

1.0 GENERAL

1.1 Scope

- 1.1.1 The work shall consist of constructing wastewater and/or storm mains to line and grade and cross-sections as shown on the plans or as designated by the Engineer in the field.

1.2 Related Sections

- 1.2.1 Section 01320 – Sewer Main Testing
- 1.2.2 Section 01330 – Manhole and Catchbasin Construction
- 1.2.3 Section 02271 – Rip Rap
- 1.2.4 Section 02315 – Trench Excavation and Backfill
- 1.2.5 Section 02516 – Water and Sewer Service Connections
- 1.2.6 Section 02560 – Culverts
- 1.2.7 Section 02997 – Sewer Cleaning and CCTV Inspections

2.0 PRODUCTS

2.1 Piping

2.1.1 Reinforced Circular Concrete Pipe

- .1 Shall be manufactured according to the five (5) classes in ASTM C76M. Non-reinforced circular concrete pipe shall conform to ASTM C14M. ASTM C655 shall be used for concrete pipe where a D-load for pipe is specified.
- .2 At the manufacturer's discretion, pipe designated as Class pipe under ASTM C76M may be manufactured under ASTM C655, providing the D-load is equivalent or exceeds the D-load (based on test results) for the Class of pipe specified. In addition a pipe designated as a D-load pipe may be manufactured as class pipe under ASTM C76M provided that the class of pipe exceeds the D-load specified (based on test results).
- .3 Unless otherwise specified acceptance shall be based on tests described in either Section 5.1.1 of ASTM C76M or Section 4.1 and 4.1.2 of ASTM C655. All tests shall be certified by an independent testing firm.
- .4 Design and manufacturing of Class pipe shall be in compliance with ASTM 76M. All concrete pipe shall be manufactured with sulphate resistant, Type HS Portland Cement to meet CAN/CSA – A3000.

2.1.2 Polyvinyl Chloride (PVC) Pipe

- .1 PVC pipe installations of storm sewers in Industrial areas are restricted to pipe diameters of less than 450 mm.
- .2 PVC gravity sewer pipe and fittings (150 mm to 375 mm diameter) shall conform to CSA certified B182.1 and B182.2, standard dimension ratio (SDR) 35 and minimum pipe stiffness of 320 kPa and ASTM D3034.
- .3 PVC gravity sewer pipe and fittings (large diameter 450 mm to 675 mm) shall conform to CSA certified B182.2, minimum pipe stiffness of 320 kPa and ASTM F679. For sizes 750 mm to 900 mm, third party independent test verification shall accompany each shipment of pipe and shall not be installed until approved by the City. These sizes (750 mm to 900 mm) must also have minimum pipe stiffness of 320 kPa.
- .4 PVC ribbed gravity sewer pipe and fittings (150 mm to 900 mm diameter) shall conform to CSA certified B182.4 and shall be Class V pipe of minimum pipe stiffness of 320 kPa and ASTM F794.
- .5 The PVC pipe referred to in this specification may be used for wastewater and storm sewer up to and including 900 mm diameter except as noted.

2.2 Joints

2.2.1 Sanitary Sewer

- .1 Concrete pipe joints shall be rubber gasket to ASTM C443.
- .2 Polyvinyl Chloride pipe joints shall be locked-in gasket and integral bell system which conforms to ASTM C443.
- .3 Polyethylene to polyethylene joints shall be thermal butt fusion welded according to manufacturer's instructions. Polyethylene to flanged fittings or pipe shall be made by a slip on flange assembly. The flanged assembly shall consist of a polyethylene stub end, and metal slip on flange. The polyethylene stub end shall be butt fused to the end of the pipe and will be made of the same resin and of the same series as the remainder of polyethylene pipe. The slip on metal flange shall be ductile iron, conforming to AWWA C203. It shall be faced and drilled to ANSI B16.1, 860 kPa and coated with coal tar enamel.

2.2.2 Storm Sewer

- .1 Concrete pipe joints shall be rubber gasket to ASTM C443 and installed as recommended by the Manufacturer.
- .2 Polyvinyl Chloride (PVC) Pipe joints shall be locked-in gasket and integral bell system.

2.3 Miscellaneous

2.3.1 Cement

- .1 Cement shall be sulphate resisting Type HS Portland to meet CSA CAN3-A3000 for all pipe, underground structures and mortar.

2.3.2 Mortar

- .1 Shall be one part sulphate resisting Portland cement to two parts clean sharp sand mixed dry. Add only sufficient water after mixing to give optimum consistency for placement. The use of additives shall not be allowed.

2.3.3 Rip Rap

- .1 Refer to Section 02271 for Rip Rap

3.0 EXECUTION

3.1 General

- 3.1.1 The interior of pipes and fittings shall be kept free of dirt and foreign matter. Cement shall be stored properly to prevent dampness.
- 3.1.2 No pipe shall be laid in water or on frozen trench bottom or when in the opinion of the Engineer the trench conditions or the weather conditions are unsuitable for such work.
- 3.1.3 Excavation and backfill shall be in accordance with Section 02315. Backfilling shall not be carried out until pipe installation has been approved by the Engineer.

3.2 Lines and Grades

- 3.2.1 Sewers shall be laid to the grade and alignment shown on the drawings and/or staked in the field by the Engineer.

PIPE SIZE	ALLOWABLE VERTICAL DEVIATION	ALLOWABLE HORIZONTAL DEVIATION
Up to and including 300 mm	25 mm	50% of pipe dimension
375 mm - 525 mm	50 mm	50% of pipe dimension
600 mm - 1200 mm	75 mm	50% of pipe dimension
1350 mm and greater	100 mm	50% of pipe dimension

- 3.2.2 Modern laser technology, batter boards and boning rod or survey techniques must be used to transfer the grade and alignment to the pipe.
- 3.2.3 Each pipe length must be checked by the above methods during construction.
- 3.2.4 Acceptable deviations from these lines for any manhole to manhole section shall be:

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- .1 In all cases, variation from vertical alignment resulting in a reverse sloping invert is unacceptable.
 - .2 Misalignment beyond these limits shall be corrected by re-excavation and re-laying the pipe.

3.3 Installation of Main

3.3.1 All joints shall be done in accordance with Manufacturer's recommendations.

3.3.2 During excavation, and before leaving work at any time, close end of sewer with watertight plug to prevent entry of water and foreign matter.

3.3.3 Concrete or Polyvinyl Chloride Pipe

- .1 Commence laying at lower end of line. Lay pipes and specials true to line and grade, socket ends up grade, joints close and evenly butted all around pipe. Take special care to prevent sagging of spigot end in hub and provide true, even invert surface throughout entire length of sewer. Excavate at end of each pipe to provide rest for socket, sufficient to permit proper jointing.
- .2 Set each pipe with measuring rod and sight rails set at equal height from grade line. Adjust pipe until sight rails and top of rod are exactly in line while rod is held plumb to invert of pipe. Set pipe true to line by plumbing down from a taut cord fastened to sight rails or reference line. Provide at least three sight rails during construction of any section of sewer. Do not lay pipe until all sight rails line through correctly. Fabricate sight rails of substantial material and pin to prevent any variation from preset grades. Other methods of establishing lines and grades may be used subject to the approval of the Engineer. Backfilling shall not be carried out until the pipe installation has been approved by the Engineer.
- .3 Lift holes in concrete pipe shall be made water tight with mortar from the inside and outside.

3.3.5 Junctions and Risers

- .1 Junctions and risers where required shall be installed in the sewer mains using prefabricated T branches or Y branches, Strap-On-Saddles are not acceptable. Vertical wooden 50 mm by 5 mm markers shall be placed opposite the risers and shall extend from the bottom of the trench to approximately 300 mm above ground surface.

3.3.6 Connection to Existing System

- .1 Connections to existing pipes, manholes and structure shall be made as indicated on the drawings. Perform all excavation, backfilling, pipe cutting, jointing, demolition, repair and other work required. Supply all materials.

- .2 Connections shall be scheduled to reduce interruptions in service as much as possible. Adequate notice shall be given to the property owner prior to making any connections.

3.3.7 Storm Outlets to Creeks or Storm Channels

- .1 Where storm sewers outlet to creeks, storm channels, etc., the outlet shall be of high density polyethylene, concrete or CSP as per Section 2650 for Culverts, 6 meters in length and the same diameter of the line being connected.
- .2 Rip Rap shall be placed at the mouth of the outlet pipe to prevent erosion of the existing slope and shall conform to Drawing S-23.
- .3 For submerged outlets the installation shall be as per Drawing S-22.