

Part 1 General

1.1 SCOPE OF WORK

- .1 Work under this section consists of the supply of all labour, material, plant and equipment for the supply and installation of water service laterals, curb stop and box, and other related appurtenances, and all incidentals as shown on the drawings and herein specified.

1.2 RELATED SECTIONS

- .1 Section 31 05 17 Aggregate Materials
- .2 Section 31 23 33.01 Excavating, Trenching, and Backfilling

Part 2 Products

2.1 WATER SERVICE LATERAL

- .1 Service lateral piping, fittings and appurtenances shall be supplied by the Contractor. Appurtenances shall include service saddle, main stop, curb stop, and curb box.
- .2 Pipe shall be of minimum diameter as indicated on the Contract Drawings blue Municipex (PEXa), meeting the latest requirements of CSA B137.5 and ASTM F877 Standards, unless otherwise specified. Stainless steel liner shall be inserted into the ends of all Municipex tubing for all connections to compression fittings.

Brass components shall be Mueller, or Cambridge, meeting the requirements of ASTM B62 and threads to AWWA Standard C800, latest edition.
- .3 Corporation main stops shall be Cambridge or Mueller, and shall be full port ball valve construction, 300 PSI maximum working pressure. Body shall be red brass 85-5-5-5 to the latest ASTM-B62 Standard Q-Line or CTS compression type outlet fittings and inlet having AWWA threads conforming to the latest AWWA Standard C-800.
- .4 Service saddles shall be Concord Daigle D-71, Smith-Blair TaperSeal, Robar, or Romac type, cast-bronze body with two wide stainless steel straps and components, or approved equal. SERVICE SADDLES MUST BE USED FOR ALL SERVICE CONNECTIONS.
- .5 Curb stops shall be Mueller or Cambridge and shall be full port ball valve construction, 300 PSI maximum working pressure. Body shall be red brass 85-5-5-5 without any drains to the latest edition of the ASTM-B62 Standard Q-Line or CTS compression type outlet fittings.

Stainless steel liners are to be inserted into the ends of Municipex tubing for all connections to compression fittings.

- .6 Curb boxes for 38mm and 50mm services shall be adjustable for a depth of bury 1.8 - 2.1 m and shall be Mueller Type A-728, Clow D2, or approved equal, with a stainless steel stationary rod and stainless steel cotter pin and Type A-800 cover.
- .7 Corporation couplings shall be suitable for copper to copper compression type, Grip Joint.
- .8 Compression connections shall be the gripper ring type, having a minimum 1 000 kg (2200 lb) pull out resistance and shall be tightened using a torque wrench to the Manufacturer's specification.

2.7 THRUST BLOCKS

- .1 Shall be cast-in-place concrete, minimum strength 32 MPa @ 28 days.

2.8 INSULATION

- .1 Insulation shall be rigid 50mm thick Styrofoam Highload 40 Extruded Polystyrene Insulation or approved equivalent.

2.9 BEDDING AND BACKFILL

- .1 To Section 31 23 33.01 – Excavating, Trenching and Backfilling.

2.10 Utility Marker Tape

- .1 150mm wide polyethylene marker tape; blue in colour (APWA colour coding) and marked CAUTION - BURIED WATER LINE. Tape as distributed by K & D Industries or approved equivalent.

Part 3 Execution

3.1 CONNECTION TO EXISTING WATERMAINS AND OPERATION OF VALVES

- .1 UNDER NO CIRCUMSTANCES WHATSOEVER SHALL A CONTRACTOR OPERATE EXISTING WATERMAIN VALVES OR MAKE CONNECTIONS TO EXISTING WATERMAINS.
- .2 It is the Contractor's responsibility to ensure that their operations do not contaminate the public water supply. If, at any time, the water in the existing system becomes contaminated through actions by the Contractor, whether or not due to negligence, he shall be held financially accountable for any corrective action taken by the Departmental Representative, as well as for the cost of defending any settlement of all claims resulting from his negligence, including but not limited to, costs and attorney fees.
- .3 The Contractor shall make all arrangements with the Department Representative at least (48 hours) prior to connecting or locating existing

watermains. The Contractor shall coordinate with the Departmental Representative regarding schedules, methods and procedures to be followed for isolating sections of the water system and connecting to these mains.

3.2 TRENCHING AND BACKFILLING

- .1 Do excavation, bedding and backfilling work to Section 31 23 33.01- Excavating, Trenching and Backfilling.

3.3 WATER SERVICE LATERALS

- .1 The location of water service laterals shall be as indicated in the Contract Drawings or as located in the field by the Departmental Representative.
- .2 Construct service connections at right angles to water main unless otherwise directed.
- .3 Tapping into watermains shall be with the use of proper tools and equipment and according to recognized good practice and in compliance with the pipe manufacturer's specifications. The watermain shall be tapped at a 67½ degree angle from the top centerline of the pipe.
- .4 A "goose neck" shall be provided in service lateral piping and shall have a maximum deflection of 22½ degrees.
- .5 All connections on service laterals shall be of the compression type.
- .6 All new water service laterals shall be one continuous section of pipe with no couplings between the main stop and the curb stop connection at the building.
- .7 The curb stop and curb box shall be installed at locations as indicated on the Contract Drawings. The curb box shall be set directly over the curb stop and installed plumb. Curb boxes shall be set to finish grade, then adjusted to match existing grade.
- .8 Lay and join pipes to AWWA Standards and manufacturer's instructions.
- .9 Install utility marker tape over all service laterals.
- .10 Insulate all water lateral piping with less than 1.8 m of cover with minimum 1.2 m wide, 50 mm thick rigid insulation centered over the pipe at 150 mm above the top of the pipe.

3.4 FLUSHING AND DISINFECTION

- .1 All watermains and service laterals shall be flushed and thoroughly disinfected.
- .2 Do all flushing and disinfection in accordance with AWWA C651 and AWWA 652 and all other applicable AWWA standards. Flushing velocity to be not less than 0.75 m/s.

- .3 Before the service lateral is placed in service it shall be disinfected with liquid chlorine meeting the requirements of the latest AWWA Standards - B300 Section for Disinfection Chemicals. The dosage shall be 50 parts per million available chlorine. The chlorine water shall be allowed to stand in the lateral for a period of not less than twenty-four (24) hours. At the end of the twenty-four (24) hour period the treated water shall be tested and contain not less than 10 parts per million available chlorine or the procedure must be repeated. Following the disinfection procedure, the lateral shall be flushed until the residual chlorine is reduced to less than 3 parts per million.
- .4 Total residual chlorine still present in the water used to disinfect the service lateral shall be reduced to a maximum of 1 part per million (1.0 mg/l) if released to an environment other than a sanitary or combined sewer pipe.
- .5 After final flushing and before the service lateral is activated, water samples will be tested for e-coli and total coliform by an approved laboratory. Sampling shall be in accordance with the latest AWWA C651 Standard. Two sets of samples shall be collected, at least 24 hours apart. At least one set of samples shall be collected from the end of the new line. Departmental Representative will take samples. The Contractor shall notify the Departmental Representative not less than forty-eight (48) hours in advance of readiness to sample. If results are not satisfactory, the Contractor shall carry out further flushing and disinfection of the service lateral until test results are acceptable.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Work under this section includes the supply of all labour, materials and equipment for the installation of sanitary sewer main, service laterals, sanitary manholes and all incidentals required to make a complete functional system.

1.2 Related Sections

- .1 Section 31 23 33.01 – Excavating, Trenching, and Backfilling

1.3 SUBMITTALS

- .1 Submit shop drawings for manholes and pipe in accordance with Section 01 33 00.

Part 2 Products

2.1 PIPE AND FITTINGS

- .1 Polyvinyl Pipe: to the latest requirements of CSA B182.2 and ASTM D3034
 - .1 Standard Dimensional Ratio (SDR): 35, colour-coded green.
 - .2 Locked-in gasket and integral bell system; push on joints.

2.2 PLUGS AND CAPS

- .1 Shall be an approved PVC plug or cap complete with gasket seal and shall meet the requirements of Section 2.1.

2.3 SERVICE BENDS

- .1 Long radius type only; to withstand same pressure as pipe.

2.4 MANHOLES

- .1 Pre-cast manhole sections and frames and covers shall be supplied by the Contractor.
- .2 Manholes shall be of pre-cast concrete sections that will meet the requirements of the latest CAN/CSA Standard A257.4 and ASTM Standard C478 for pre-cast reinforced concrete manhole sections. Joints between sections will be rubber gasket or Ram-nek gasket as indicated on the detail drawings, and will meet the requirements of the latest CAN/CSA Standard A257.3.
- .3 Manhole base sections shall be of pre-cast concrete with reinforced concrete slabs within. Manhole bases will also have cast in rubber gaskets to suit the inlet and outlet pipes and factory installed benching. Any additional holes required in the field shall be cored drilled and a Kor-n-seal connector inserted.

- .4 Sanitary manhole frame and cover: to be cast iron, # 411, solid cover. Standard grey cast-iron to ASTM A-48, strength class 30B for grey iron castings. Bearing surfaces to be machined to give contact over entire surface.
- .5 Adjustment units for final height shall be made with 150 and 300mm concrete riser sections as per the detail drawings.

2.5 SADDLES

- .1 PVC, gasketed with stainless steel clamp, oil resistant gasket and "O" ring, meeting the same requirements as the sanitary sewer service pipe.

2.6 BEDDING AND BACKFILLING

- .1 To Section 31 23 33.01 - Excavating, Trenching and Backfilling.

2.7 COUPLINGS

- .1 "Fernco" couplings suitable for PVC pipe.

2.8 INSULATION

- .1 Insulation shall be rigid 50mm thick Styrofoam Highload 40 Extruded Polystyrene Insulation or approved equivalent.

Part 3 Execution

3.1 PREPARATION

- .1 Clean pipes and fittings of debris and water before installation. Carefully inspect materials for defects before installing. Remove defective materials from site.

3.2 TRENCHING AND BACKFILLING

- .1 Do trenching and backfill work in with Section 31 23 33.01 - Excavating, Trenching, and Backfilling.
- .2 Do not allow contents of any sewer or sewer connection to flow into trench.
- .3 Trench line and depth require approval prior to placing bedding material and pipe.

3.3 PIPE INSTALLATION

- .1 Approved laser alignment equipment must be used to control line and grade during all pipe installation.
- .2 Laser alignment equipment shall be installed in the pipe, just above the pipe, or in the bottom of the manhole. Installation of the laser beam contrary to the aforementioned shall require approval of the Departmental Representative.

- .3 Trenches where pipe laying is in progress shall be kept dry and no pipe shall be laid in water or upon a wet bedding. As the pipes are laid, they must be thoroughly cleaned and protected from dirt and water. No length of pipe shall be laid until the preceding length has been thoroughly embedded and secured in-place so as to prevent any movement or disturbance of the pipe.
- .4 Lay and join pipe in accordance with manufacturer's recommendations.
- .5 Handle pipe by approved methods. Do not use chains or cables passed through pipe bore so that weight of pipe bears upon pipe ends.
- .6 Lay pipes on prepared bed, true to line and grade with pipe invert smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .7 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .8 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .9 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .10 Position and join pipes by approved methods. Do not use excavating equipment to force pipe sections together.
- .11 No walking on or working over the pipes after they have been laid will be allowed until there is at least 300mm of cover over them, except as may be necessary in refilling the trench and compacting the bedding material.
- .12 Insulate all sanitary sewer piping with less than 1.5 m of cover with minimum 1.2 m wide, 50 mm thick rigid insulation centered over the pipe at 150 mm above the top of the pipe.

3.4 PIPE VIDEO INSPECTION

- .1 All sanitary sewer pipe shall be thoroughly flushed and video inspected for alignment and obstructions by the Contractor. Water ponding in gravity sewers that cannot be eliminated by flushing and cleaning will be considered as evidence of pipe settlement. Any and all defects such as water ponding, leaking joints, sags, improper grade or alignment, excessive deflection, debris, and obstructions, etc. shall be cause for rejection and such defects must be repaired by the Contractor at no additional cost to the Owner. Video inspection is to be completed and submitted to the Departmental Representative for review after the installation of the aggregate base.
- .2 A written report from the video inspection company describing defects and anomalies in pipe is to be submitted along with unedited CD.
- .3 Video to include a visual record of distance as well as a description of defective locations and, each service connection.

- .4 Video and video report shall reference date of inspection and manhole numbers as per the drawings.

3.5 REPAIRS

- .1 Repair any sewer mains or service connections which are shown to be defective. Methods of repair to be approved.
- .2 Clean any sewer mains which are shown to have accumulations of foreign matter, such as rocks and silt, which may obstruct sewage flows.
- .3 Re-video sewers, at no additional cost, after they have been repaired or cleaned and re-submit to the Departmental Representative for review.

3.6 TESTING SANITARY SEWER MAINS

- .1 All sewer mains installed shall be tested using the air exfiltration method, upon completion of the aggregate base application.
- .2 The Contractor shall provide all labor, equipment and materials required to provide leakage tests on sanitary sewer mains.
- .3 The Contractor shall notify the Departmental Representative at least forty-eight (48) hours in advance of performing leakage tests.
- .4 Supply low pressure air to the plugged pipe section and slowly fill until the internal air pressure is 25 kPa above the average back pressure of any groundwater above the pipe.
- .5 Allow a minimum of two minutes for temperature stabilization.
- .6 Measure the volume of air that must be added to the pipe section in order to maintain this pressure for one minute; this will represent the volume of air lost from the test section.
- .7 Should leakage tests prove unsatisfactory the Contractor shall excavate to determine the cause, make repairs and backfill at his own expense.
- .8 Repair as necessary until the leakage is less than the greater of:
 - 0.05 cubic metres per minute;
 - or**
 - 0.001 cubic metres per minute per square metre of internal pipe surface area.
- .9 Test all pipe from manhole to manhole.
- .10 The test shall also be considered satisfactory if the time required for the pressure to drop from 25kPa to 15kPa in the test length of pipe is not less than the time, t, in seconds calculated from the formula: $t = 15 \text{ df seconds}$

where,
d = inside pipe diameter in mm
f = loss factor in cubic metres air lost per cubic metre of internal pipe volume.

Note:

f = 0.0987 for no groundwater above the top of the pipe
f = 0.0900 for 1 m of groundwater above the top of the pipe
f = 0.0827 for 2 m of groundwater above the top of the pipe
f = 0.0765 for 3 m of groundwater above the top of the pipe
f = 0.0711 for 4 m of groundwater above the top of the pipe

3.7 MANHOLE INSTALLATION

- .1 Manholes shall be constructed of pre-cast concrete sections according to the details indicated on the drawings. Additional openings required in the field in the units shall be core drilled and a Kor-n-seal connector inserted. Hammering is not an approved method.
- .2 Manhole base sections shall be set on a 150mm layer of bedding material conforming in all respects to the requirements for pipe bedding. Manholes shall be constructed plumb.
- .3 Joints in pre-cast manhole sections shall be made watertight with the use of rubber gaskets or Ram-nek gaskets. Lifting holes in pre-cast sections shall be plugged with cement mortar for full depth and made watertight.
- .4 Manhole frames and covers in paved roadways shall be the adjustable type set 10 mm below finished grade and shall conform to the crown of the road. Frames and covers located in landscaped and gravel areas shall be the 411W type set 50 mm below the finished grade.

3.8 TESTING SANITARY SEWER MANHOLES

- .1 All sanitary sewer manholes shall be tested for leakage.
- .2 Testing methods and requirements shall be according to the latest ASTM Standard C1244M-04 (Negative Air Pressure - Vacuum Testing). Any deviation from this test method to be approved, in writing, by the Departmental Representative.
- .3 The aggregate base must be completed, including compaction, prior to testing.

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 23 33.01 – Excavating, Trenching and Backfilling

1.2 SCOPE OF WORK

- .1 Work under this section includes the supply of all labor, materials, plant, equipment, and incidentals for the supply and installation of manholes, catch basins, storm main, catch basin laterals, culverts and all other items as shown on the drawings and herein specified.

1.3 SUBMITTALS

- .1 Submit shop drawings for pipe, manholes and catch basins in accordance with Section 01 33 00.

Part 2 Products

2.1 PIPE AND FITTINGS

- .1 Storm sewer shall be:
 - .1 Polyvinyl chloride (PVC) sewer pipe and fittings shall be SDR35, meeting the requirements of ASTM D- 3034, and CAN/CSA B182.2, latest editions.
 - .2 Reinforced concrete pipe, gasketed, meeting the requirements of the latest CAN/CSA Standard A257.2, Class 65D for reinforced concrete pipe.
 - .3 Profile PVC sewer pipe and fittings meeting the requirements of the latest ASTM Standard F794 and CAN/CSA Standard B182.4, latest editions.
- .2 Joints will be bell and spigot type with rubber gaskets. The bell will be an integral and homogeneous part of the pipe barrel. All rubber gaskets must meet the requirements of CAN/CSA A257.3, latest edition.
- .3 Catch basin lateral pipe and fittings shall be polyvinyl chloride (PVC) sewer pipe, DR35, meeting the requirements of the latest editions of ASTM D-3034 and CAN/CSA B182.2 and shall be a minimum diameter of that indicated on the drawings. Joints shall be bell and spigot type with locked-in rubber gasket.
- .4 Tees, bends, reducers, plugs and caps for ends of pipes, and all other fittings shall be polyvinyl chloride (PVC) sewer pipe, DR35 color coded white, meeting the requirements of Section 2.1.1 of this Specification.
- .5 Bends shall be of the long radius type.
- .6 Perforated Pipe and Fittings: Shall be polyvinyl chloride (PVC) sewer pipe, DR35 colour coded white, meeting the requirements of the latest edition of CAN/CSA B182.2 and perforated as per CAN/CSA B182.1 (Clause 4.1.5). Perforated pipe shall be of minimum diameter as indicated on the contract drawings. All bends, caps and other fittings shall match the grade and quality of the pipe supplied.

- .7 Culverts shall be:
 - .1 Reinforced concrete pipe, gasketed, meeting the requirements of the latest CAN/CSA Standard A257.2, Class 65D for reinforced concrete pipe of size indicated on the Contract Drawings.
 - .2 High-density Polyethylene pipe, double wall with smooth interior surface and a minimum ring stiffness of 320kPa, meeting the requirements of the latest CAN/CSA Standard B182.8-02. Ends of pipe shall be plain end with proper couplings supplied by the manufacturer.

2.2 MANHOLES AND CATCH BASINS

- .1 Manhole and Catch Basin Sections: Shall be of pre-cast reinforced type, of a size as indicated on the Contract Drawings. They shall come with pre-cut holes and cast-in rubber gaskets of sufficient size to suit the OD of the storm mains/laterals. Manhole and catch basin sections shall meet the requirements of the latest revision of CAN/CSA A257.4 and ASTM C478 for precast reinforced concrete manhole sections and shall be stamped with the manufacturer's name and date of casting.
- .2 Joints between sections shall be rubber gasket or Ram-nek gasket (where applicable), and meet the requirements of the latest CAN/CSA A257.3.
- .3 Adjustment units for final height shall be made with 150 mm and 300 mm concrete riser sections as per the Contract Drawings.
- .4 Frames and Grates: Cast iron, # 411W round type as indicated on the contract drawings. Standard grey cast-iron to ASTM A-48 for grey iron castings. Bearing surfaces to be machined to give contact over entire surface.

2.3 BEDDING AND BACKFILL

- .1 Bedding and backfill materials shall be as per Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

Part 3 Execution

3.1 PREPARATION

- .1 Clean pipes and fittings of debris and water before installation. Carefully inspect materials for defects before installing. Remove defective materials from site.

3.2 EXCAVATION, TRENCHING, BEDDING AND BACKFILLING

- .1 Do all excavation, trenching, bedding and backfilling as per Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.3 INSTALLATION

- .1 Approved laser alignment equipment must be used to control line and grade during all pipe installation.
- .2 Lay and join pipe in accordance with manufacturer's recommendations. Approved laser alignment equipment must be used to control line and grade during all pipe laying.
- .3 Handle pipe by approved methods. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .4 Lay pipes on prepared bed of granular bedding material, true to line and grade with pipe inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Suitable excavation shall be made to receive the bell or collar which shall not bear upon the subgrade or bedding.
- .5 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .6 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .7 Do not allow water to flow through pipes during construction except as may be permitted by Departmental Representative.
- .8 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .9 Position and join pipes by approved methods. Do not use excavating equipment to force pipe sections together.
- .10 Joints:
 - .1 Install gaskets as recommended by manufacturer.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes carefully before joining.
 - .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
 - .5 Complete each joint before laying next length of pipe.
 - .6 Minimize joint deflection after joint has been made to avoid joint damage.
 - .7 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .11 Manholes and catch basins shall be placed on a properly compacted 150 mm layer of bedding conforming in all respects to the requirements detailed in Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .12 Construct manhole and catch basin units plumb and true to alignment and grade at locations indicated on the Contract Drawings.

- .13 Plug lifting holes with cement mortar for full depth and make watertight.
- .14 Existing catch basins, catchbasin manholes and storm manholes shall be adjusted to finished grade with 150 mm and 300 mm concrete riser sections c/w Ramnek gaskets. Final height adjustments less than 150 mm shall be made with either a single layer of burned clay brick, an approved cast-iron ring and/or steel insert.
- .15 Install perforated pipe on prepared bed of geotextile and drainage stone as indicated on the Contract Drawings. Face perforations and coupling slots downward. Place drainage stone and wrap geotextile to encapsulate drainage stone as indicated on the Contract Drawings.
- .16 Insulate all storm sewer piping with less than 1.2 m of cover with minimum 1.2 m wide, 50 mm thick rigid insulation centered over the pipe at 150 mm above the top of the pipe.

3.4 FLUSHING AND VIDEO INSPECTION

- .1 All catch basin laterals and storm sewer pipe shall be thoroughly flushed and video inspected for alignment and obstructions by the Contractor. Water ponding in gravity sewers that cannot be eliminated by flushing and cleaning will be considered as evidence of pipe settlement. Any and all defects such as water ponding, leaking joints, sags, improper grade or alignment, excessive deflection, debris, and obstructions, etc. shall be cause for rejection and such defects must be repaired by the Contractor at no additional cost to the Owner. Video inspection is to be completed and submitted to the Departmental Representative for review after the installation of the aggregate base.

3.5 EXISTING UTILITIES

- .1 Establish location and depth of all existing underground utilities prior to pipe installation.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 31 05 17 - Aggregate Materials.
- .2 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D698-00a, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B1800-02, Plastic Non-pressure Pipe Compendium - B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).
 - .1 CSA B182.2-02, PVC Sewer Pipe and Fittings (PSM Type).
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [drainage material] and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 SITE CONDITIONS

- .1 Known underground utility lines and buried objects are as indicated on plans verify locations with Departmental Representative before commencing work.

Part 2 Products

2.1 MATERIALS

- .1 Drainage Stone to Section 31 11 00 – Excavating, Trenching and Backfilling for Buildings.
- .2 Pipe and Fittings: Shall be polyvinyl chloride (PVC) sewer pipe, DR35 colour coded white, meeting the requirements of the latest edition of CAN/CSA B182.2 and perforated as per CAN/CSA B182.1 (Clause 4.1.5). Perforated pipe shall be of minimum diameter as indicated on the contract drawings. All bends, caps and other fittings shall match the grade and quality of the pipe supplied.
- .3 Geotextile Fabric: Type N1 as per Section 31 23 33.01 – Excavating, Trenching and Backfilling.

2.2 BACKFILL MATERIAL

- .1 Excavated or graded material existing on site may be suitable to use if approved by Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

- .1 Ensure graded subgrade conforms with required drainage pattern before placing filter bed material.
- .2 Ensure improper slopes, unstable areas, areas requiring additional compaction or other unsatisfactory conditions are corrected to approval of Departmental Representative.
- .3 Ensure foundation wall and damproofing, rigid insulation have been installed and approved by Departmental Representative before placing bedding material.

3.2 INSTALLATION

- .1 Pipe bedding: place geotextile fabric on bottom of trench, place drainage stone for bedding material starting at high points and sloping to low points with a minimum slope of 1:100.
- .2 Pipe Laying:
 - .1 Ensure pipe interior and coupling surfaces are clean before laying.
 - .2 Lay perforated pipe to prepared bedding materials. Face perforations and coupling slots downward.
 - .3 Do not use shims to establish pipe slope.
 - .4 Use fittings recommended by manufacturer except where indicated otherwise.
 - .5 Install end plugs at ends of collector drains and screw-in end caps at tops of vertical runs.
 - .6 Protect pipe ends from damage and ingress of foreign material.
- .3 Connect foundation drainage system to storm sewers, as indicated on plans.
- .4 Backfill:
 - .1 Place drainage stone on each side of perforated pipe and minimum of 300 mm thickness over perforated pipe.
 - .2 Wrap geotextile fabric around drainage stone to encapsulate drainage pipe.
 - .3 Place fill by hand, in 150 mm lifts. Consolidate by hand tamping lightly. Prevent displacement of pipe.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International):
 - .1 CSA C22.2 No. 211.1-06, Rigid Types EBI and DB2/ES2 PVC Conduit.

1.2 SUBMITTALS

- .1 Provide submittals 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 two (2) copies WHMIS MSDS - Material Safety Data Sheets in accordance with Division 01 – General Requirements.
- .3 Quality assurance submittals: submit following in accordance with Division 01 – General Requirements.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Division 01 – General Requirements with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Division 01 – General Requirements.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Division 01 – General Requirements.

2.2 PVC DUCTS AND FITTINGS

- .1 Rigid PVC duct: to CSA C22.2 No. 211.1, with moulded fittings, for direct burial expanded flange ends:
 - .1 Nominal length: 3.0m plus or minus 12mm.
 - .2 Nominal wall thickness: 6mm
- .2 Rigid PVC split ducts.
- .3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make complete installation.
- .4 Rigid PVC 90 degrees and 45 degrees bends.
- .5 Rigid PVC 5 degrees angle couplings.

- .6 Expansion joints every 40m and as required.

2.3 SOLVENT WELD COMPOUND

- .1 Solvent cement for PVC duct joints.

2.4 CABLE PULLING EQUIPMENT

- .1 1/4" stranded nylon pull rope tensile strength 5 kN.

2.5 MARKERS

- .1 Cable markers: as indicated, with words: "Cable", "Joint" or "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

- .1 Install conduit in accordance with manufacturer's instructions.
- .2 Clean inside of ducts before laying.
- .3 Ensure full, even support every 1.5m throughout duct length.
- .4 Slope ducts with 1 to 400 minimum slope.
- .5 During construction, cap ends of ducts to prevent entrance of foreign materials.
- .6 Pull through each duct steel mandrel not less than 300mm long and of diameter 6mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter:
 - .1 Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .7 In each duct install pull rope continuous throughout each duct run with 3m spare rope at each end.
- .8 Install markers as required.

3.3 CLEANING

- .1 Proceed in accordance with Division 01 – General Requirements.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION