PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00 - Concrete Forming and Accessories.

.2 Section 03 20 00 - Concrete Reinforcing.

.3 Section 03 30 00 - Cast-In-Place Concrete.

.4 Section 26 05 28 - Grounding - Secondary.

.5 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM A1064/A1064-13, Standard Specification for Carbon-Steel Wire, e Reinforcement, Plain and Deformed, For Concrete.
- .2 ASTM C 478/C 478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections.
- .3 ASTM D 1056-14, Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

.2 Canadian Standards Association (CSA International)
- .1 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .2 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction Test Methods and Standard Practices for Concrete.
- .3 CAN/CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.3 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.

.3 Shop Drawings:
.1 Submit shop drawings for precast manholes.

.4 Quality assurance submittals: submit following in accordance with Section 01 45 00 – Testing and 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 one week prior to beginning work of this Section and on-site installation, with contractor's representative and Departmental 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 and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 MEASUREMENT FOR PAYMENT

.1 No measurement for payment will be made for items under this section. Include all costs incidental to the Lump Sum for the associated work.

PART 2 - PRODUCTS

2.1 PVC DUCTS

.1 PVC ducts, type DB2, encased in reinforced concrete.

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 5 degree angle couplings.

2.3 MANHOLES

.1 Provide type indicated.

.2 Top, walls, and bottom: reinforced concrete.

.3 Walls and bottom: monolithic concrete construction.

.4 Locate duct entrances and windows near corners of structures to facilitate cable racking.

.5 Covers: fit frames without play.

.6 Form steel and iron to shape and size with sharp lines and angles.

.7 Castings: warp and blow hole free.

.8 Exposed metal: smooth finish without sharp lines and arises.

.9 Provide lugs, rabbets, and brackets.

.10 Set pulling-in irons and other built-in items in place before depositing concrete.

.11 Install pulling-in iron in wall opposite each duct line entrance.

.12 Cable racks, including rack arms and insulators: sized to accommodate cable.

2.4 PRECAST CONCRETE MANHOLES

.1 Precast concrete manholes and auxiliary sections fabricated in steel forms.

.2 Aggregates: to CSA A23.1/A23.2.

.3 Portland Cement: to CAN/CSA-A3001.

.4 Steel welded wire fabric mesh reinforcing: to CAN/CSA -G30.18.

.5 Pulling inserts and bolts for racks integrally cast in concrete.

.6 Neoprene gasket seals between manhole sections: to ASTM D 1056.

.7 Size: 914 mm clear diameter, unless indicated otherwise.

.8 Precast Concrete Manholes: to ASTM C 478/C 478M, size as indicated.
.1 Manhole step and ladder rung spacing: 405 mm.

2.5 DRAINAGE

.1 Sump pit: 300 x 300 x 125 mm.

2.6 MANHOLE NECKS

.1 Concrete brick and mortar.

2.7 MANHOLE FRAMES AND COVERS

.1 Cast iron manhole frames and covers.

.2 Size: 914 mm clear diameter, unless indicated otherwise.

2.8 GROUNDING

.1 Ground rods: in accordance with Section 26 05 28 - Grounding - Secondary for cable rack grounding.

2.9 CABLE RACKS

.1 Hot dipped galvanized cable racks and supports.

.2 12 x 100 mm preset inserts for rack mounting.

2.10 CABLE PULLING EQUIPMENT

.1 Pulling iron: galvanized steel rods, size and shape as indicated.

.2 Pull rope: 6 mm stranded polypropylene, tensile strength 5 kN, continuous throughout each duct run with 3 m spare rope at each end.

2.11 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.

2.12 WARNING TAPE

.1 4 mil Polyethylene warning tape 75 mm in width. Text on tape to read "CAUTION BURIED ELECTRIC LINE BELOW".

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 INSTALLATION GENERAL

.1 Install underground duct banks and manholes including formwork.

.2 Build duct bank on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.

.3 Open trench completely between manholes 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 0.9 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 75 mm horizontally and vertically.

.1 Stagger joints in adjacent layers at least 150 mm and make joints watertight.

.2 Encase duct bank with 75 mm thick concrete cover.

.3 Use galvanized steel conduit for sections extending above finished grade level.

.7 Make transpositions, offsets and changes in direction using 5 degree bend sections, do not exceed a total of 20 degree with duct offset.

.8 Use bell ends at duct terminations in manholes or buildings.

.9 Use conduit to duct adapters when connecting to 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 manholes or buildings.

.1 Wire rods to 15M dowels at manhole 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.

3.3 MANHOLES

.1 Install precast manholes.

.2 Install manhole frames and covers for each manhole:
.1 Set frames in concrete grout onto manhole neck.

.3 Drain floor towards sump with 1 to 48 slope minimum and install drainage fittings as indicated.

.4 Install cable racks, anchor bolts and pulling irons as indicated.

.5 Grout frames of manholes:
.1 Cement grout to consist of two parts sand and one part cement and sufficient water to form a plastic slurry.

.6 Ensure filling of voids in joint being sealed.
.1 Plaster with cement grout, walls, ceiling and neck.

.7 Spray paint "X" on ceiling of manhole above floor drain or sump pit.

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 100 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.

.6 Lay warning tape throughout ductbank length half way distance between finish grade level and the top of ductbank.

3.5 FIELD QUALITY CONTROL

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

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