

**1.0 GENERAL****1.1 Description**

- .1 This section specified requirements for constructing gravity sanitary sewer and pipe embedment to lines, grades and dimensions indicated or directed.

**1.2 Related Work Specified Elsewhere**

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|----|--|---------------|
| .1 | Trenching, Backfilling, and Compaction for Utilities | Section 02315 |
| .2 | Water Distribution                                   | Section 02510 |
| .3 | Manholes   | Section 02536 |
| .4 | T.V. Camera Sewer Main Inspections                   | Section 02800 |

**1.3 Schedule of Work**

- .1 Schedule work to minimize interruptions to existing services.

**1.4 Method of Measure**

- .1 Sanitary Sewer Main Construction:

Measurements will be made in lineal metres from centre to centre of manholes and the depths of excavation will be those determined at the time the grade stakes are set. The elevations of ground opposite the stake and on the centre line of the proposed trench will be recorded, and the final estimate will be considered as the average of the excavation depths in vertical metres taken every 15 lineal metres between every pair of manholes.

The unit price tendered shall cover the cost of supplying, hauling, laying and jointing all pipe, together with the necessary excavation, pipe embedment, common backfilling as specified, disposal of surplus material, all acceptance testing including CCTV camera and infiltration/exfiltration testing and all other work required to install the sewer mains as specified.

- .2 Connection to Existing Sanitary Sewer:

Connection to the existing sanitary sewer main will be paid for at the lump sum bid and shall include all labour, equipment and materials required to make the connection. This shall include manhole, pipe connections and include related measures required to keep sewer service uninterrupted during the connection.

**2.0 PRODUCTS**

**2.1 Sanitary Sewer Pipe**

- .1 Type PSM PVC Sewer Pipe and Fittings for Non-Insulated Sections
  - .1 Pipe shall be Type PSM PVC sewer pipe
  - .2 Pipe shall conform to CSA B182.2
  - .3 Standard Dimension Ratio SDR 35
  - .4 Factory installed locked-in gasket and integral bell system conforming to ASTM F477.
  - .5 Materials used for pipe shall come from a single compound manufacturer and shall have a cell classification of 12454-B, 12454-C, or 12364-C as defined in ASTM Standard D1784. Materials used for moulded fittings shall come from a single compound manufacturer and shall have a cell classification of 12454-B, 12454-C, or 13343-C as defined in ASTM Standard D1784.
  
- .2 Type PSM PVC Sewer Pipe and Fittings for Insulated Sections
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  - .6 The sewer mains shall be insulated with 50 mm polyurethane insulation with a density of 55 kg/m<sup>3</sup> with a compressive strength of 275-310 kPa and in locations shown on drawings or as directed by the Engineer where the ground cover is less than 2.5 metres above crown of the pipe.
  - .7 The insulation shall be covered with a minimum 1 mm thick HDPE outer jacket.

- .8 The insulation shall extend to the ends of the bell. Where the bell and spigot ends meet the insulation, shall be covered with mastic to ensure a waterproof joint exists.

**2.2 Cement Mortar**

- .1 Portland Cement to conform to CAN A3001 Type HS.
- .2 Mortar to be one part by volume of cement to two parts of clean, sharp sand mixed dry. Add only sufficient amount of water after mixing to give optimum consistency for placement. Do not use additives.

**2.3 Pipe Foundation, Embedment and Backfill Materials**

- .1 Granular Material for Final Backfill: As per Section 02315.
- .2 Common Backfill: As per Section 02315.
- .3 Pipe Embedment Zone Materials: As per Section 02315.
- .4 Bedding Stone: As per Section 02315.
- .5 Concrete: As per Section 02315.

**3.0 EXECUTION**

**3.1 Delivery and Stockpiling Materials**

- .1 Contractor shall be responsible for arranging, stockpiling, and protecting the materials from damage and theft.
- .2 The Contractor shall be responsible for the delivery of material and the Owner will not pay for materials ordered by the Contractor and not used in the work, nor pay for shipping charges on the return of such material to the supplier.

**3.2 Preparation**

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

**3.3 Trenching and Backfill**

- .1 Do Type PSM PVC sewer trenching and backfill work in accordance with ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications except as modified in Section 02223 - Trenching, Backfilling and Compaction for Utilities.
- .2 Do not allow contents of any sewer or sewer connection to flow into trench.
- .3 Do not perform pipe embedment until the foundation, pipe grade and alignment meet the design requirements.

- .4 Do not backfill trenches until pipe grade and alignment have been reviewed by the Engineer.

**3.4 Pipe Embedment Zone Construction**

- .1 Construct in pipe embedment zone to conform to ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications except as noted herein.

- .2 Pipe Embedment Zone Construction:

- .1 Place granular bedding, haunch and initial backfill materials to details indicated in Section 02315 and drawing details.
- .2 Shape bed true to grade and to provide continuous, uniform bearing surface for barrel of pipe. Do not use blocks when bedding pipe.
- .3 Shape transverse depressions as required to receive bell if bell and spigot pipe is used.
- .4 Install PVC and reinforced concrete pipe as a Type 2 installation as per the detail drawings. As noted on the detail drawing, do not compact bedding material under the middle 1/3 of pipe diameter of the pipe.
- .5 Place haunch and initial backfill to 300 millimetres above the crown of the pipe. Compact in maximum 150 millimetre lifts to the specified density for a Type 2 installation.
- .6 For flexible pipe, exercise caution and place and compact material for haunch and initial backfill area in such a manner that adverse vertical and horizontal deflection does not occur.

- .3 Concrete Bedding:

- .1 Pipe may be positioned on concrete blocks to facilitate placement of concrete. When necessary, sufficiently anchor or weight pipe, to prevent floatation and resultant compromised line and grade, while concrete is placed and sufficiently cured.
- .2 Do not backfill over concrete within 24 hours after placing.

**3.5 Pipe Installation**

- .1 Lay and join pipes in accordance with ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications and manufacturer's recommendations except as noted herein.

- .2 Handle pipe with approved equipment. Do not use chains or cables passed through pipe bore so that weight of pipe bears upon pipe ends.
- .3 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.
- .4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Do not exceed permissible deflection at joints recommended by pipe manufacturer unless directed in writing.
- .6 Do not allow water to flow through pipe during construction that adversely affect the installation.
- .7 Whenever work is suspended, install a removable watertight bulkhead at open ends of last pipe laid to prevent entry of foreign materials.
- .8 Position and join pipes with approved equipment. Do not use excavation equipment to force pipe sections together.
- .9 Pipe Jointing:
  - .1 Install pipe joints in accordance with manufacturer's recommendations.
  - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until pipes are properly joined.
  - .3 Align pipes carefully before joining.
  - .4 Maintain pipe joints free from mud, silt, gravel or other foreign material.
  - .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned and lubricated and replaced before joining is attempted.
  - .6 Complete each joint before laying next length of pipe.
  - .7 Minimize joint deflection after joint has been made to avoid joint damage.
  - .8 At rigid structures, install a pipe joint not more than 1.2 m from side of structure.
  - .9 Apply sufficient pressure in making joints to assure that joint is complete as outlined in manufacturer's recommendations.

**SANITARY SEWERS**

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- .10 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Engineer.
- .11 Block pipes when any stoppage of work occurs in such a manner as required by Engineer to prevent creep during down time.
- .12 Cut pipes as required for special inserts, fittings or closure pieces in a neat manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe.
- .13 Make watertight connections to manholes with manufacturer's factory installed rubber gaskets.
- .14 Upon completion of pipe laying, and after Engineer has inspected pipe joints, place specified granular material to dimensions indicated or directed.
- .15 Hand place granular material in uniform layers of 150 mm thick or less. Dumping of material directly on top of pipe is not permitted.
- .16 Place layers uniformly and simultaneously on each side of pipe to prevent lateral displacement of pipe.

**3.6 Delivery and Stockpiling Materials**

- .1 The Contractor shall be responsible for arranging, stockpiling, and protecting the materials from damage and theft.
- .2 The Contractor shall be responsible for the delivery of material and the Owner will not pay for materials ordered by the Contractor and not used in the work, nor pay for shipping charges on the return of such material to the supplier.

**4.0 ACCEPTANCE TESTING**

- .1 Sewer inspection by televising:
  - .1 Storm sewers less than 1350 mm diameter shall be inspected by camera after backfilling of the trench to finished grade.
  - .2 The inspection shall be made by employing television scanning equipment which shall be provided by the Contractor. The Contractor shall employ a qualified closed circuit television Contractor acceptable to the Engineer to carry out the inspection.
  - .3 The closed circuit television Contractor shall provide all equipment and materials necessary to conduct the inspection as specified in Section 02800.

- .4 All television inspection shall be carried out in the presence of the Engineer who shall be given at least 48 hours advance notice of any testing to be carried out. Television inspection shall be performed by the Contractor on all sewers unless otherwise directed by the Engineer.
- .2 Infiltration test:
  - .1 The Contractor shall conduct an infiltration test on the gravity sewer mains including manholes.
  - .2 Conduct infiltration test where static groundwater level is 300 mm or more above top of pipe measured at highest point in the test section.
  - .3 Do not interpolate a head greater than 750 mm above the pipe to obtain an increase in allowable infiltration rate.
  - .4 Install a watertight plug at upstream end of pipeline test section.
  - .5 Discontinue pumping operations for at least 72 hours before test measurements are to commence, and during this time keep thoroughly wet at least one third of pipe invert perimeter.
  - .6 Prevent damage to pipe and bedding material due to flotation and erosion.
  - .7 Place a 90° V-notch weir, or other measuring device approved by Engineer to measure infiltration.
  - .8 Measure rate of flow over a minimum of 1 hour, with recorded flow for each 5 minute interval.
- .3 Exfiltration Testing:
  - .1 If required by the Engineer, the Contractor shall conduct an exfiltration test.
  - .2 Fill test section with water in such a manner as to allow displacement of air in line. Maintain under nominal head for 24 hours to ensure absorption in pipe wall is complete before test measurements are commenced.
  - .3 Immediately prior to test period add water to pipeline until there is a head of 0.3 m over interior crown of pipe measured at highest point of test section or water in manhole is 1.0 m above static groundwater level, whichever is greater.
  - .4 Duration of exfiltration test shall be two hours.

- .5 Water loss at end of test period shall not exceed maximum allowable exfiltration over any test section.
- .4 Allowable Infiltration/Exfiltration:
  - .1 Infiltration/Exfiltration shall not exceed following 40 litres per hour per 100 metres of pipe, including manholes.

**END OF SECTION**