

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 26 05 00 – Common Work Results – Electrical.
- .2 Section 03 30 00 – Cast-In-Place Concrete.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 26 05 00.
- .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.
 - .2 Submit shop drawings for pull pits.
- .4 Quality assurance submittals: submit following in accordance with Section 26 05 00.
 - .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.

Part 2 Products**2.1 PVC DUCTS**

- .1 PVC ducts, type DBII, 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 manholes of size, shape and type as indicated on the drawings.
- .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 Cement: CAN/CSA-A3001, Type 50.
- .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 D1056.
- .7 Size: as shown on drawings.
- .8 Precast Concrete Manholes: to ASTM C478/C478M.

2.5 CAST-IN-PLACE CONCRETE MANHOLES

- .1 Smooth trowel finish for floors and horizontal surfaces.
- .2 Concrete: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .3 Construct walls on cast-in-place concrete footing except that precast concrete base sections are used for precast concrete manhole risers.

2.6 MANHOLE NECKS

- .1 Concrete brick and mortar.

2.7 MANHOLE FRAMES AND COVERS

- .1 Cast iron manhole frames and covers.
- .2 Padlocked or bolt down covers to prevent unauthorized entry. A minimum of 4 – 10mm stainless steel bolts drilled and tapped at 90 degrees shall be used for bolt down covers.
- .3 Size: 762 mm clear diameter.

2.8 PULL PITS

- .1 Electrical pull pits to be constructed of thick 'traffic' rated pre-cast concrete with a galvanized steel lid seat cap ring permanently molded into the concrete body.
- .2 Pull pit covers to be galvanized 13mm thick checker plate steel, 'traffic' rated.
- .3 Pull pits to be 762 mm W x 1524 mm L x 1524 mm D and complete with the following accessories:
 - .1 Padlock and eye bolt cover lock
 - .2 Cable racks
 - .3 3000 lb. pulling eye at each end
 - .4 Ground Bus
- .4 Pour 50 mm concrete 'mud slab' floor in the pull pit after all ducts are roughed in.
- .5 Seal all duct entries with cementitious grout to ensure a 'rodent free' enclosure.
- .6 Acceptable Product: New Castle 'Christy' series.

2.9 GROUNDING

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

2.10 CABLE RACKS

- .1 Hot dipped galvanized cable racks and supports.
- .2 12 x 100 mm preset inserts for rack mounting.

2.11 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.

2.12 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.

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, manholes and pull pits including formwork.
- .2 Build duct bank, manholes and pull pits 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 or pull pits before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.
- .4 Prior to laying ducts, construct "mud slab" not less than 75 mm thick.
- .5 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400.

- .6 Install base spacers at maximum intervals of 1.5 m levelled to grades indicated for bottom layer of ducts.
- .7 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 100 mm thick concrete cover.
- .8 Make transpositions, offsets and changes in direction using 5 degree bend sections, do not exceed a total of 20 degree with duct offset.
- .9 Use bell ends at duct terminations in manholes or buildings.
- .10 Use conduit to duct adapters when connecting to conduits.
- .11 Terminate duct runs with duct coupling set flush with end of concrete envelope when dead ending duct bank for future extension.
- .12 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.
- .13 Allow concrete to attain 50% of its specified strength before backfilling.
- .14 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.
- .15 Clean ducts before laying:
 - .1 Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.
- .16 Duct cleaning:
 - .1 Pull 300 mm long x diameter 6 mm less than internal diameter of duct wooden 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.

- .17 Install four 3 m lengths of 10M reinforcing rods, one in each corner of duct bank when connecting duct to manholes, pull pits or buildings.
 - .1 Wire rods to 10M 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.
- .18 Install pull rope continuous throughout each duct run with 3 m spare rope at each end.

3.3 MANHOLES

- .1 Build cast-in-place manholes or install precast manholes.
- .2 Concrete Placement:
 - .1 Place concrete in two lifts with slab and sump in first, walls, roof and neck in second lift.
 - .2 Provide key in walls to slab.
 - .3 Place 100 x 6 mm PVC water bar vertically in key.
 - .4 Install ground rod before placing slab and place reinforcing steel, inserts for cable rack, pulling irons, drain, duct outlets, duct run dowels before casting walls. Make manhole to duct connection as indicated.
- .3 Provide 115 mm deep window to facilitate cable bends in wall at each duct connection.
 - .1 Terminate ducts in bell-end fitting flush with window face.
 - .2 Provide four 10M steel dowels at each duct run connection to anchor duct run.
- .4 Build up concrete manhole neck to bring cover flush with finished grade in paved areas and 40 mm above grade in unpaved areas.
- .5 Install manhole frames and covers for each manhole:
 - .1 Set frames in concrete grout onto manhole neck.
- .6 Install cable racks, anchor bolts and pulling irons as indicated.
- .7 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.
- .8 Ensure filling of voids in joint being sealed.

- .1 Plaster with cement grout, walls, ceiling and neck.

3.4 PULL PITS

- .1 Electrical pull pits to be constructed of thick 'traffic' rated pre-cast concrete with a galvanized steel lid seat cap ring permanently molded into the concrete body.
- .2 Pull pit covers to be galvanized 13mm thick checker plate steel, 'traffic' rated.
- .3 Pull pits to be 762 mm W x 1524 mm L x 1524 mm D and complete with the following accessories:
 - .1 Padlock and eye bolt cover lock
 - .2 Cable racks
 - .3 3000 lb. pulling eye at each end
 - .4 Ground Bus
- .4 Pour 50 mm concrete 'mud slab' floor in the pull pit after all ducts are roughed in.
- .5 Seal all duct entries with cementitious grout to ensure a 'rodent free' enclosure.
- .6 Acceptable Product: New Castle 'Christy' series.

3.5 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.

3.6 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.

3.7**CLEANING**

- .1 Proceed in accordance with Section 26 05 00.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION