

HALDIMAND COUNTY

DESIGN CRITERIA

SECTION U

HALDIMAND HYDRO STANDARD REQUIREMENTS

Revised 2008

1. Scope

The following requirements apply to the design and installation of power lines and equipment associated with the underground electrical supply located entirely outside buildings for residential developments within the service territory of Haldimand County Hydro Inc.

2. Standards

The design and installation shall conform, as a minimum, to the current issue of:

- Canadian Standards Association Standard C22.3 No. 7 Underground Systems,
- Haldimand County Hydro Design Approval Process, and
- these Electrical Distribution Requirements for Residential Subdivisions.

3. Costs

The costs associated with the design and installation of the electrical distribution system for the development of the subdivision and its connection to Haldimand County Hydro's distribution system shall be borne by the Developer, as determined by Haldimand County Hydro in accordance with its Conditions of Service.

4. Material

All material and equipment for the installation of the electrical distribution system shall satisfy the requirements of Haldimand County Hydro's specifications.

5. Equipment

Haldimand County Hydro will supply and install the following equipment:

- transformers,
- switchgear,
- junction kiosks.

The Developer shall supply and install foundations for the equipment listed above and any pulling vaults and other sub-surface chambers that may be required.

The distribution system shall be designed to accommodate transformers that are built to the current issue of CSA Standard C227.3 *Low profile, single phase, pad-mounted distribution transformers with separable insulated high-voltage connectors*, and sized as follows:

- 100 kVA as standard for not more than 12 detached or semi-detached houses, or
- 75 kVA as an option for not more than 10 row houses.

- 5.1 Equipment foundations shall be located in the boulevards of public rights-of-way at side lot line extensions that do not conflict with proposed street lighting pole locations, or at locations for which prior approval has been obtained from Haldimand County Hydro.
- 5.2 Where boulevard locations are unavailable, equipment foundations shall be installed in easements registered to Haldimand County Hydro and located at the corners of adjoining lots fronting onto public rights-of-way or at locations for which prior approval has been obtained from Haldimand County Hydro.
- 5.3 Easements for the installation of equipment foundations shall be sized as follows:
 - 4 m x 4 m for single-phase equipment, or
 - 6 m x 6 m for three-phase equipment.
- 5.4 Equipment foundations shall be located so as to provide a minimum separation between the foundation wall and the edge of driveways, trees, vegetation, and structures, such as walls, poles, fire hydrants, utility pedestals, post office boxes, fences, posts, etc., as follows:
 - 3.0 m on sides where the cable compartment doors are proposed, and
 - 1.0 m on the remaining sides.
- 5.5 Transformer foundations shall be located according to classification of roadway as follows:
 - a distance of 1.2 m from street property line to the face of transformer foundations outside G1 Rural 20 m rights-of-way;
 - a distance of 1.25 m from gutter to the face of transformer foundations in G2 Urban 20 m rights-of-way;
 - a distance of 1.2 m from street property line to the face of transformer foundations outside G3 Partially Urbanized 24 m rights-of-way.
- 5.6 Transformer foundations shall be located so as to provide a minimum line-of-sight separation from the surface of the proposed transformer of:
 - 3 m between any combustible surfaces or materials on a building or equipment, and
 - 6 m to any door or window and ventilation inlet or outlet.
- 5.7 Equipment foundations should be located on the opposite side of the roadway from the water main.
- 5.8 Transformer foundations should optimally be located centrally in respect to their service connections to minimize cable lengths and the associated voltage drops.
- 5.9 Equipment foundations at intersections should not be located beyond the “Beginning of Curve” (BC).
- 5.10 Equipment foundations should not be located at curves or bends in the road or cul-de-sacs.
- 5.11 Equipment foundations shall be orientated such that their cable compartment doors will open away from oncoming traffic on their side of the roadway.

5.12 Equipment foundations shall be backfilled with sand within 1 m around their perimeters.

6. Equipment Grounding

The Developer shall supply and install a ground grid for each transformer, switchgear and junction kiosk, in accordance with the following requirements:

- 6.1 One ground rod shall be driven at each of the four corners of each equipment foundation. A minimum buried depth of 500 mm below final grade to the top of each ground rod.
- 6.2 A continuous 2/0 AWG bare copper ground conductor shall be buried to a depth of 600 mm below final grade between all four ground rods around each equipment foundation. The 2/0 AWG bare copper ground conductor is to be installed 1m from the outside perimeter of the equipment foundation.
- 6.3 The two ends of the continuous ground conductor shall be extended into the equipment foundation at diagonally opposite locations leaving a 2 m coil at each end inside the transformer foundation.
- 6.4 The ground conductor shall be connected to each ground rod with a compression connector approved by Haldimand County Hydro.

7. Cable

Haldimand County Hydro will arrange for high potential testing of high-voltage cables and will supply and install all cable connectors and terminators.

The Developer shall supply and install all cables in accordance with the following requirements:

- 7.1 Future load requirements shall be determined utilizing planning and zoning maps to identify potential customers, such as commercial, industrial and institutional customers, that may need 3-phase power.
- 7.2 The circuit configuration and number of phase conductors shall be determined with the aid of Haldimand County Hydro's five-year plan.
- 7.3 In all cases, the circuit configuration shall incorporate a loop-feed backup design to improve reliability through ease of restoration during plant failures.
- 7.4 No more than 20 transformers may be connected to a single-phase high-voltage (16 kV) distribution cable between fused termination points.

- 7.5 The number of phases to be installed will be determined by the quantity of transformers connected between fused termination points
- 7.6 The maximum length of cable shall be determined by restricting the maximum calculated pulling tension to 4 kN (900 lb.), which amounts to a maximum of 600 m for straight lengths of duct. Termination points shall be strategically located to avoid the use of pulling vaults in complying with the maximum pulling tension restriction.
- 7.7 High-voltage cables shall be sealed with water tight end caps.
- 7.8 Low voltage service cables of 200 A nominal ampacity shall be installed to provide each residential customer with an individual supply circuit.
- 7.9 Service cables shall be restricted to a maximum length of 60 m from the transformer foundation to the service stub at each residential customer's lot line, to minimize the voltage drop.
- 7.10 A 4 m length of cable shall be left coiled in each equipment foundation and pulling vault. High-voltage cables shall be coiled counter clockwise and low-voltage service cable shall be coiled clockwise.
- 7.11 A 3 m length of service cable shall be left attached to a 50 x 100 mm stake located 1 m past the street property line and 1 m from the side lot property line.
- 7.12 Service cables shall be clearly marked at each end with the lot number that the cable services.

8. Ducts and Tubing

The Developer shall install ducts and tubing in accordance with the following requirements:

- 8.1 The centre line of trenches for the installation of ducts and tubing along the boulevards of public rights-of-way shall be located according to classification of roadway as follows:
- at a distance of 2.5 m from street property line in G1 Rural 20 m rights-of-way;
 - at a distance of 2.75 m from gutter on the transformer side of the roadway and 3.75 m on the water main side of the roadway in G2 Urban 20 m rights-of-way;
 - at a distance of 3.0 m from street property line in G3 Partially Urbanized 24 m rights-of-way.
- 8.2 Duct and tubing installations shall maintain a 0.3 m separation from all pipelines.
- 8.3 Ducts and tubing shall be buried in trenches at a minimum depth of 0.9 m for low-voltage service cables and 1.0 m for high-voltage cables; and shall be surrounded by an envelope of sand.
- 8.4 The bottoms of trenches shall be free of all stones, debris and surplus material and shall be leveled to a tolerance of 100 mm before backfilling.

- 8.5 High-voltage cables shall be installed in 75 mm rigid PVC ducts suitable for direct burial.
- 8.6 At equipment foundations, ducts shall be terminated with bell end fittings sealed flush with the inside walls.
- 8.7 Service cables shall be installed in 100 mm flexible HDPE tubing suitable for direct burial, except where 75 mm PVC duct is required as follows:
- Under asphalt and concrete pavement, roadways, lane ways, drive ways, parking lots, sidewalks, etc., and
 - Under commercial and industrial properties.

9. Road Crossings

The Developer shall install all road crossings in accordance with the following requirements:

- 9.1 Ducts under roads shall be encased in 20 MPa concrete and reinforced with 13 mm steel bar.
- 9.2 Duct spacers shall be installed to bind the ducts and reinforcing bars together.
- 9.3 One spare duct shall be installed at each road crossing. The ends of spare ducts shall be plugged with plastic plugs.
- 9.4 Road crossing ducts shall be re-aligned with main trench ducts using 90-degree bends. The 90-degree bends shall be encased in 20 MPa concrete half-way around the radius of the bend.
- 9.5 Road crossing ducts shall be located at a 3 m offset from the centre of equipment foundations.

10. Poles

Haldimand County Hydro-owned poles shall be installed at a minimum of 2 m from back of curb to centre of pole.

11. Street Lights

Contact Haldimand County's Engineering and Infrastructure Division for specifications on street light design and installation.

12. Drawings

The Developer shall submit five (5) sets of printed drawings, in 1:500 or 1:1000 scale, for approval prior to construction; and, a digital electronic copy of the “as-built” drawings for the record.

Drawings shall conform to Haldimand County Hydro’s Design Approval Process.

13. Inspection

The Developer shall arrange for Haldimand County Hydro’s inspection of the installation:

- after staking locations prior to excavation,
- during excavation and installation, and
- prior to backfilling excavations and pouring concrete.

Product No.	Description
718405	Cable underground, 28 kV TRXLPE 1 conductor 2/0 AWG Al. compact blocked strand, encapsulated LLDPE jacket, 100% insulation level, 100% concentric neutral conductance with 15 x #14 AWG Cu. wires, 90°C rated, 750 m max./reel with 66-in. max. flange diameter, per CEA WCWG-01 (95) except 2/0 conductor
718243	Cable, underground, 600 V XLPE USC90, 3 conductor 3/0 AWG Al. triplex, compact strand, PVC jacket, red, black and white colour coded, 90°C rated, 450 m max./reel, per CEA WCWG-04
718313	Cable, underground, 600 V XLPE USC90, 3 conductor 250 kcmil Al. triplex, compact strand, PVC jacket, red, black and white colour coded, 90°C rated, 300 m max./reel, per CEA WCWG-04
153007	<p>Foundation, low profile, transformer, precast concrete, 1473 mm L x 1016 mm W x 1219 mm H x 152 mm Thick, of 30 MPa concrete, reinforced with 152 mm grid of #3 10 mm steel reinforcing bars or equivalent reinforcement, and equipped with 13 x 203 x 864 mm galvanized steel cover plate, all per CSA A23.4-05 and drawing TP-142-48</p> <ul style="list-style-type: none"> • Hygrade Precast Concrete Products Inc. # TP-142-48 • Reid's Precast Cement Products Ltd. # RLP-48.1
153411	<p>Foundation, junction, precast concrete, 1473 mm L x 1016 mm W x 1067 mm H x 152 mm Thick, of 30 MPa concrete, reinforced with 152 mm grid of #3 10 mm steel reinforcing bars or equivalent, and equipped with 305 x 1052 mm galvanized steel cover plate, for Kabar 1-phase junction kiosk, all per CSA A23.4-05 and drawing ICS 189SP</p> <ul style="list-style-type: none"> • Industrial Cast Stone Ltd. # ICS 189SP • Brooklin Concrete Products Ltd. # BCP 110PS
153412	<p>Foundation, junction, precast concrete, 1561 mm L x 1193 mm W x 1220 mm H x 152 mm Thick, of 30 MPa concrete, reinforced with 100 mm grid of 6/6 gauge welded wire fabric or equivalent reinforcement, for Kabar 2-phase junction kiosk, all per CSA A23.4-05 and drawing ICS 201</p> <ul style="list-style-type: none"> • Industrial Cast Stone Ltd. # ICS 201
153413	<p>Foundation, junction, precast concrete, 1880 mm L x 1524 mm W x 1067 mm H x 152 mm Thick, of 30 MPa concrete, reinforced with 100 mm grid of 6/6 gauge welded wire fabric or equivalent reinforcement, for Kabar 3-phase junction kiosk, all per CSA A23.4-05 and drawing ICS 210</p> <ul style="list-style-type: none"> • Industrial Cast Stone Ltd. # ICS 210

Product No.	Description
153415	Foundation, switchgear, precast concrete, 1930 mm L x 1575 mm W x 1219 mm H x 152 mm Thick, of 30 MPa concrete, reinforced with 152 mm grid of #3 10 mm steel reinforcing bars, or equivalent reinforcement, and equipped with a collar to fit S&C type PMH switching cubicle, all per CSA A23.4-05 and drawings ICS 191 and 191A <ul style="list-style-type: none"> • Industrial Cast Stone Ltd. # ICS 191 and 191A • Brooklin Concrete Products Ltd. # BCP 330P & 330TC
240208	Rod, ground, galvanized steel, 3/4 in. x 10 ft, galvanized full length, cone point, per CSA 83.41-96 Type 2 No.16xL
406003	Duct, straight, PVC, type DB2/ES2, 3 in. x 20 ft., solid wall for direct burial, per CSA C22.2 No. 211.1-06
406008	Bend, duct, PVC, type DB2/ES2, 3 in., 90 degree, 36-in. radius, solid wall for direct burial, per CSA C22.2 No. 211.1-06
406013	Coupling, duct, HDPE, 3 in., push fit with internal stop, for type DB2/ES2 PVC direct buried duct, per CSA C22.2 No. 211.1-06
406018	Bell end fitting, duct, PVC, type DB2/ES2, 3 in., for direct burial, per CSA C22.2 No. 211.1-06
406023	Plug, duct, HDPE, 3 in., push fit, for type DB2/ES2 PVC direct buried duct, per CSA C22.2 No. 211.1-06
406028	Spacer, duct, base, HDPE, 3 in., with 2-in. vertical and horizontal spacing and 3-in. ground clearance, for type DB2/ES2 PVC direct buried duct, per CSA C22.2 No. 211.1-06 <ul style="list-style-type: none"> • Ipex Inc. # 29570
406033	Spacer, duct, intermediate, HDPE, 3 in., with 2-in. vertical and horizontal spacing, for type DB2/ES2 PVC direct buried duct, per CSA C22.2 No. 211.1-06 <ul style="list-style-type: none"> • Ipex Inc. # 29554
406044	Tube, flexible, HDPE, corrugated, 4 in. diameter, single wall, perforated for direct burial
406117	Conduit, rigid PVC, 2-in. diameter, bell end, for direct burial, 10' length, per CSA C22.2 No. 211.2-06
406143	Adapter, reducing, rigid PVC, 3-in. duct to 2-in. conduit, per CSA C22.2 No. 211.1 <ul style="list-style-type: none"> • Ipex Inc. # 29191

Product No.	Description
406155	Adapter, reducing, rigid PVC, 4-in. duct to 2-in. conduit, per CSA C22.2 No. 211.1 <ul style="list-style-type: none"><li data-bbox="402 422 678 453">• Ipex Inc. # 29192
711086	Conductor, bare Cu., 2/0 AWG MHD, 19-strand class B, 3799 lb. UTS, 300 m max./reel, per ASTM B8-04
721525	Connector, compression, #2 - 2/0 AWG Cu. to 3/4-in. ground rod, figure-8 configuration of tin-plated wrought copper with min. conductivity of 99% I.A.C.S., for direct burial or in concrete, hex compression with die code embossing, per IEEE 837-2002 <ul style="list-style-type: none"><li data-bbox="402 722 862 753">• Thomas & Betts # GR34-202TP<li data-bbox="402 758 781 789">• Burndy/FCI # YGHR2634