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PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Materials and installation for storm sewer.
- 1.2 RELATED SECTIONS .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 03 30 00 - Cast-in-Place Concrete.
- .3 Section 31 23 10 - Excavating, Trenching and Backfilling
- .4 Section 33 05 13 - Manholes and Catch Basin Structures.
- 1.3 REFERENCES .1 American Society for Testing and Materials (ASTM).
- .1 ASTM C117, Test Method for Material Finer Than 0.075 mm (No.200) sieve in Mineral Aggregates by Washing.
- .2 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D698, Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft-lbf/ft<sup>3</sup>(600 kN-m/m<sup>3</sup>)).
- .4 ASTM D1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
- .5 ASTM D3034, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .6 ASTM F794, specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings based on Controlled Inside Diameter.

- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire.
  - .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International), Latest Edition.
  - .1 CSA B1800, 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). CSA B182.2, PVC Sewer Pipe and Fittings (PSM Type).
    - .1 CSA B182.4, Profile PVC Sewer Pipe and Fittings.
    - .2 CSA B182.11, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

### 1.3 DEFINITIONS

- .1 A pipe section is defined as length of pipe between successive catchbasins and/or manholes.

### 1.4 SUBMITTALS

- .1 Shop drawings to indicate proposed method for installing carrier pipe for undercrossings.
- .2 Inform Departmental Representative at least 4 weeks prior to beginning Work of proposed source of bedding materials and provide access for sampling.
- .3 Submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.
- .4 Certification to be marked on pipe.

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|   | .5 | Submit to Departmental Representative 1 copy of manufacturer's installation instructions.  |
| <u>1.5 DELIVERY, STORAGE AND HANDLING</u>     | .1 | Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.   |
| <u>1.6 SCHEDULING OF WORK</u>                 | .1 | Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.  |
|   | .2 | Submit schedule of expected interruptions for approval and adhere to approved schedule.  |
| <u>1.7 MEASUREMENT FOR PAYMENT</u>            | .1 | Storm Utility Drains will not be measured for payment. Contractor shall include all costs including all materials as identified in trench detail, plant, materials, equipment and labour required to do the work under lump sum items. |
| <u>PART 2 - PRODUCTS</u>                      |    |  |
| <u>2.1 PLASTIC PIPE</u>                       | .1 | Type PSM Polyvinyl Chloride (PVC): to ASTM D3034.  |
|   | .2 | Separate gasket and integral bell system.  |
|   | .3 | Nominal lengths: 6 m.  |
| <u>2.2 PIPE BEDDING AND SURROUND MATERIAL</u> | .1 | Granular material in accordance with the following requirements:<br>.1 Crushed or screened stone, gravel or sand.  |

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

Table

| Sieve<br>Designation | % Passing        |                 |
|----------------------|------------------|-----------------|
|                      | Stone/<br>Gravel | Gravel/<br>Sand |
| 25                   | 100              | -               |
| 19                   | -                | -               |
| 12.5                 | 65-90            | 100             |
| 9.5                  | -                | -               |
| 4.75                 | 35-55            | 50-100          |
| 2.00                 |                  | 30-90           |
| 0.425                | 10-25            | 10-50           |
| 0.180                | -                | -               |
| 0.075                | 0-8              | 0-10            |

2.3 BACKFILL MATERIAL .1 Type 3 to Section 31 23 10 -  
Excavating Trenching and  
Backfilling.

PART 3 - EXECUTION

3.1 PREPARATION .1 Clean pipes and fittings of debris  
and water before installation, and  
remove defective materials from site  
to approval of Departmental  
Representative.

3.2 TRENCHING .1 Do trenching Work in accordance with  
Section 31 23 10 - Excavation,  
Trenching, and Backfilling.  
.2 Do not allow contents of sewer or  
sewer connection to flow into  
trench.

- .3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.
- .4 Water jetting of backfill under haunches of corrugated steel pipe may be permitted if recommended by manufacturer and approved by Departmental Representative.

### 3.3 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 95 %corrected maximum dry density.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

### 3.4 INSTALLATION

- .1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .2 Handle pipe using methods approved by Departmental Representative. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

- .3 Lay pipes on prepared bed, 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.
- .4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .6 Do not allow water to flow through pipes during construction except as may be permitted by Departmental Representative.
- .7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Jointing Pipe to Pipe & Fittings
  - .1 PVC Pipe:
    - .1 Install rubber gasket around the spigot end of pipe between the second and third ribs.
    - .2 Slide the spigot end inside a lubricated bell end.
- .9 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent "creep" during down time.
- 10. Plug lifting holes with Departmental Representative approved prefabricated plugs, set in shrinkage compensating grout.

11. Cut pipes as required for special inserts. Fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .12 Make watertight connections to manholes and catch basins. Use shrinkage compensating grout when suitable gaskets are not available.
- .13 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes. Joint to be structurally sound and watertight.
14. Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

### 3.5 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated. Leave joints and fittings exposed until field testing is completed.
3. Hand place surround material in uniform layers not exceeding 150mm compacted thickness as indicated.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95 % corrected maximum dry density.

- .6 Compact each layer from mid height of pipe to underside of backfill to at least 90 % corrected maximum dry density to ASTM D698.
- .7 When field test results are acceptable to Departmental Representative place surround material at pipe joints.

### 3.6 BACKFILL

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

### 3.7 FIELD TESTING

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 When directed by Departmental Representative, draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Do infiltration and exfiltration testing as specified herein and as directed by Departmental Representative. Perform tests in presence of Departmental Representative. Notify Departmental Representative two (2) working days in advance of proposed tests.

- .5 Carry out tests on each section of sewer between successive manholes including service connections.
- .6 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.
- .7 Exfiltration test:
  - .1 Fill test section with water to displace air in line. Maintain under nominal head for 24 hours to ensure absorption in pipe wall is complete before test measurements are begun.
  - .2 Immediately prior to test period add water to pipeline until there is head of 1 m over interior crown of pipe measured at highest point of test section or water in manhole is 1 m above static ground water level, whichever is greater.
  - .3 Duration of exfiltration test: 2 hours.
  - .4 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.
- .8 Infiltration test:
  - .1 Conduct infiltration test in lieu of exfiltration test where static ground water level is 750 mm or more above top of pipe measured at highest point in line to be used.
  - .2 Do not interpolate a head greater than 750 mm to obtain an increase in allowable infiltration rate.
  - .3 Install watertight plug at upstream end of pipeline test section.
  - .4 Discontinue pumping operations for at least 3 days before test measurements are to begin and during this time, keep thoroughly wet at

- least one third of pipe invert perimeter.
- .5 Prevent damage to pipe and bedding material due to flotation and erosion.
- .6 Place 90 degrees V-notch weir, or other measuring device approved by Departmental Representative in invert of sewer at each manhole.
- .7 Measure rate of flow over minimum of 1 hour, with recorded flows for each 5 min interval.
- .9 Infiltration and exfiltration not to exceed 5.5 L per hour per 100 m of pipe, including service connections.
- .10 Repair visible leaks regardless of test results.
- .11 Television and photographic inspections: carry out inspection of installed sewers by television camera, photographic camera or by other related means.
- .12 Provide certification of test acceptance. Provide Departmental Representative with copy of video tape, VHS format and certification of corrected deficiencies. If retesting is required Contractor to pay cost.