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GCS0001				

UNDERGROUND RESIDENTIAL DISTRIBUTION

INSTALLATION OF CIVIL WORK

CONSTRUCTION DETAIL

See Hydro Ottawa's Web site for the
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REVISION SHEET

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1.0 Introduction

This specification sets down the general requirements for installation of civil works for Underground Residential Distribution (URD) not requiring a manhole system or main electrical trunk circuits.

2.0 Reference Documents

This specification is supported by Hydro Ottawa's Conditions of Service document number ECS0012 and the Hydro Ottawa Engineering Specifications listed in Table 2.1.

TABLE 2-1 Hydro Ottawa Engineering Specifications

NUMBER	DESCRIPTION	TYPE
ECS0002	120/240 V Underground Residential Meter Socket	Construction/Wiring Detail
GCM0001	Underground Residential Distribution	Bill of Material
GCS0005	Specification for Installation of Civil Works for Underground Distribution	Construction Detail
GCS0004	XLPE Cable Installation 15/28 kV and 600 V	Construction Detail
GCS0012	Underground Distribution Plant Identification	Identification Detail
UDS0023	Pole Lateral Standard	Construction Detail
UCS0003	Single Phase Transformer Base and Pad 50-167 kVA	Construction/Wiring Detail
UCS0004	1 & 3 Phase Transformer/Switchgear Base and Pad	Construction Detail
UDS0001	Concrete Duct Bank	Construction Detail
UDS0002	Joint Utility 3 Party Trench for Residential Subdivision	Construction Detail
UDS0003	Residential Service Trench	Construction Detail
UDS0014	Joint Utility 4 Party Trench Typ. Cross Section	Construction Detail
UDS0015	Joint Utility 3 Party Trench with Direct Buried Secondary Cable	Construction Detail
UFS0001	Protective Bollards	Construction Detail
UGS0002	1 & 3 Phase Transformer/Switchgear Base	Grounding Detail

3.0 Location of Plant

Main line trenches for Hydro Ottawa cables are to be located within the standard municipal right of way as indicated on the municipal cross sectional drawing (Public Utility Coordinating Committee) applicable to the project. For rural subdivisions where the sloping of ditches does not provide adequate space for trenches, they shall be installed in a 3-meter easement on private property.

In general, service trenches for single homes shall be on the side of the home opposite the driveway. Town homes are serviced from the end-wall of the building. In each case, the standard service trench location shall be centered 500 mm from the side property line and shall be straight between the angle points indicated on the Hydro Ottawa drawing.

Where specified by Hydro Ottawa, trenches for primary and secondary cables shall be located on easements granted to Hydro Ottawa.

It is the developer's responsibility to establish and maintain all grades and locate all iron bars required to delimit the property and to ensure proper location of Hydro Ottawa plant.

4.0 Trenches

Joint utility 3 party trenching (hydro, communication, cablevision) is the standard trench configuration for underground residential servicing. Where the design specifies direct buried duct installation for primary and secondary cables, the joint utility 3 party trench shall be constructed as per Hydro Ottawa Engineering Specification No. UDS0002. Where the design specifies direct buried duct for primary cables and direct buried secondary cables, the joint utility 3 party trench shall be constructed as per Hydro Ottawa Engineering Specification No. UDS0015. Secondary service trenches shall be constructed as per Hydro Ottawa Engineering Specification No. UDS0003. Gas pipelines running parallel to main residential trenches shall maintain a minimum horizontal separation of 900mm from all Hydro Ottawa underground cables. Gas pipelines running parallel to service trench shall maintain a minimum horizontal separation of 300mm from all Hydro Ottawa cables. Where underground gas pipelines intersect with Hydro Ottawa underground cables, a minimum 300mm vertical separation is required.

Joint utility 4 party trenching (hydro, communication, cablevision, gas) is an alternative standard for underground residential servicing and shall only be used at the determination of Hydro Ottawa. Joint utility 4 party trenches shall be constructed as per Hydro Ottawa Engineering Specifications UDS0014 and UDS0016.

Concrete encased duct(s) and manhole system shall be constructed as per section 5.0.

Prior to excavating any trench, the first lift of base course asphalt shall be installed and the boulevard grade shall be within 150 mm of final elevation. The trenches shall be excavated to the required depth and sand bedding (see Appendix "A") shall be in place before any duct is installed. After the duct is installed, the required sand cushion shall be placed prior to general backfilling. Native material may be used as a general backfill, if it is clear sand, clay, loam, or similar material. In any case, the nature of the general backfill material must be such as to permit easy access to the cable by hand excavation methods during future maintenance. Hydro Ottawa shall approve all native backfill. In the event that the native backfill material is not approved, the developer shall import backfill acceptable to Hydro Ottawa. **NO TRENCH SHALL BE BACKFILLED WITHOUT APPROVAL FROM THE HYDRO OTTAWA INSPECTOR.** Reasonable notice is required for Hydro Ottawa to complete on-site inspections.

5.0 Installation of Ducts and Cables

All concrete encased, steel reinforced duct banks shall be installed as per Hydro Ottawa Engineering Specification No. GCS0005.

Hydro Ottawa primary cable shall be placed in 100 mm PVC DB2 duct that is either encased in reinforced concrete or direct buried, as specified in the Hydro Ottawa design. Secondary cables shall be placed in 100 mm PVC DB2 duct that is either encased in reinforced concrete or direct buried or placed directly in the trench in sand bedding, as specified on the Hydro Ottawa design.

Where secondary cable is installed in duct to the lot line, the duct shall be capped until the cable is installed then sealed with a clean rag after cable installation

All ducts shall be according to CSA Standard C22.2 No. 211.1. All duct accessories shall be of PVC solvent weld type i.e. couplings, cement, etc. All 45 and 90 degree bends shall be FRE type (915 mm radius) or PVC type (915mm or 1500 mm radius) as specified on the design drawing.

Concrete encased road crossings shall extend a minimum of 1 meter beyond the curb, or where there is a sidewalk beyond the sidewalk, or when meeting a perpendicular trench to the radius of the duct bend.

All completed ducts shall be rodded by the site contractor in the presence of a Hydro Ottawa inspector and shall be clear of all extraneous material. A wire brush and mandrel, to nominal diameter of duct, supplied by Hydro Ottawa will be passed through each duct. In the event of ducts blocked by ice, the developer's representative shall be responsible for clearing the ducts prior to the cable installation. One 9.5 mm polypropylene rope shall be installed in each duct for cable pulling.

Any underground cable terminating at a line pole may require a pole lateral as specified by Hydro Ottawa Engineering Specification No.UDS0023. Hydro Ottawa will determine in the field the location of the riser on the line pole.

Only Hydro Ottawa Approved Contractors may install duct for Hydro Ottawa use or connect to existing Hydro Ottawa direct buried ducts, concrete duct banks or manholes. All work on existing Hydro Ottawa plant must be completed in the presence of a Hydro Ottawa inspector and in accordance with the appropriate safety acts and regulations.

Secondary service cables to both single and multi unit dwellings shall be direct buried from the property line to the meter base unless noted otherwise on the Hydro Ottawa design drawing. Where secondary cables are installed in duct, the end of the duct shall be sealed with a clean rag to prevent the ingress of dirt.

Hydro Ottawa shall inspect all duct formations prior to placing concrete or in the event of direct buried duct or cables, before backfilling the trench. Hydro Ottawa reserves the right to refuse any duct or trench installation, which was not inspected by Hydro Ottawa. Reasonable notice is required for Hydro Ottawa to complete on-site inspections.

6.0 Low Profile Single Phase Padmounted Transformer Base

Details for the installation of a transformer base, transformer grounding and protective bollards are detailed on Hydro Ottawa Engineering Specifications UCS0004, UGS0002 and UFS0001 respectively. Transformer ground connections, cable training, equipment tagging and signage are detailed on GCS0012, UTS0004, UTS0005, UTS0006 and UTS0008.

The transformer base shall be located within the road allowance on front lots (in the green space opposite driveways, centered on lot lines) or along the side of lots or easement as indicated on

the Hydro Ottawa design drawing. The front of the transformer shall face the street. An iron survey bar and grade marker must be in place before installation of the transformer base.

The developer shall ensure transformer bases are installed at the proper grade and location. Bedding for the concrete base shall be placed on undisturbed soil and shall consist of 300 mm of Granular "A" compacted to 95% standard proctor density. The base and slab shall be flat, level and free from rocking without the aid of shimming; see Hydro Ottawa Specification UCS0004.

Ducts entering the transformer base shall be cut perpendicular and shall terminate 25 mm inside the base. Spaces left between the ducts or around conductors and the exterior of the concrete base shall be sealed with expanding foam from outside the concrete base.

The transformer grounding system is to be completed in accordance with Ontario Electrical Safety Code (OESC) and as per Hydro Ottawa Engineering Specification No. UGS0002. The developer shall supply and install a minimum of four 3050 mm galvanized ground rods with 2/0 AWG copper conductor connecting all rods together in a loop system at a depth of 300 mm below final grade. Connections to the ground loop must enter the base at two separate locations (opposite sides) and have a 3 m coil for each of the conductors in the bottom of the transformer base. The transformer base excavation shall not be backfilled until a satisfactory ground resistance of < 25 ohms is obtained (additional ground rods or ground plates may be required). Communication or cable pedestals located within 2 m of the transformer ground grid shall be solidly bonded to this ground grid.

The following minimum clearances must be maintained from transformers whenever possible:

- a. 3 m from a driveway (driveway measured as being perpendicular from the house),
- b. 1 m from sidewalks,
- c. 2 m from roadway curbs,
- d. 600 mm from a building as per the Ontario Electrical Safety Code,
- e. 600 mm from telephone and cable pedestals,
- f. operating clearances are indicated on Hydro Ottawa Engineering Specification UTS0001,
- g. outside the 15 m sight line triangle at road intersections,
- h. 1 m from street light poles,
- i. 3 m from fire hydrants,
- j. 3 m from trees,
- k. as per municipal standard road cross section details and pedestal locations.

Where the above clearances are not achieved and there is a threat of damage to the transformer from stray vehicles, snowploughs or heavy equipment; protective bollards shall be installed as per Hydro Ottawa Engineering Specification No. UGS0001. Where protective bollards are installed, they shall be radially bonded to the transformer ground grid as per Hydro Ottawa Engineering Specification No. UGS0002.

All landscaping or shielding around transformers must be installed in consultation with Hydro Ottawa. Hydro Ottawa will complete a site visit to indicate transformer clearances, the location of underground cables, ground wires and ground rods. Hydro Ottawa will evaluate proposals for approved decorative enclosures (Hydro Ottawa Engineering Specification No. GCS0009) around transformers for rear lot installations only.

7.0 Metering

Metering in subdivisions shall be in accordance with the most current edition of Hydro Ottawa's Metering Specification No. GCS0008.

Meters shall be installed in a location where there is clear access to the meter from the street at all times. Meters shall be located on the side of the dwelling within 1 m of the front corner. A minimum of 1 m clearance is required between the meter and property line and any other obstructions. The recessing of meters is prohibited.

A minimum distance of 900 mm shall be maintained between Hydro Ottawa meters and gas meters as per Ontario Electrical Safety Code requirements.

Hydro Ottawa shall not connect services unless there is clear access to the meter base, the service trench is backfilled to ± 150 mm of final grade and safe, secure access is provided to the basement via stairs or a ladder acceptable to Hydro Ottawa.

8.0 As Built Drawing

As-built drawings shall be provided for each project in accordance with Hydro Ottawa Working Procedure Doc. No. DFS0002.

APPENDIX A

All sand used for bedding and cover over direct buried ducts and cables shall meet or exceed the sieve size and percentage of material passing (rejected) as listed in the following table:

SIEVE SIZE (mm)	PERCENTAGE OF MATERIAL PASSING
4.75	100.0
2.36	99.9
1.18	99.8
0.60	95.3
0.30	71.9
0.150	24.5
0.075	5.9