

- Part 1 General
- 1.1 RELATED SECTIONS
- .1 Section 03 30 00 – Cast-in-Place Concrete.
 - .2 Section 26 05 00 – Common Work Results for Electrical.
 - .3 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
 - .4 Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts.
- 1.2 REFERENCE STANDARDS
- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A1064/A1064M-15, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .2 Canadian Standards Association (CSA International)
 - .1 A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-13, Cementitious Materials for Use in Concrete.
 - .3 C22.2 No. 211.1-06 (R2011), Rigid Types EB1 and DB2/ES2 PVC Conduit.
 - .4 G30.18-09 (R2014), Carbon-Steel Bars for Concrete Reinforcement.
 - .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit in accordance with Division 01 – General Requirements.
 - .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 WHMIS SDS – Safety Data Sheets in accordance with Division 01 – General Requirements.
 - .3 Quality assurance submittals: submit following in accordance with Division 01 – General Requirements.
 - .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.
 - .4 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 on-site installation, with Contractor's representative and Departmental Representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building subtrades.
 - .4 Review installation instructions.
- 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 to make complete installation.
 - .2 Expansion joints.
 - .3 Rigid PVC 5 degree angle couplings.
 - .4 Rigid PVC 45 degree and 90 degree bends.
 - .5 Base and intermediate plastic spacers.
 - 2.3 SOLVENT WELD COMPOUND
 - .1 Solvent cement and cleaner for PVC duct joints.
 - 2.4 CABLE PULLING EQUIPMENT
 - .1 Pulling iron: galvanized steel rods, size and shape as required.
 - .2 Pull rope: 6 mm stranded nylon/polyester, tensile strength 5 kN, continuous throughout each duct run with 3 m spare rope at each end.
 - 2.5 WARNING TAPE
 - .1 Metal-detectable warning tape, 76 mm wide, 5 mils thick, red polyester material laminated to aluminum foil core, imprinted with black letters indicating "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 including formwork.
- .2 Use steel plates in all instances over open trenches across all streets and roadways to permit continuous flow of vehicular traffic.
- .3 Build duct banks on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.
- .4 Open trench completely before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.
- .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 Form ducts prior to pouring concrete. Do not install excess concrete in trenches.
 - .3 Encase duct bank with 75 mm thick concrete cover.
- .8 Make transpositions, offsets and changes in direction using 5 degree bend sections, do not exceed a total of 20 degrees with duct offset.
- .9 Terminate duct runs with duct coupling set flush with end of concrete envelope when dead ending duct bank for future extension.
- .10 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.
- .11 Form duct banks prior to pouring concrete, sides of trench are not acceptable forms. Do not install excess concrete in trenches. Where concrete encasement is poured in sections, provide 4 x 10M rebar connections between sections, 1 in each corner of concrete encasement, extending at least 1.0 m into each section.
- .12 Allow concrete to attain 50% of its specified strength before backfilling.

- .13 Use anchors, ties and trench jacks 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 buildings.
 - .1 Wire rods to 15M dowels at building and support from duct spacers.
 - .2 Protect existing cables and equipment when breaking into existing buildings.
 - .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 Place continuous strip of warning tape 300 mm below final grade above duct.

3.3 FIELD QUALITY CONTROL

- .1 Notify Departmental Representative for field review once concrete encased duct banks have been built and formed up, prior to placing concrete.
- .2 Notify Departmental Representative for field review upon completion of concrete encased duct banks and obtain acceptance prior to backfill.

END OF SECTION

- Part 1 General
 - 1.1 RELATED SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
 - .2 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
 - .3 Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts.
 - .4 Section 31 23 33.01 – Excavating, Trenching and Backfilling.
 - 1.2 REFERENCE STANDARDS
 - .1 CSA International
 - .1 C22.2 No. 211.1-06 (R2011), Rigid Types EB1 and DB2/ES2 PVC Conduit.
 - 1.3 QUALITY ASSURANCE
 - .1 Quality assurance submittals: submit following in accordance with Division 01 – General Requirements.
 - .1 Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
 - .2 Manufacturer's Instructions: for installation and special handling criteria, installation sequence and cleaning procedures.
 - 1.4 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Division 01 – General Requirements and with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- Part 2 Products
 - 2.1 PVC DUCTS AND FITTINGS
 - .1 Rigid PVC duct: Type DB2, size as indicated, with expanded flange ends, for direct burial.
 - .1 Nominal length: 3 m or 6 m as required, plus or minus 12 mm.
 - .2 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make a complete installation.
 - .3 Rigid PVC 90 degrees, 45 degrees bends and 5 degrees angle couplings as required.

- .4 Expansion joints as required.
- 2.2 SOLVENT WELD COMPOUND
 - .1 Solvent cement and cleaner for PVC duct joints.
- 2.3 CABLE PULLING EQUIPMENT
 - .1 6 mm stranded nylon/polyester pull rope tensile strength 5 kN.
- 2.4 WARNING TAPE
 - .1 Metal-detectable warning tape, 76 mm wide, 5 mils thick, red polyester material laminated to aluminum foil core, imprinted with black letters indicating "CAUTION BURIED ELECTRIC LINE BELOW".
- 2.5 DUCT END SEAL
 - .1 Low VOC mastic compound.
- 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
 - .1 Install duct in accordance with manufacturer's instructions and at elevations as indicated.
 - .2 Apply cleaning and solvent compounds in accordance with manufacturer's instructions.
 - .3 Clean inside of ducts before laying.
 - .4 Ensure full, even support every 1.5 m and smooth transition throughout duct length.
 - .5 Slope ducts with 1 to 400 minimum slope.
 - .6 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.
 - .7 Pull through each duct a mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.
 - .1 Pull stiff bristle brush through each duct immediately before pulling-in cables.
 - .8 Install a pull rope continuous throughout each duct run with 3 m spare rope at each end.

- .9 Place continuous strip of warning tape 300 mm below final grade above duct and as indicated.
- .10 Notify Departmental Representative for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

3.3 DUCT SEALANT

- .1 All ducts entering buildings from underground or penetrating the building vapour barrier must be internally sealed immediately inside the building after installation of wires to prevent entrance of water and condensation.
- .2 Install in accordance with manufacturer's instructions.

END OF SECTION

- Part 1 General
- 1.1 RELATED REQUIREMENTS
 - .1 Section 03 30 00 – Cast-in-Place Concrete.
 - .2 Section 26 05 00 – Common Work Results for Electrical.
 - .3 Section 26 05 28 – Grounding – Secondary.
 - .4 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
 - .5 Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts.
 - .6 Section 33 65 73 – Concrete Encased Duct Banks.
- 1.2 REFERENCE STANDARDS
 - .1 Canadian Standards Association (CSA International)
 - .1 A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
 - .1 Submit in accordance with Division 01 – General Requirements.
 - .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.4 QUALITY ASSURANCE
 - .1 Quality assurance submittals: submit following in accordance with Division 01 – General Requirements.
 - .2 Regulatory Requirements:
 - .1 Perform Work to comply with applicable Provincial/Territorial regulations.
 - .2 Coordinate and meet requirements of power supply authority.
 - .1 Ensure availability of power when required.
 - .3 Certificates: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
 - .4 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

- 1.5 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Division 01 – General Requirements and with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

- 1.6 COORDINATION WITH POWER SUPPLY AUTHORITY
 - .1 Coordinate with NS Power for de-energization and removal of existing Holland Building padmount transformer and primary cable.
 - .2 Coordinate with NS Power for installation of Holland Building primary cables, padmount transformer and termination and connections of primary and secondary cables.
 - .3 Coordinate with NS Power for de-energization and re-energization of Holland and Murray Buildings as required for Work.
 - .4 Coordinate and meet requirements of NS Power. Ensure availability of power when required.
 - .5 Arrange for primary line extensions, utility installation and energization.
 - .6 Include and pay for all NS Power costs in tender price.

- Part 2 Products
 - 2.1 MATERIALS
 - .1 Underground ducts: rigid type DB2.
 - .2 Conductors: copper, type RWU-90.
 - .3 Transformer pad: pre-cast pad for 3 phase transformer 500 to 1500 kVA to NS Power Standard 6U-ED-20M, 21M.
 - .4 Backfill: clean and free of debris.
 - .5 Pulling Iron:
 - .1 22 mm diameter hot dipped galvanized steel bar with exposed triangular shaped opening.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Saw cut and remove existing concrete pad. Cut around existing primary ducts to allow for extension.
- .2 Extend existing primary ducts to primary location of transformer.
- .3 Extend secondary ducts to secondary location of transformer.
- .4 Concrete encase primary ducts for electrical systems in accordance with CAN/CSA A23.1 and Section 33 65 73 – Concrete Encased Duct Banks.
- .5 Direct bury secondary ducts for electrical systems in accordance with Section 33 65 76 – Direct Buried Underground Cable Ducts.
- .6 Install transformer pad and grounding to NS Power Standards 6U-ED-20M, 21M, 10U-ED-30M.
- .7 Reinstate grounding for existing sectionalizing cabinet to NS Power Standard 10U-ED-30M.
- .8 Install pulling irons.
- .9 Install cables in trenches and in ducts in accordance with Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts.
- .10 Allow adequate conductor length for connection to supply by power supply authority. Provide suitable bus to cable lugs so Utility can properly terminate secondary conductors at transformer.
- .11 Allow adequate conductor length for connection to service equipment.
- .12 Make grounding connections in accordance with Section 26 05 28 – Grounding – Secondary, and Utility requirements.
- .13 Seal ducts and conduits at building entrance location after installation of cable.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests:
 - .1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Perform additional tests if required by authority having jurisdiction.
- .2 Submit written test results to Departmental Representative.

END OF SECTION