

**TS 803  
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## **1.0 Scope**

This specification covers the requirements for the installation of direct buried rigid duct, rigid ducts by subsurface installation, and flexible ducts.

The requirements of TS 1.00 and TS 801 shall apply to this work.

## **2.0 References**

### **Toronto Transportation:**

TS 1.00	Maintenance of Traffic
TS 2.10	General Excavation
TS 5.00	Sodding
TS 5.10	Topsoil
TS 13.00	Non-Structural Concrete
TS 13.10	Unshrinkable Fill
TS 801	Electrical Work
TS 815	Removals

### **Ontario Provincial Standards**

TS 1010	Aggregates - Granular A,B,M
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### **Canadian Standards Association:**

- CSA C22.1-06 - Canadian Electrical Code, Part 1 (20 Edition), Safety Standard for Electrical Installations.
- CSA C22.2 No. 211.2-M1984 (R2003) - Rigid PVC, Unplasticized Conduit.
- CSA C22.2 No. 211.3-96 (R2002) - Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
- CSA C22.3 No. 7-94 (R2000) - Underground Systems.

### **NEMA**

NEMA Standard TC 7-2000 - smooth Wall Coilable Polyethylene Electrical Plastic Duct

## **3.0 Rigid Ducts, Direct Buried**

Ducts shall be installed as indicated on the Contract Drawings or as specified by the Commissioner and shall be approved on site by Toronto Transportation, before construction is commenced.

The work for rigid ducts, direct buried, regardless of the size of ducts or the number of ducts per installation, shall include the work described in subsections 3.1.1 to 3.1.12 where applicable and the work described in subsection 3.1.13 and 3.1.14 for transitions and terminations.

### **3.1.1 Installation**

Unless otherwise specified all ducts shall be buried beneath the granular base of roads, but in no case except in curbed median shall they be placed at a depth less than 600mm below finished grade. The trench bottom shall be shaped and uniformly graded to support the entire duct.

Lengths of duct shall be connected using couplings suitable to the size and type of duct supplied. Ducts shall enter the handwells in a radial direction (i.e. perpendicular to centerline). For direct buried poles provide a 50mm diameter rigid 90° elbow with a capped 200mm rigid duct extension above finished grade at the pole which shall be used to redirect the duct upward along the outside of the pole. The vertical portion of the duct shall be secured to the pole as follows:

- (i) for wooden poles use 50mm two hole pipe straps.
- (ii) for concrete or metal poles use 16mm stainless steel banding.

Where it is necessary for ducts to cross over other ducts, a minimum depth of 100mm of sand bedding material shall be placed between the ducts at the point of crossing. Where it is necessary for ducts cross over utilities, a minimum separation of 300mm shall be maintained, above or below the utility. Such separation shall be back-filled with sand bedding material and a minimum of three cable protection bricks shall be installed over the cables.

### **3.1.2 Protection During Construction**

Where ducts are installed prior to placing roadbed granular materials, the ducts shall be protected with a minimum cover of 300mm of compacted materials.

### **3.1.3 Utility Clearance**

Where utilities interfere with the standard vertical location of ducts, the Contractor shall notify the Contract Administrator to arrange inspection of the crossing point. The Contractor shall adjust the location of the ducts to obtain the clearance required and shall construct any concrete saddle or alternative protection approved by the utility company.

### **3.1.4 Fish Line**

A polypropylene string fish line shall be installed in all "in use" ducts. For ducts designated as "spare" or intended for future use a #14 AWG solid annealed copper wire fish line shall be installed. The fish line shall be brought out of the duct, left coiled and tied in an accessible location at each end of the duct.

### **3.1.5 Excavation**

Where road crossing ducts are to be installed via an open trench, the road surface is to be cut using a wet cutting method. All applicable measures and procedures are to be followed as per the City of Toronto Measures and Procedures for Roadwork with

Asphalt Containing Asbestos Fibres. Dry saw cutting of the roadway surface is not permitted.

Trenches shall be excavated to the widths, depths, and alignment required in the contract. Such widths, depths and alignment shall be adjusted to obtain proper clearances with utilities or other works.

The trench bottom shall be undisturbed earth or suitable imported materials compacted conforming to TS 1010. The trench bottom shall be free of sharp rock fragments or debris and uniformly graded to support the ducts. Where unsuitable earth materials are encountered in the trench bottom they shall be removed and replaced with suitable materials as directed by the Contract Administrator.

Where trenches are to be constructed prior to the completion of final grades, the Contractor may excavate trenches to give a minimum temporary cover of 300mm for the ducts.

### **3.1.6 Sand Bedding**

Sand shall conform to TS 1010.

Sand bedding shall be installed in trenches for duct where the trench bottom contains sharp rock fragments, and where crossover of ducts is required.

### **3.1.7 Backfill**

Unshrinkable backfill shall conform to TS 13.10.

Except when unshrinkable back-filling is used, back-filling shall conform to TS 1010. Backfill materials containing rock fragments and stone larger than 50mm in diameter shall not be placed within 300mm of the duct.

Where direct buried ducts are back-filled with unshrinkable backfill, they shall be considered to be concrete encased ducts.

### **3.1.8 Cable and Duct Protection and Marking**

The Contractor shall install marker tape. The Contractor shall install cable bricks and concrete protection in the trench at locations as required by Toronto Transportation.

Cable brick shall be seated on uniformly graded and compacted material and butted end to end. Multiple rows of bricks shall be installed in trenches where the width exceeds 300mm.

### **3.1.9 Ducts and Fittings**

Ducts and fittings shall conform to the applicable CSA standards.

Duct joints shall be made with the use of couplings which provide a smooth watertight joint between ducts, using a suitable cement that is specifically designed for use with the duct pipe being used.

### **3.1.10 Locating Existing Ducts**

The Contractor shall locate all existing ducts requiring modification or usage.

### **3.1.11 Breaking into Existing Handwells and Structures**

The Contractor shall break into an existing handwell or substation for installing ducts where indicated in the contract.

When breaking into an existing handwell the Contractor shall take all due care to ensure the handwell integrity is maintained. Every effort shall be made to prevent unnecessary damage to the handwell. The preferred method to break into a handwell is to use a hand-held core-drilling machine with a suitably sized round bit. As an alternative a hammer drill or chipping hammer could be used to create a duct opening into the handwell. The use of pavement breakers or sledge hammers to create a duct opening is not an acceptable method.

The space between the duct and the opening shall be filled with mortar mix.

### **3.1.12 Removals and Restoration Work**

The removals and restoration work shall conform to TS 815.

### **3.1.13 Transitions**

Where it is required to install transition sections between different types of rigid duct installations, the Contractor shall use deflection couplings or bend the ducts as required over a maximum of two standard duct lengths to obtain the required configuration.

### **3.1.14 Termination**

All ducts shall be temporarily plugged or sealed until wiring is installed.

Where ducts are indicated as 'spare' or intended for future use, the duct ends shall be plugged with plastic plugs.

## **3.2 Ducts by Subsurface Installation**

The work for ducts by subsurface installation shall include the work described in subsections 3.1.1 to 3.1.12 where applicable and the work described in subsection 3.1.14 for terminations.

### **3.2.1 Installation**

High Density Polypipe (HDPE SDR13.5 minimum) conforming to NEMA Standard TC 7-2000 may be used however, rigid PVC ducts may be used, as directed by the Contract Administrator.

Where existing utilities allow, pits required for subsurface installation operations shall be set back a 1000mm minimum of curb. Bore holes shall only be 25mm larger in diameter than the rigid duct being installed.

### **3.3 Flexible Ducts**

The work for flexible ducts, regardless of type, diameter and number of runs shall include installation, protection during construction, utility clearance, termination, and marking, fish line, cable and duct operation and marking, locating existing ducts, breaking into concrete structures, earth excavation, sand bedding, backfill, including unshrinkable backfill, removals and restoration work.

#### **3.3.1 Installation**

Flexible ducts shall be laid loosely in the trench to allow for expansion and contraction. Ducts shall be installed free of kinks or flattening and shall clear any sharp object.

Where ducts are specified for use in curbed medians or slab medians, flexible duct shall be used at a depth of 150 to 200mm installed near the inside edge of the curb. In no case shall they be installed in the centre line of the median.

Where flexible ducts are brought into existing handwells, the ducts shall be grouted into the sleeve of the handwell.

Flexible ducts shall be used between handwells, installed in medians.

### **4.0 Quality Assurance**

When requested by the Contract Administrator, the Contractor shall ensure that all ducts that will be left for future use are free of debris, water, breakage or distortion by pulling a mandrel through the ducts. The mandrel shall be solid, round and have a diameter of 6 mm less than the nominal duct diameter. The Contractor shall give the Contract Administrator 24 hours notice of when this work will be carried out.

### **5.0 Measurement for Payment**

#### **5.1 Actual Measurement**

##### **5.1.1 Flexible Ducts, Direct Buried Rigid Ducts, Direct Buried Ducts by Subsurface Installation**

Measurement for ducts will be made in metres, along the horizontal axis of the duct. Measurement will be from end to end of ducts where the ducts do not terminate in structure, or from the start of extension of existing duct or from centre to centre of poles, pole footings, handwells, junction boxes, sign footings and concrete pads, and to the face of bridge structures and retaining walls.

## **5.2 Plan Quantity Measurement**

### **5.2.1 Flexible Ducts, Direct Buried Rigid Ducts, Direct Buried Ducts by Subsurface Installation**

Measurement will be by Plan Quantity as may be revised by Adjusted Plan Quantity, when designated in the Contract. Such measurement will be based on the units indicated in the clauses under 5.1.1 Actual Measurement.

## **6.0 Basis of Payment**

### **6.1 Flexible Ducts, Direct Buried – Item Rigid Ducts Direct Buried – Item Ducts by Subsurface Installation - Item**

Payment at the contract price for the above item(s) shall be full compensation for all labour, equipment and material required to do the work.