

## **Part 1 General**

### **1.1 RELATED SECTIONS**

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 05 28 - Grounding - Secondary.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM).
  - .1 ASTM A82/A82M-05a, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - .2 ASTM A185/A185M-05a, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .3 ASTM C139-05, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
  - .4 ASTM C 478/C478M-06, Standard Specification for Precast Reinforced Concrete Manhole Sections.
  - .5 ASTM D1056-00, Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
- .2 Canadian Standards Association (CSA International).
  - .1 CAN/CSA-A3000-03(R2005), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .2 CSA A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.
  - .4 CAN/CSA C22.2 No. 211.1-06 (R2011) - Rigid Types EB1 and DB2/ES2 PVC Conduit.
- .3 Hydro-Québec.
  - .1 Norme E.21-11 (Livre vert, 5<sup>e</sup> édition), Service d'électricité en basse tension à partir des postes distributeurs.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit two copies WHMIS MSDS - Material Safety Data.
- .3 Shop Drawings:
  - .1 Submit shop drawings for precast handholes, precast transformer pads, PVC conduits, and accessories.
- .4 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
  - .1 Test reports: submit certified test reports for specified materials from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

#### **1.4 QUALITY ASSURANCE**

- .1 Pre-Installation Meetings: convene pre-installation meeting two weeks prior to beginning work of this Section, with contractor's representative in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (Gantt) Chart to:
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Co-ordination with other building subtrades.
  - .4 Review manufacturer's installation instructions and warranty requirements.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, Shipping, Handling, and Unloading:
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

#### **1.6 ACCEPTABLE PRODUCTS AND MATERIALS**

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

**Part 2 Products**

**2.1 PVC DUCTS**

- .1 PVC ducts, to CSA C22.2 No. 211-1, type DB2, encased in reinforced concrete, sizes as indicated.
- .2 PVC ducts, type DB2, to Hydro-Québec Standard E.21, encased in reinforced concrete, sizes as indicated, for electrical service entrance.
- .3 Acceptable Products:
  - .1 IPEX (Scepter).
  - .2 Thomas & Betts (Carlton).
  - .3 Royal Pipe Systems.
  - .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

**2.2 PVC DUCT FITTINGS**

- .1 Rigid PVC opaque solvent welded type couplings, bell end fittings, plugs, caps, adaptors, as required to make complete installation.
- .2 Expansion joints.
- .3 Rigid PVC angle couplings, 5°, 22.5°, 45° or 90° as needed, radius: 915 mm, unless indicated otherwise.
- .4 Acceptable Products:
  - .1 IPEX (Scepter).
  - .2 Thomas & Betts (Carlton).
  - .3 Royal Pipe Systems.
  - .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

**2.3 SOLVENT WELD COMPOUND**

- .1 Solvent cement for PVC duct joints.

**2.4 PRECAST CONCRETE HANDHOLES**

- .1 Precast concrete handholes and auxiliary sections fabricated in steel forms.
- .2 Precast Concrete Handholes: To ASTM C478/C478M.
- .3 Walls and Bottom: Reinforced concrete, monolithic construction.
- .4 Aggregates: to CSA A23.1/A23.2.
- .5 Cement: CAN/CSA-A3001, Type GU.
- .6 Steel welded wire fabric mesh reinforcing: to ASTM A82/A82M.ASTM A185/A185M.

- .7 Two pulling-in irons cast in concrete.
  - .1 Set pulling-in irons and other built-in items in place before depositing concrete.
  - .2 Install pulling-in iron in wall opposite each duct line entrance.
- .8 Neoprene or butyl gasket seals between handhole and cast iron cover frame.
- .9 Circular shape handhole, 1,040 mm internal diameter and 500 mm height.
- .10 Mandhole frames and covers.
  - .1 Cast iron manhole frames and covers.
  - .2 Bolted on covers to prevent unauthorized entry.
  - .3 Size: 762 mm clear diameter.
- .11 Acceptable Products:
  - .1 PT-021203 of Lecuyer.
  - .2 Replacement materials or products: approved by addendum according to Instructions to bidders.

## **2.5 PRECAST CONCRETE TRANSFORMER PAD**

- .1 Precast concrete transformer pad, fabricated in steel forms conforming to the 347/600 V three-phase low voltage supply guide, published by Hydro-Québec, dimensions: as indicated.
- .2 Acceptable Products:
  - .1 SBT-041221 of Lecuyer.
  - .2 Replacement materials or products: approved by addendum according to Instructions to bidders.

## **2.6 GROUNDING**

- .1 Grounding in accordance with Section 26 05 28 - Grounding - Secondary.

## **2.7 CABLE PULLING EQUIPMENT**

- .1 Pulling iron: galvanized steel rods, size, and shape as indicated.
- .2 Pull rope: 6 mm stranded nylon, tensile strength 5 kN.

## **2.8 WARNING TAPE**

- .1 Standard 4-mil polyethylene 76 mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW".

## **2.9 MARKERS**

- .1 Concrete type cable markers: 600 x 600 x 100 mm, with words: "Cable", "Joint", "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.

- .2 Cedar post type markers: 89 x 89 mm square, 1.5 m long, pressure treated with clear, copper naphthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing duct.
  - .1 Nameplate: aluminum anodized 89 x 125 mm, 1.5 mm thick mounted on cedar post with mylar label 0.125 mm thick with words "Cable", "Joint", "Conduit" with arrows to indicate change in direction.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### **3.2 DUCTBANKS**

- .1 Install underground duct banks including formwork.
- .2 Build duct bank on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.
  - .1 Avoid concrete contact with soil containing iron pyrite.
- .3 Open trench completely between handholes before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.
- .4 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400.
- .5 Install base spacers at maximum intervals of 1.5 m levelled to grades indicated for bottom layer of ducts.
- .6 Lay PVC ducts with configuration and reinforcing as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than 40 mm horizontally and vertically.
  - .1 Stagger joints in adjacent layers at least 150 mm and make joints watertight.
  - .2 Encase duct bank with 75mm thick concrete cover.
  - .3 Use galvanized steel conduit for sections extending above finished grade level.
- .7 Make transpositions, offsets and changes in direction using bend sections.
- .8 Use bell ends at duct terminations in handholes or buildings.
- .9 Use conduit to duct adapters when connecting to steel conduits.
- .10 Terminate duct runs with duct coupling set flush with end of concrete envelope when dead ending duct bank for future extension.
- .11 Cut, ream and taper end of ducts in field in accordance with manufacturer's recommendations, so that duct ends are fully equal to factory-made ends.
- .12 Allow concrete to attain 50% of its specified strength before backfilling.

- .13 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during placing of concrete.
  - .1 Tie ducts to spacers with twine or other non-metallic material.
  - .2 Remove weights or wood braces before concrete has set and fill voids.
- .14 Clean ducts before laying:
  - .1 Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.
- .15 Duct cleaning:
  - .1 Pull 300 mm long x diameter 6 mm less than internal diameter of duct steel mandrel through each duct, immediately after placing of concrete.
  - .2 Then pull stiff bristle brush through duct; avoid disturbing or damaging ducts where concrete has not set completely.
  - .3 Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .16 Install four 3 m lengths of 15M reinforcing rods, one in each corner of duct bank when connecting duct to handholes or buildings.
  - .1 Wire rods to 15M dowels at handhole or building and support from duct spacers.
  - .2 Protect existing cables and equipment when breaking into existing manholes.
  - .3 Place concrete down sides of duct bank filling space under and around ducts.
  - .4 Rod concrete with flat bar between vertical rows filling voids.
- .17 Install pull rope continuous throughout each duct run with 3 m spare rope at each end.
- .18 Construct electrical ductbank for service entrance according to the 347/600 V three-phase low voltage supply guide, published by Hydro-Québec, for a pad-mounted transformer.

### **3.3 HANDHOLES AND TRANSFORMER PADS**

- .1 Install precast handholes and transformer pads as indicated.
- .2 Install manhole frames and covers for each handhole.
- .3 Drain floor towards sump with 1 to 48 slope minimum and install drainage fittings as indicated.

### **3.4 MARKERS**

- .1 Mark location of duct runs under hard surfaced areas not terminating in manhole with railway spike driven flush in edge of pavement, directly over run.
  - .1 Place concrete duct marker at ends of such duct runs.
  - .2 Construct markers and install flush with grade.
- .2 Mark ducts every 150 m along straight runs and changes in direction.
- .3 Where markers are removed to permit installation of additional duct, reinstall existing markers.
- .4 Lay concrete markers flat and centered over duct with top 25 mm above earth surface.

- .5 Provide drawings showing locations of markers.

### **3.5 FIELD QUALITY CONTROL**

- .1 Site Tests/Inspections:
  - .1 Inspection of duct will be carried out by Departmental Representative prior to concrete placing.
  - .2 Placement of concrete and duct cleanout to be done when Departmental Representative.

### **3.6 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**