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**2.21 CABLE DUCTS**2.21.1 GENERAL2.21.1.1 **Description**

The scope of work shall include the construction of 100 mm cable ducts in accordance with these specifications and in conformity with the plans herein, at locations as provided or as directed by the Consultant.

2.21.2 MATERIALS2.21.2.1 **Ducts**

Duct shall be 100 mm nominal inside diameter and of rigid non-metallic P.V.C. pipe. Couplings are to suit the pipe.

2.21.2.2 **Spacers**

Spacers shall be cast concrete or interlocking plastic designed for 100 mm standard duct on 200 mm by 200 mm centres. Wooden or metal spacers shall not be used.

2.21.2.3 **Concrete**

Concrete construction shall follow the methods specified in ASTM Specifications: C150, C260, C33, A185, C309. Concrete shall have a minimum compressive strength of 20 MPa at 28 days as tested by ASTM C39. Aggregate shall have a maximum size of 19 mm. Cement shall be Type V (Sulphate Resistant) Portland Cement. Slump shall not exceed 80 mm as tested by ASTM C143. An air-entrainment agent shall be added to result in an air content between 5 and 7 percent, as tested by ASTM test C231.

2.21.2.4 **Rope**

Pull rope shall be 7 mm diameter nylon cord. The rope shall be continuous through each duct with 3 metres spare at each end.

2.21.2.5 **Sealant**

Duct seal shall be a non-thermoplastic compound used for electrical applications, e.g., Duxseal.

2.21.3 CONSTRUCTION2.21.3.1 **Trenching**

All trenching shall be governed by Provincial and local Municipal Codes relating to trenching and safety.

The trench shall be carefully excavated to the required depth to allow the duct run to be set on undisturbed soil. Where soft spots or unsuitable material are encountered the Contractor shall, at no extra cost, undercut a minimum of 150 mm, or as directed by the Consultant, replace with acceptable material and compact to 95% Standard Proctor Maximum Dry Density.

### 2.21.3.2 Duct Installation

The duct shall not be placed until the trench has been checked for line and grade by the Consultant. All ducts shall be placed a minimum of 600 mm below subgrade. Duct runs shall be graded uniformly to their ends.

Duct installation shall be by the tier method using the specified spacers. The duct group shall be securely banded together using metal strapping.

Duct couplings shall be staggered by at least 150 mm along the duct run. The cutting and tapering of duct joints shall be made with tools as specified by the duct manufacturer. All duct joints shall be made water tight. Where ducts are to be connected to existing conduits a suitable conduit to duct coupling shall be used. All ducts shall terminate with a duct coupling that is set flush with the end of the concrete envelope.

Split duct shall be wrapped with a waterproof, impregnated paper or plastic sheeting and securely taped to prevent entry of any concrete.

The duct assembly shall be securely anchored to the trench bottom to prevent ducts from shifting or floating when concrete is poured.

The concrete shall be carefully placed by chute down on the sides of the duct bank so that the concrete flows under the ducts and rises up around the ducts to fill all spaces. The concrete shall be carefully rodded with a flat bar.

Pull ropes shall be installed in each duct and shall be checked to ensure they are free of kinks, bends or joints. The surplus shall be coiled 3 metres at each end on the duct.

Duct locations shall be marked by the Consultant in the field prior to backfilling. A 50 mm by 100 mm marker (painted red) shall extend from the duct entrance to 450 mm above grade.

A spike shall be driven flush in the edge of the pavement over the duct run.

### 2.21.3.3 Backfilling and Compaction

Backfilling shall not be undertaken until the concrete has been checked by the Consultant.

The backfill of trenching shall be with material similar to that removed except that organic material or stones larger than 150 mm in diameter shall be removed.

The degree of compacting shall be similar to existing or to the degree required for various pavement layers under other sections of these specifications. The ends of each duct system shall be backfilled using an envelope of sand, or other suitable backfill, extending 1 metre from the duct for a width of 600 mm and from the bottom of the duct system to 500 mm above the top duct.

### 2.21.3.4 Testing Requirements

The Contractors Approved Testing Agency shall carry out the following tests, copies of which shall be submitted directly to the Consultant for approval, or otherwise, immediately after tests are completed.

- (a) Air Content Test on Concrete - ASTM C231 - one test for each day of concrete pouring.
- (b) Slump Test on Concrete - ASTM C143 - one test for each day of concrete pouring.
- (c) Compressive Strength Test on Concrete - ASTM C31 and C39 - one 28 day test for each day of concrete pouring. One strength test shall consist of tests on two standard specimens.

#### 2.21.4 MEASUREMENT AND PAYMENT

##### 2.21.4.1 **Cable Duct**

Payment will be made at the unit price bid per metre of encasement (including 2-100 mm standard ducts). This price shall include all labour, materials, and equipment necessary to complete the work to the satisfaction of the Consultant.

#### 2.21.5 FINAL ACCEPTANCE

##### 2.21.5.1 **Acceptance**

After each section of duct run is completed and the concrete thoroughly set, a test mandrel that is 65 mm smaller in diameter than the nominal duct size shall be drawn through each individual duct. This test shall be done in the presence of the Consultant.

The Contractor shall be responsible to clear or replace any ducts that do not pass the mandrel test.

Acceptance of the Work will be given upon certification that all ducts have been tested and proven clear of any obstructions.

##### 2.21.5.2 **Sealing**

At the completion of the acceptance the Contractor shall seal in a tight manner the ends of all ducts by using duct seal.