal of trash, removal of slipping and tripping hazards, proper storage of material and securing work areas.
- Prior to energization, on-site Contractor(s) or their designated sub-contractors shall be responsible for the safety of all individuals on their site and shall have proper safety procedures and equipment in place. A copy of this plan shall be forwarded to BPI before commencement of work.
- After energization of the Electrical Plant in part or whole, BPI shall be responsible for personnel safety on jobs involving handling or operation of live electrical services and shall be contacted before proceeding and to provide the necessary safety equipment for a particular job. Site safety in all other areas shall continue to be the responsibility of the on-site Contractor.
- Contractors shall use a regular system of work and job site safety inspections to detect, document and correct hazardous conditions, safety violations and unsafe practices.

3.15 WARRANTY PERIOD

The Owner shall provide guarantee in the form of a performance bond for all design, construction and installation on the Development. After energization, BPI shall retain 10% of the value of the bond as guarantee for a period of one year, which shall be released upon approval by BPI of the said facilities following a final inspection. If this inspection reveals remedial work that is required from the Owner, BPI shall retain a portion of the above monies as performance warranty equivalent to the cost of the said works, for a period of one year after the completion of this work to the satisfaction of BPI Inspector.

4.0 INSTALLATION OF ELECTRICAL PLANT

4.1 TRENCH EXCAVATIONS AND BACKFILLING

Trench shall be excavated to sufficient depth to accommodate the designed number of ducts and cables. The 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 in accordance with the latest edition of Ontario Health and Safety Act.

It shall be the 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 inspector. The Contractor shall promptly notify the utility concerned in the event of damage occurred during construction, whether caused by

him/her or others.

Locations where minimum separation between gas pipelines and the standard trench fall below 380mm (15") shall be immediately brought to the attention of the BPI inspector.

Primary and secondary cable runs in a trench shall have 75mm (3") of sand below and 150mm (8") of sand above all direct buried cables/ducts, before regular backfill. The sand used shall have no smooth stone over 13mm (1/2") diameter and no crushed stone. The trench bottom shall be kept as smooth as possible to permit laying of cable or duct. If in the opinion of the inspector, any part of the bottom of the trench is found unsound or in any way unsuitable, the Contractor shall remove as much as may be required and replace accordingly.

4.2 JOINT USE OF TRENCH

Unless otherwise approved by BPI, electric utility power cables shall not be placed in the same trench as Bell Canada and Cable Television facilities.

If joint-use is approved by BPI, the Electrical Consulting Engineer shall arrange coordination and provision of joint-use plans.

Reasonably adequate time shall be provided for Bell Canada and Cable Television to prepare for the installation of their plant.

A minimum vertical separation of 300mm (12") shall be maintained between BPI cables, and Bell Canada, Rogers and other communication cables together with a red warning tape on top of BPI cables along the entire length of the joint use (see Section 4.7). Sand must be used for backfill over BPI cables.

Above grade telephone and cable facilities shall be located so as not to conflict with above grade BPI facilities. Pedestals shall be placed clear of transformers so as not to interfere with access to the cable compartment. All pedestals placed within 1m. of transformers shall be effectively bonded to the transformer system ground.

4.3 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, 10mm pea gravel aggregate and an air-entraining, low-slump mixture. Accelerating or anti-freeze admixtures will not be permitted. No above-grade pour shall be allowed when forecasted ambient temperature is above 25^oC or below 5^oC within 72hours 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 confirming to ASTM Cl50. 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 approved design, concrete used for load bearing foundations (such as pad mounted transformer, switches, junction/pull boxes etc.) shall have a 28-day minimum compressive strength of 31 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.

Concrete encased duct banks shall be reinforced with non pre-stressed 15mm (5/8") deformed steel reinforcing bars – grade 400 and conforming to CSA G30.12 (latest revision). Steel reinforcing bars shall be installed continuously; minimum 300mm overlap, tied with non-metallic ties and be located as per Standards 37-343 to 37-345. Concrete 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.

BPI shall determine if concrete testing is necessary and shall also determine the method of any concrete testing which is performed. 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.

4.4 INSTALLATION OF DUCTS

All duct material and the associated fittings used for the construction of the Electrical Plant shall conform to CSA standard C.22-2 No. 211.1 – MI 984 and subject to BPI approval. For above-grade installation, Rigid-PVC conduits, risers and bends (Schedule 40) shall be used.

The duct(s) shall be laid end-to-end in as straight a line as possible to facilitate pulling in of the cable. Maximum number and radii of bends between pull points (i.e. manholes, hand holes, transformer bases/vaults etc.) shall be based on pull calculations. Where three (03) or more ducts are installed in one trench they must be concrete encased. "3M" EMS markers shall be installed at the termination point of all spare ducts and the ends of road crossing ducts.

Where tie-ins are made to ducts left for future plant these ducts shall be continued to the next structure except where left for services. These shall be properly sealed using an approved duct seal once services are installed to prevent migration of silt.

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.

All direct buried cables (other than grounding cables) entering in to a structure must enter through a 1.5m minimum length of duct with a bell end also at the trench end of the duct.

This end shall be sealed around the conductors using an approved duct seal. Grounding/bonding cables shall enter the structure through the lifting holes, if available and an approved seal shall be made around these to prevent silt migration.

A continuous 10mm (3/8") dia. polypropylene pull rope must be installed throughout the entire length of all spare ducts. This rope is to be tied off within the structure wherever possible, at the discretion of BPI Inspector.

Following usage makes the installation of ducts mandatory by the Contractor:

- a) On all road allowances where the cables pass under travelled roadways, they shall be in ducts, which shall be concrete encased.
- b) Primary voltage cables installed direct buried shall have a spare duct installed in parallel for the buried length for exclusive use by BPI. This duct shall be installed direct buried in boulevards and concrete encased at road crossings and bends around corners in the boulevard. Only one spare duct is required per length, for either single phase or three phase installation
- c) In addition to above, spare ducts shall also be installed to provide future servicing to blocks of land and future extensions to the Development.
- d) On all service risers and crossings underneath aboveground structures.

4.4.1 DIRECT BURIED INSTALLATION

Where ducts are installed direct buried, the excavation shall be carried out so that all ducts are supported on a solid bed of undisturbed earth. Ducts, which are terminated in soil, shall be plugged with plastic caps, the exact location noted on the plan and a "3M" marker placed at the location. The duct lengths shall be joined together with approved couplings of the same make and bonded with PVC glue.

Where two ducts are installed direct buried in a trench, each duct shall be separated from the other by at least 75mm (3").

The ends of all buried ducts and any change in the direction of the ducts shall be tied down in the field and shown on the 'As-Built' plans.

Ducts shall be terminated at poles as per Standard 37-190 in Appendix A.

4.4.2 CONCRETE ENCASED INSTALLATION

All concrete-encased duct banks shall be designed and installed as per Standard 37-341-1 and 37-341-2. Ducts shall be terminated at poles as per Standard 37-190.

Ducts shall be concrete encased around daylight corners and all other tight radii turns as per Standard 37-351.

4.4.3 INSTALLATION CAPACITY

The number of ducts required in a concrete envelope or to provide service to future Development will depend on the cables to be installed in them. The maximum number

of cables in each duct shall not exceed the maximum allowable fill capacity as per the current applicable CSA standards.

Different voltage cables, with the exception of grounding cable, shall<u>not</u> be installed in the same duct.

4.5 ROAD CROSSINGS

Concrete envelopes under roadways must extend at least 300mm (1') beyond the proposed curbs and be a minimum 760mm (30") below proposed boulevard grade. In all cases, the concrete envelope below the roadway must be at a minimum depth of 1000mm (40"). The duct ends must terminate at the main trench.

Concrete road crossings shall be perpendicular to the road alignment and where possible placed across from the transformer or switch pads and the ducts carrying utility cables shall extend and terminate into the vault. All other services ducts (eg. Bell, cable etc.) shall terminate before the vault, or be routed around it. Refer to Standard 37-349 in Appendix A for road crossing details.

Where crossings terminate at a structure (vault, etc) the structure shall be placed first and the crossing shall be poured against the wall of the structure to the other side of the street.

4.6 CABLE INSTALLATION

The Contractor will use care in storing, handling and installing the cables to prevent scuffing or otherwise damaging the protective covering. Cables shall generally be installed direct buried unless otherwise noted on the plans or as directed by BPI. All direct buried cables in a common trench on private property and street allowance shall be separated from adjacent cables of the same voltage class and supported at the bottom using sand bedding with minimum depth of 75mm (3") and a sand cover of 200mm (8") above.

The exact location of any mid-span splicing or termination shall be noted on the plan and a "3M" marker placed at the location, 300mm below grade. All cable ends shall be properly capped with a bonding cement and PVC cap or taped and identified at each termination location.

The cables will be handled and reeled off in such a manner as to prevent kinking or bending beyond the minimum radius. The conductor shall be laid as straight as possible. Crossover of cable shall be permitted only at service entrances.

Cables shall be trained into ducts with bell-end terminations in smooth bends and looped to a length generally equal to the vault perimeter, which shall be left inside the vault for connection.

4.6.1 INSTALLATION OF SECONDARY CABLES

Secondary cables shall be labelled with the house numbers, which the cables services as per Standard 37-400.

Each dwelling unit on a single-family or semi-detached lot shall have its own individual service cable from the transformer to the meter base and shall be sized to

suit in accordance with the cable specification of Appendix-D.

For service installation on private residential lots and meter base, refer to Section 3.9.

4.6.1.1 TERMINATION AND CONNECTION OF SECONDARY CABLES

Cables shall be 'looped' or 'snaked' at termination point with sufficient cable left to ensure ease of installation. Secondary connections at transformer shall be made using connectors as specified in Appendix E.

Secondary neutral cables only shall be connected to transformer by the Contractor prior to hi-pot testing. The Contractor shall also make connections for secondary service at the meter base unless the installation is done by BPI. Secondary connections (other than neutral) at the transformer shall be made by BPI. Where cables are left unconnected or exposed, they shall be capped with bonding cement and PVC cap, or if approved, sealed, with rubber tape and made waterproof as follows:

- a) The first layer shall consist of two (02) wraps of self-amalgamating tape, half lapped to provide the necessary electrical characteristics for 600V and sealed against ingress of moisture.
- b) The second layer shall consist of two (02) wraps of vinyl tape and shall be applied half lapped to enclose the first layer of tape. It shall be made and installed in a manner to eliminate unravelling (i.e. last two lengths of wraps around the circumference of the cable, are not to be stretched).

4.6.2 INSTALLATION OF PRIMARY CABLES

Primary cable shall be 1/0 AWG and as per specification in Appendix D. No splice shall be allowed in the primary cables. Primary cables shall be labelled as per Standard 37-400.

Primary cables shall generally be installed at the bottom of and in the same trench as the secondary cables. There shall be a minimum separation of 150mm (6") between the primary and the secondary cables.

For primary cable installation at the dip pole refer to Standard 37-190.

4.6.2.1 TERMINATION OF PRIMARY CABLES

Primary cables shall generally be connected by BPI, however, the Contractor shall be responsible to prepare cables terminations for final connection. Only trained electricians or linepersons experienced in primary cable terminations and approved by BPI shall install primary terminations. A list of approved cable terminations for primary cable is included in Appendix E.

The primary cables shall be terminated with BPI approved 200 Amp load break elbows. The load break elbows may be left on de-energized transformer bushings to aid in storage of elbows. Protection of the local service primary loop ends shall be by RTE elbow surge protectors, if required, and placed as shown on the approved schematic.

High voltage dead-end caps, plugs, standoff bushings shall be as specified in the list of approved materials in Appendix E.

All pole-top cable terminations shall be supplied and installed by the Owner/Contractor, for connection by BPI. The conductor shall be terminated with either a pin-type or a two-hole lug, as per BPI standard detail on the primary schematic. Overhead switches and phase terminations shall be identified as required by BPI. Loops fed directly from overhead lines shall be protected with a Surge Protector at the stress cone of the riser pole.

For underground terminations, a fault indicator (Catalog # STHI in Appendix E) shall be installed on the test point of the load side load break elbow at each transformer, switch or junction location other than at a normally open point.

For overhead terminations, with a line tap switch, BPI shall supply and install a fault indicator (Catalog # SDHI2 in Appendix E) on the source termination conductor feeding the subdivision.

4.6.2.2 TESTING

The Owner shall complete all of the Electrical Plant prior to requesting testing and energization.

Upon completion of all terminations and grounding, and with Contractor and BPI personnel present, the following tests must be performed.

a) All cables shall be meggered and identified to verify the correctness of cable tags. Primary cables shall be submitted to a standard Hi-pot test and the standard test form in Appendix F shall be completed and submitted to BPI Inspector.

Each primary cable 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 not satisfactory to BPI or have not been witnessed by BPI Inspector, shall be replaced with new ones and retested at no extra cost. No re-testing of tested cables shall be allowed.

4.6.3 INSTATALLATION OF NEUTRAL

The Contractor shall install the secondary neutral wire at the transformer including all terminations.

Concentric neutrals shall be bound and terminated as per termination manufacturer's recommendations.

4.7 WARNING TAPE / ELECTRONIC MARKER

It is required to install an electronic marker (3M's #1256 – Power), a warning tape or a

concrete over-lay as specified at the following locations. The tape or marker shall be installed 300mm below finished grade in all trenches. The tape shall be bright <u>RED</u> coloured plastic on polyethylene, 75mm -152mm wide with inscription " CAUTION – BURIED ELECTRIC CABLES BELOW". Where sufficient cover above the cables, of a standard trench, is not possible, mechanical protection shall also be provided by using cable bricks or concrete cover.

The Contractor shall bring in and stub the secondary service cable at least 1m inside the property line with at least 3m (10') of cable coil left for future splicing, as shown in Standard 25U-202-1. The coiled cable end shall be buried in clean sand and an EMS cable marker shall be place on top.

- Marker at all duct ends;
- Marker at splice locations (primary and secondary);
- Marker where there are buried cable coils;
- Tape over concrete over-lay (bricks or slabs) where there are non-standard cable depths; and
- Marker/tape with or without concrete overlay at any other area specified by BPI inspector.

4.8 INSTALLATION OF SYSTEM GROUND

At each transformer, switchgear and cable termination, the case and all other non-current carrying metallic parts shall be grounded. 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") diameter by 3m (10') long 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 vault or manhole with a clearance of 1m, and connect the ground rods to the equipment ground bushings, as per Standard 41U-200 in Appendix A. Additional grounding provisions may be required if rock is encountered.

An insulated ground line shall be installed from the ground grid at the transformer to the meter bases as per Standard 41U-300 in Appendix A.

4.9 INSTALLATION OF TRANSFORMERS

Single-phase transformers shall be used for the supply of power to residential homes and townhouses and shall be as specified in Appendix C. Transformers shall be selected to comply with the minimum requirements set out in the latest edition of CAN/CSA - C802-94 for transformer losses and CAN/CSA - 802.1-00 for minimum efficiency values. The minimum impedance for 50kVA transformers shall be 1.5% and for 100kVA transformers, shall be 2.5%. Notwithstanding the above, all type test reports or third party inspection reports shall be made available to BPI for review and acceptance prior to installation. Pad mounted transformers shall be numbered with BPI-designated transformer numbers painted on the sides and visible from road.

4.9.1 TRANSFORMER LOCATION

The transformer shall be located as close as possible to the 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 electrical safety code and standards.

The Electrical Consulting Engineer must select locations that are not in line with drainage swales or sufficient lot grading must be done to redirect water flow away from transformer vaults.

The transformer vaults shall be located as shown on the plan view drawing of the Electrical Plant and in general, positioned on the lots in the locations shown on Standard 37-505-1 and 37-505-2 in Appendix A.

4.9.2 TRANSFORMER VAULTS

Vaults shall be set to provide for a minimum 50mm (2") -150mm (6") clearance from top surface to 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 vault shall be sloped in such a manner that run-off is directed away from the vault. The earth material around the vault shall be prepared and maintained to prevent formation of sinkholes.

The concrete vaults shall be constructed as per standard 37-329 in Appendix A and be complete with steel plate and plate locking bolts. The installation of the transformer vaults shall be inspected by BPI Inspector prior to the Contractor committing any ducts or cables to them.

4.9.3 ORIENTATION AND PLACEMENT

The transformers shall be mounted on concrete vaults and oriented so that the transformer opening is opposite to the direction of traffic flow and parallel to the road for ease of operation and maintenance.

In the case of poured-in concrete vaults, placement of the transformer on vaults shall not be made before the poured-in foundations have reached full strength, which shall not be less than 7 days in all circumstances. A Consultant certificate verifying the designed load capacity of the vault shall be submitted to BPI, duly signed and stamped by a Professional Engineer. Any damage to the transformer after placement, as a result of this shall be the responsibility of the Developer or contractor and may delay energization of service by BPI.

The transformer shall be left at all times with all penta-bolts tightened down.

4.10 INSTALLATION OF SWITCHGEAR

Some subdivisions may require the installation of switchgear. The Owner shall purchase the switchgear and install it to the most current BPI specifications and standards. The specifications and standards will be provided at the time switchgear is required.

Installation of switchgear foundation and placement shall follow the same standards as required for transformers. The owner shall confirm that the dimensions and weight of the switchgear matches the foundation footprint and its load bearing capacity before placing the order. Vault catalog number (if available) and dimensions shall be provided on the plan view drawing.

4.11 INSTALLATION OF PRIMARY DIP POLE(S)

Where primary dip poles are installed by the Owner's contractor, the pole design must be approved and stamped by a P.Eng. certified to meet the safety requirements of Ontario Regulation 22/04. All poles receiving BPI overhead primary service wires shall be rated Class-3 or higher and all unbalanced loads on the pole, supported with adequate number of guys and anchors. The installation shall be subject to BPI inspection and approval.

APPENDIX A

DRAWINGS SHOWING

STANDARD INSTALLATION PRACTICES

METRIC LINEAR DIMENSIONS SHOWN IN MILLIMETRES

19U-515

(JUNE 13, 2008)



SECONDARY CABLES TO CUSTOMERS

NOTE:

- 1. ALL SECONDARY CABLES SHALL BE LOOPED INSIDE THE VAULT
- AND SUPPORTED BY PLACING THEM AT THE BOTTOM. 2. ALL CABLES SHALL BE TAGGED WITH A PERMANENT SERVICE
- ADDRESS, APPROVED BY BPI. 3. PENETROX SOLUTION SHALL BE USED BETWEEN CABLE ENDS AND CONNECTER BOLTS AND MANUFACTURER RECOMMENDED TORQUE SHALL BE APPLIED TO ENSURE PROPER CONTACT.
- 4. FOR GROUND CONNECTION DETAILS REFER TO STD. 41U-110.
- 5. FOR SECONDARY TAG DETAILS REFER TO STD. 37-400.

L	BILL OF MATERIALS				
Γ	Part No.	Qty	Description		
Γ	00174T	++	U/G WIRE, SEC 3 - 3/0 AL. TRI.		
Γ	000N13	6	NUT, COARSE 1/2"-13 BRASS		
Γ	000N14	12	WASHER, ROUND 1/2" BRASS		
Γ	000N15	6	WASHER, LOCK EVERDUR 1/2"		
Γ	0000N4	6	BOLT, 1/2" x 1 1/2"		
Γ	00324P	3	CONNECTOR, 14 WAY W/2 S/L PORTS		
Γ	000SH5	*	HOLDERS, MINI TAGS		
Γ	TIE4	•	TIE WRAP, BLACK 4" x 3/32"		
-					

++ - LENGTH TO SUIT

* - NUMBER AS NEEDED

TYPICAL INSTALLATION OF SECONDARY SERVICES IN A SINGLE PHASE TRANSFORMER





NOTES:

- 1. CUSTOMER OR OWNER TO PREPARE A SERVICE TRENCH AS SHOWN IN TYPICAL SERVICE SECTION DETAIL, UNLESS OTHERWISE SPECIFIED BY BPI.
- 2. FINAL GRADE SHALL BE ESTABLISHED WITH STAKED PROPERTY LINES PRIOR TO TRENCHING. 3. A MINIMUM 75 mm BEDDING AND 150mm COVER OF CLEAN SAND SHALL BE PROVIDED FOR CABLES
- AND DUCTS AT ALL TIMES IN THE LATERAL AND MAIN TRENCH. 4. TRENCH BOTTOM AND BACKFILL MATERIAL SHALL BE FREE OF STONES, DEBRIS AND OTHER
- POTENTIALLY DAMAGING MATERIALS. ONLY CLEAN BACKFILL SHALL BE USED. 5. SERVICE CABLE SHALL BE DIRECT BURIED ON PRIVATE PROFERTY BUT SHALL BE INSTALLED IN A
- 5. SERVICE CABLE SHALL BE DIRECT BURIED ON PRIVATE PROPERTY BUT SHALL BE INSTALLED IN A CABLE DUCT UNDER ALL FORMED SURFACES AND STRUCTURES INCLUDING CONCRETE WALKWAYS. THE DUCTS SHALL RUN CONTINUOUSLY AND EXTEND A MIN. 200 mm FROM THE EDGES OF THE ABOVE GROUND STRUCTURES AND SHALL BE PROPERLY SEALED AT BOTH ENDS. THE DUCT SHALL BE TYPE DB2/ES2, DIAMETER OF 100 mm (4°).
- 6. INSTALLATION MUST BE INSPECTED BY BRANTFORD POWER, PRIOR TO BACKFILLING.
- 7. ALL SECONDARY SERVICES FROM THE TRANSFORMER TO THE LOT SHALL BE INSTALLED DIRECT BURIED EXCEPT UNDER ROADS AND CONCRETE STRUCTURES / WALKWAYS WHERE IT SHALL BE INSTALLED IN 100mm DB2/ES2 TYPE DUCTS.
- 8. SERVICE CABLE SHALL BE TERMINATED 10 m INSIDE THE PROPERTY LINE. A COIL OF THIS CABLE SHALL BE LOOPED AT THIS LOCATION UNDER AN EMS MARKER.
- 9. ALL SERVICES SHALL BE LOCATED OPPOSITE SIDE OF PROPERTY AS THE DRIVEWAY.

UNDERGROUND SERVICE INSTALLATION 120/240V





METRIC LINEAR DEMENSIONS SHOWN IN MILLINETRES

25U-205-2 (TULY 30, 2010)

NOTES:

- 1. METER BASE SERVICE LOCATION AND SERVICE TRENCH LOCATIONS MUST HAVE APPROVAL OF BPI
- PRIOR TO INSTALLATION. REFER TO CONSTRUCTION DESIGN DRAWING/S. METER BASES SHALL GENERALLY BE INSTALLED ON ONE SIDE OF THE BUILDING. METER BASE MUST 2
- BE LOCATED WITHIN 3m OF THE FRONT OR REAR FACADE OF THE BUILDING. METER BASE MUST BE LOCATED WITHIN 3m OF THE FRONT OR REAR FACADE OF THE BUILDING. METER BASE MAY BE LOCATED AT THIS POINT SUBJECT TO APPROVAL BY BPL CABLE TO THE METER BASE WILL BE DIRECT BURIED EXTENDED TO APPROVAL BY BPL CABLE TO THE METER BASE WILL BE DIRECT BURIED EXTENDED TO APPROVAL BY BPL CABLE TO THE METER 3. IT WILL BE INSTALLED AS PER STD. 25U-202.
- METER BASE SHALL BE AS PER METERING SPECIFICATION AVAILABLE FROM BPI METERING 4. DEPARTMENT.
- METER BASE TO BE LOCATED 10 m MINIMUM FROM WINDOWS, DOORS AND OTHER OPENINGS. FOR TOWNHOUSES AND ROW BUILDING THIS MAY BE REDUCED TO A MINIMUM 600 mm. FOR ALL 5. INSTALLATIONS A 1.0 m MINIMUM RADIUS CLEARANCE FROM OTHER OBJECTS IN ALL DIRECTIONS IS TO BE MAINTAINED.
- FOR SERVICE INSTALLATION > 400 A REFER TO STD. 25U-260 AND CONTACT BPI ENGINEERING AND 6. CONSTRUCTION AND BPI METERING DEPT.
- CABLE FROM THE TRANSFORMER TO 10m BEYOND THE PROPERTY LINE SHALL BE CONTINUOUS AND WITHOUT SPLICES. FOR SERVICE TRENCH DETAIL, REFER TO STANDARD 25U-202-1.
 TRANSFORMERS SHALL BE LOCATED AT A MINIMUM OF 3.0 m FROM DOORS, WINDOWS OR VENTILATION
- INLETS/OUTLETS. TRANSFORMERS WITHIN THE 3.0 m LIMIT REQUIRE A BARRIER (BLAST WALL) AS PER RELEVANT SAFETY CODE.
- CIVIL DRAWINGS TO BE REVIEWED TO ENSURE TRANSFORMER PLACEMENT DOES NOT OVERLAP OR 9. INTERFERE WITH OTHER SERVICES.
- 10. ALL SERVICES SHALL BE LOCATED OPPOSITE SIDE OF PROPERTY AS THE DRIVEWAY.

UNDERGROUND SECONDARY SERVICE LAYOUT 120/240V





PRIMARY DIP POLE CABLE INSTALLATION

2.4/4.16kV TO 16/27.6kV



LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-329

864 Β 38 RECESSED AREA 15.11 FROM TRANSFORMER NOTES: NOTES: 1. CONCRETE MINIMUM 4500 PSI (31MPa) 2. THREADED INSERTS TO BE PLUGGED TO PREVENT ENTRY OF FOREIGN MATTER DURING TRANSIT. 3. TOP SURFACE TO BE FINISHED SMOOTH. 4. REINFORCING 100 mm. + 100 mm. - 6/6 GA. WELDED WIRE MESHI OR NO.3 REINFORCING BARS AT 150 mm. CENTRES COVERING TOTAL AREA. 5. OFENINGS ARE FLARED AND RECESSED WITH POLYSEALS. 6. NO OPTIONAL STEEL PLATE REQUIRED. 7. GRADE SURROUNDING THE VAULT SHALL SLOPE SO THAT THAT RUN-OFF IS DIRECTED AWAY FROM THE VAULT. t_ THREADED INSERT 1016 711 A А 152 1.3.1.3.1 i i . M -148 2 \leqslant Β TOTAL LOAD BEARING CAPACITY: 3650 LBS. (1665 kg) (approx.) 1168 152 152 FINISHED GRADE (SEE NOTE 7) OPENINGS ARE FLARED & RECESSED W/POLYSEALS ROAD SO-75 SIDE FIELD 102 MIN 203 SIDE NZINT. 305 7 51mm DIA. LIFTING HOLE 182 ġ. 000000 0000 E 000000 3 991 660 1473 1016 SECTION A - A SECTION B - B **³**[∗] STONE BALLAST

> PRECAST TRANSFORMER VAULT FOR A SINGLE PHASE TRANSFORMER OR SWITCH (UPTO 16kV)



37**-**329A

(JUNE 13, 2008)





METRIC LINEAR DIMENSIONS SHOWN IN MILLIMETRES

1016

37-336 (JUNE 13, 2008)



NOTES: 1. CONCRETE - 4500 PSI, AIR ENTRAINED, LOW SLUMP, REINFORCED WITH #3 (3/8" DIA.) HI-BOND REINFORCING STEEL BARS. 2. FOR MAIN & DEFAULT: REMEM TO STEE DO DO

2. FOR VAULT DETAILS, REFER TO STD. 37-329

PRECAST CONCRETE VAULT COVER FOR SINGLE PHASE PADMOUNTED SWITCH (16kV)



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 BURIEL 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



37-341-2

(JUNE 13, 2008)

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

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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



LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-344



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

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



LINEAR DIMENSIONS SHOWN IN MILLIMETRES



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



LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-349

(JUNE 13, 2008)



TYPICAL ROAD CROSSINGS DETAIL



METRIC
LINEAR DIMENSIONS SHOWN IN MILLIMETRES







NOTES:

1. AT ALL BENDS, EXTEND THE CONCRETE A MINIMUM OF 1 m BEYOND THE BEND ENCASING BOTH THE 15° • 90° ELBOW AND A 1.0 m SECTION OF THE STRAIGHT, ADJOINING DUCT. (SEE FIG. 1 & 2)

2. ALL CONCRETE ENCASED DUCTS SHALL BE INSTALLED AS PER STD. 37-341 AND 37-343 TO 37-345.

3. END OF DUCT BANK SHALL BE MARKED WITH AN ELECTRONIC MARKER AS PER STD. 37-349.

4. DIMENSION 'A' SHOWN IN FIGURE 1AND 2 SHALL BE TAKEN FROM THE PROPERTY LINE (P/L) ONLY, NOT FROM THE CURB.

5. FOR ROAD CROSSING DETAILS REFER TO STD. 37-349.

CONCRETE ENCASED BENDS (15° - 90°)



METRIC LINEAR DIMENSIONS SHOWN IN MILLIMETRES



.



TYPICAL LABELING OF PRIMARY AND SECONDARY CABLES



LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-505-1

(JUNE 13, 2008)



NOTES:

1. BPI. SERVICE TO BE INSTALLED ON SIDE OF LOT CLOSEST TO TRANSFORMER

1.0m FROM LOT LINE AND TERMINATED 1.0m INSIDE THE STREET LINE.

2. BPI. SERVICE TO BE INSTALLED ON OPPOSITE SIDE OF LOT CENTRE

LINE TO THE STORM, SANITARY AND WATER SERVICES .

3. PADMOUNT TRANSFORMER SHALL BE LOCATED ON EITHER LEFT OR RIGHT SIDE OF LOT LINE.

STANDARD LOCATION OF ELECTRICAL PLANT SINGLE FAMILY LOTS UNDERGROUND DISTRIBUTION



METRIC LINEAR DIMENSIONS SHOWN IN METRES

37-505-2

(JUNE 13, 2008)

RIGHT OF WAY LOCATION DIMENSIONS OF ELECTRICAL PLANT				
R.O.W. Size	Layout of Street	Dimension A	Dimension B	
16.0m	NO SIDEWALK. TREE LINE ON SAME SIDE OF STREET AS ELECTRICAL PLANT	1.2m	2.1m	
16.0m	NO TREE LINE. SIDEWALK ON SAME SIDE OF STREET AS ELECTRICAL PLANT.	2.0m	2.65m	
16.5m		2.25m	2.75m	
18.0m	SIDEWALK, HYDRANT AND TREE LINE ON SAME SIDE OF STEET AS ELECTRICAL PLANT	2.6m	3.5m	
18.0m	NO HYDRANT OR TREE LINE. SIDEWALK ON SAME SIDE OF STREET AS ELECTRICAL PLANT	2.0m	2.65m	
20.0m		2.5m	3.5m	

STANDARD LOCATION OF ELECTRICAL PLANT SINGLE FAMILY LOTS UNDERGROUND DISTRIBUTION



LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-510 (JUNE 13, 2008)



NOTES:

- NOTES: 1. RISER BEND TO BE POSITIONED SO THAT WIEN RISER CONDUIT IS ADDED IT WILL RUN STRAIGHT UP & TIGHT TO THE POLE. 2. ALL CONDUITS RISERS, BENDS AND FITTINGS SHALL BE CSA APPROVED SCHEDULE 40 HEAVY WALL, RIGID PVC WITH A MINIMUM WALL THICKNESS OF 0.154 3. 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. 4. SAND BEDDING AN D COVER ONLY IN THE CASE OF OPEN-CUT TRENCHES.

TYPICAL INSTALLATION OF JUNCTION BOX AND STREET LIGHT CABLE AT POLE



METRIC LINEAR DIMENSIONS SHOWN IN MILLIMETRES

41U-105

(JUNE 13, 2008)



$\frac{3}{4}$ " x 10' COPPER CLAD STEEL GROUND ROD(4 REQUIRED)

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



METRIC LINEAR DIMENSIONS SHOWN IN MILLIMETRES

41U-110 (APRIL 15, 2009)

DETAIL 1: LOADBREAK - 200 AMP PARKING STAND (28kV) ELBOW (28kV) ARRESTER (28kV) INSULATING CAP (28kV) B**USHING** 6 OR INSERT (28kV) 1 OR 2 C.N. B**LEE**D WIRES GROUND WIRE WIRE (NOTE 1) **G**RO**UN**D BUS BAR R OC) 5 1 (2) 3 2 3 DETAIL 1: C.N. WIRES DETAIL 2: Ground Wires DETAIL 3: BLEED WIRES (10) (11) 10 4 10 (10) 0 12 BILL OF MATERIAL Disciption CLAMP, HOT-LINE, #5-400 komi RUN, #5-250komi TA3 LUG, SERVIT POST. #2 - 2/0 CONNECTOR, LUG, 2/0 AW/0 Cu, 1-HOLE CONNECTOR TAP AMPAC Cu, 2/0 - 2/0 Part No. Item No. HOTUN 0261F5 0261F3 AMP875 (10)10 (6) (6)CONNECTOR FOR 1/2" BOLT GROUND ROD, 10'X 3/4" CONNECTOR, C-TYPE, 2/0 C/ WASHER, ROUND, FLAT, 1/2" 000N13 00144A 0261F4 000N14 000N15 000515 0261F5 DETAIL 5: Ground rod WASHER, RUND, FDAT, 1/2 WASHER, SPUT, FOR 1/2* BOLT WIRE, CU, 2/0 - BARE CONNECTOR, 3/4* GRND ROD CONNECTOR, AMPAC, CU, 3/4* - 2/0 GROUND <u>TAP</u> AMP378 TYPICALLY I-ITEM PER CONNECTION

NOTES:

- 1. CONCENTRIC NEUTRAL (C.N.) WIRES TO BE SIZED AS: #1/0 AWG (FOR #1/0 AWG 28 kV CABLE)
- 2. GROUND WIRE TO BE SIZED AS STANDARD #2/0 AWG Cu. BARE 3. BLEED WIRE, IF NOT SUPPLIED BY THE EQUIPMENT MANUFACTURER,
- SHALL BE # 14 GUAGE (MIN.) Cu., WITH 40 kV INSULATION.

TYPICAL GROUNDING DETAILS FOR U/G PLANT INSTALLATION 2.4/4.16 kV TO 16/27.6 kV



41U-200



GROUNDING DETAIL

BRANTFORD 0



GROUNDING FOR RESIDENTIAL UNDERGROUND SERVICES



APPENDIX B

DRAWINGS SHOWING

STANDARD DRAFTING PRACTICES

METRIC LINEAR DIMENSIONS SHOWN IN MILLIMBTRES

37-506-1

(APRIL 15, 2009)

0	POLE.
■ → •- ı	PARKING STAND ARRESTOR.
+ I	LIGHTNING ARRESTOR (OVERHEAD).
┫╌╌╢	LIGHTNING ARRESTOR (ELBOW TYPE).
6 5 A	FUSE WITH RATING.
<u>C.L</u> .	CURRENT LIMITING FUSE.
40 ^-KO	FUSED CUTOUT (NORMALLY CLOSED) WITH RATING (EXAMPLE SHOWN) & SPEED.
40A -K C	FUSED CUTOUT (NORMALLY OPEN) WITH RATING (EXAMPLE SHOWN) & SPEED.
600A G	SWITCH (NORMALLY CLOSED) WITH RATING.
600A	SWITCH (NORMALLY OPEN) WITH RATING.
50A NX35-C B	BREAKER (NORMALLY CLOSED) WITH RATING & SPEED (EXAMPLE SHOWN) .
50A NX3 <u>5-C</u> B	BREAKER (NORMALLY OPEN) WITH RATING & SPEED (EXAMPLE SHOWN) .
<	LOAD BREAK ELBOW RECEPTACLE (200A) NORMALLY CLOSED.
\triangleleft	LOAD BREAK ELBOW RECEPTACLE (200A) NORMALLY OPEN.
<	LOAD BREAK DEAD END RECEPTACLE.
	LOAD BREAK DEAD END PLUG.
H	LOAD BREAK STAND OFF PLUG.
◀	NON-LOAD BREAK ELBOW RECEPTACLE (600A) NORMALLY CLOSED.
\leq	NON-LOAD BREAK ELBOW RECEPTACLE (600A) NORMALLY OPEN.
_ _	TWO WAY JUNCTION.
	THREE WAY JUNCTION.
-+-	FOUR WAY JUNCTION.

SCHEMATIC LEGEND



METRIC LINEAR DIMENSIONS SHOWN IN MILLIMETRES

37-506-2 (APRIL 15, 2009)

_	STRESS CONE.		
B	FAULT INDICATOR (WITH PHASE INDICATION).		
\leq	TRANSFORMER (SIZE & VOLTA	GE AS INDICATED).	
s >	TRANSFORMER WITH PRIMARY	FEED SWITCH.	
A	FEEDER DESIGNATION.		
2	RUN DESIGNATION		
R#1 COLB	INDICATES THAT MANHOLE, P	ADMOUNT TRANSFORMER ETC.	
	IS AT REAR OF #1 COLBORNE ST (F=FRONT, S=SIDE, O=OPPOSITE).		
PM1-COLB	PULLING MANHOLE.		
PMT1-COLB	PADMOUNT TRANSFORMER. Transformer room.		
TR1-COLB			
PS3-EVE	PADMOUNT SWITCH.	MUST HAVE LOT NUMBER AND STREET CODE SUFFIX	
PMJ3-EVE	PADMOUNT JUNCTION		
PV	PULLING VAULT)	
	INDICATES LIMIT OF MANHOLE, PAD, VAULT OR TRANSFORMER ROOM.		
1/0XL	CONDUCTOR (SIZE & TYPE NOTED).		
B B B DA-169 S	VACUUM BREAKER SWITCH (WITH STREET CODE & NUMBER), Shown with Breakers and Switch.		

SPLICE.

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SCHEMATIC LEGEND



METRIC	
LINEAR DIMENSIONS SHOWN IN MILLIMETRES	

37-507





NOTES: 1. FOR SHEMATIC LEGEND REFER TO STD. 37-506

TYPICAL PRIMARY SCHEMATIC UNDERGROUND DISTRIBUTION



METRIC LINEAR DIMENSIONS SHOWN IN MILLIMETRES



\longrightarrow	100 WATT HIGH PRESSURE SODIUM STANDARD LUMINAIRE.
$ \triangleleft$	250 WATT HIGH PRESSURE SODIUM STANDARD LUMINAIRE.
	3 PHASE PRIMARY (28KV) CABLE SIZE AS NOTED.
	2 PHASE PRIMARY (28KV) CABLE SIZE AS NOTED.
	SINGLE PHASE PRIMARY (28KV) CABLE SIZE AS NOTED.
4	SECONDARY SERVICES SHOWING NUMBER OF SERVICES IN THE TRENCH, SERVICE SIZE IS INDICATED BY THE SYMBOL AT FRONT PROPERTY LINE OF LOT.
	2-1/0 & 1-#2 AL TRIPLEX SERVICE.
\longrightarrow	2-3/0 & 1-1/0 AL TRIPLEX SERVICE.
0	2-250 & 1-3/0 AL TRIPLEX SERVICE.
	2-#6CU STREET LIGHT WIRE.
·	SPARE DUCT, SIZE AS INDICATED.
\otimes	10.67m (35') CONCRETE POLE (CLASS B).
\boxtimes	PADMOUNT TRANSFORMER (SIZE AS INDICATED).
	PADMOUNT 4-WAY JUNCTION ENCLOSURE.
 ○-⊞	PADMOUNT VACUUM BREAKER WITH CONTROL MODULE.
	PRECAST VAULT OR PULLING MANHOLE (AS NOTED).
PMT12-XYZ	PADMOUNT TRANSFORMER NUMBER.
VB12-XYZ	VACUUM BREAKER NUMBER.
PV12-XYZ	PRECAST VAULT NUMBER.
PM12-XYZ	PULLING MANHOLE NUMBER.
PS12-XYZ	PADMOUNT SWITCH.
45 14	LOT # (LARGE) & MUNICIPAL ADDRESS.

NOTES:

1. THE NUMBER FOR THE ABOVE VAULTS AND MANHOLES IS TAKEN FROM THE NUMBER OF THE LOT ADJACENT TO THE EQUIPMENT. 2. STREET CODE SHALL BE APPROVED BY BPI.

STANDARD LEGEND PLAN VIEW





APPENDIX C

TRANSFORMER SPECIFICATIONS



	Brantford P	ower Inc.			
Single Phase Padmount Transformer Specification					
	BPI-DT-1PA	D-0220			
Primary Voltage	16KV	Secondary Voltage	240/120V		
Specification:		•	-		
Grid Smart City GSC DT-1PAD	(Issue #4)				
Options/Exceptions:					
1. Transformers shall be equip	ped with internal fault de	tector (IFD) manufactured	by IFD Corporation.		
2.Transformers shall be equip	oed with load break switcl	nes per CSA 227.3 Figure 3	;		
3. The exterior ID label shall be located on the secondary side of the transformer hood and is to include the following: serial number, percent impedance, date of manufacture and the manufacturers name and /or logo.					
Approved Manufacturers:					
CES					
Camiran					
Approval:					
04-03-20					
John Papakyriakou, P.Eng, PMP Date (dd/mm/yy) Engineering Manager					

APPENDIX D

PRIMARY AND SECONDARY CABLE

SPECIFICATIONS

GENERAL SPECIFICATION FOR CONCENTRIC NEUTRAL POWER CABLE 28 KV

1) **SCOPE**

This specification covers the requirements for 28 KV concentric neutral power cable.

2) 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 S-66-524 and CSA Standard C68.2-1988.

3) **OPERATING CONDITIONS**

Power cable manufactured under this specification shall be capable of continuous operation at 60 cycle A.C. at 90°C at voltage as specified and must be suitable for installation at minus 40°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.

4) **CABLE CONSTRUCTION**

Conductor:	Annealed uncoated compressed strand copper			
Strand Shield:	Extruded semi-conducting cross linked			
Insulation:	Cross-linked polyethylene			
Insulation Shield:	Semi-conducting polyethylene or cross-linked polyethylene			
Concentric Neutral:	Annealed copper wires, full capacity			
Jacket:	Polyvinyl chloride			

5) **TESTING**

Completed cable test reports shall be submitted to BPI prior to shipment.

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

APPENDIX E

CATALOG NUMBERS

OF APPROVED EQUIPMENT

EQUIPMENT	MANUFACTURER	<u>CAT NO.</u>
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	5421-CI1/0A
TPR Fault Indicator with 800 Amp Trip Rating	Cooper/RTE	STHI
Overhead Fault Indicator	Cooper/RTE	SDHI2
Cold Shrink 0/H Cable Termination Kit	ЗМ	5646
Elbow Type Lightning Arrestor	Cooper/RTE	3238019C21-M
Secondary Connector	Utilco	TUT 16-250
34 KV 100 Amp Load Break Cutout	ABB	279C790A23
O/H Lightning Arrestor 21 KV	Ohio Brass	217617-8741
ETP40 Sure-Guard 0/H Current Limiting Fuse 40 K	General Electric	9F59UBD134
EMS Marker	3M	1256

NOTE: Elbow and splices are sized for use with 1/0 compact cable with insulation diameter of 0.945 - 1.05 inches.

APPENDIX F

CABLE HIGH POTENTIAL TEST



CABLE HIGH POTENTIAL TEST

LOCATION:			
CABLE MFG.	INS. TYPE:		
RATED VOLTAGE:	SIZE:		
_LENGTH:			
TIME OF DAY:	TEMPERATURE:	°C	
WEATHER CONDITIONS:			
DESCRIPTION OF ROUTE FOR CABLE UNDER TEST:			

Test Voltage	Leakage Current in Microamps				
	1 Min	2 Min	3 Min	4 Min	5 Min
25 kV DC					
50 kV DC					
75 kV DC					

COMMENTS:

TEST INSTRUMENT USED:

_TESTED BY:_____

BRANTFORD POWER WITNESS:

DATE:_____