

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Section 33 05 13 - Manhole and Catch Basin Structures.
- .3 Section 31 05 16 - Aggregate Material.

### **1.2 REFERENCES**

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
  - .2 ASTM International
    - .1 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
    - .2 ASTM C 117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
    - .3 ASTM D 698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort ((12,400 ft-lbf/ft<sup>2</sup>) (600kN-m/m<sup>2</sup>)).
    - .4 ASTM D 2241-09, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
  - .3 Canadian General Standards Board (CGSB)
    - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
    - .2 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
    - .3 CAN/CGSB-34.1-M94, Asbestos-Cement Pressure Pipe.
    - .4 CGSB 41-GP-25M-77, Pipe, Polyethylene, for the Transport of Liquids.
  - .4 CSA International
    - .1 CAN/CSA-B70-06, Cast Iron Soil Pipe, Fittings, and Means of Joining.
    - .2 CSA B137 Series-09, Thermoplastic Pressure Piping Compendium.
  - .5 City of St. John's Specifications, Book, Department of Engineering Fourth Edition 2010, Revised up to March 2011.
  - .6 Department of Justice Canada (JUS)
    - .1 Canadian Environmental Protection Act, 1999 (CEPA).
  - .7 Transport of Canada (TC)
    - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
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- .8 Atlantic Canada Wastewater Guidelines Manual for Collection, Treatment and Disposal, 2000.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures (Shop drawings and product data for manholes, catch basins, frame covers, gratings, piping, fittings and connection to drainage structure).
- .2 Inform Departmental Representative at least 4 weeks prior to beginning of Work, of proposed source of bedding materials and provide access for sampling.
- .3 Certification to be marked on pipe.
- .4 Submit to Departmental Representative 1 (one) copy of manufacturer's installation instructions.

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Scheduling:
  - .1 Schedule Work to minimize interruptions to existing services.
  - .2 Submit schedule of expected interruptions and adhere to schedule approved by Departmental Representative.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- .1 Polyvinyl Chloride (PVC) Pressure Pipe: to CSA-B137.3, ASTM D1785.
  - .1 Schedule 40, solvent welded joints, except where threaded joints are required.
  - .2 Solvent cement for socket joints shall comply to ASTM D2566 AND F656.

### **2.2 PIPE BEDDING AND SURROUND MATERIALS**

- .1 Granular material to Section 211 of the City of St. John's Department of Engineering Specifications and the following requirements:
    - .1 Crushed or screened stone, gravel or sand.
    - .2 Gradations within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
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- .2 Table:
- | Sieve<br>Designation | % Passing    |             |
|----------------------|--------------|-------------|
|                      | Stone/Gravel | Gravel/Sand |
| 200 mm               | -            | -           |
| 75 mm                | -            | -           |
| 50 mm                | -            | -           |
| 38.1 mm              | -            | -           |
| 25 mm                | 100          | - 19 mm     |
| 12.5 mm              | 65-90        | 100 9.5 mm  |
| 2.00 mm -            | 50-0.425 mm  | 10-25       |
| 0.180 mm             | -            | - 0.075 mm  |
- .3 Concrete mixes and materials for cradles for undercrossing and thrust blocks to Section 03 30 00 - Cast-in-Place Concrete.

**2.3 BACKFILL MATERIAL**

- .1 As indicated.
- .2 Place backfill material in unfrozen condition.

**PART 3 – EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for pipe installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.2 PREPARATION**

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

### **3.3 TRENCHING**

- .1 Do trenching Work, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Trench alignment and depth require approval from Departmental Representative prior to placing bedding material or pipe.

### **3.4 GRANULAR BEDDING**

- .1 Place granular bedding in unfrozen condition.
- .2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to corrected maximum dry density to ASTM D 698.
- .6 Fill excavation below design elevation of bottom of specified bedding with compacted bedding material.
- .7 When field results are acceptable to Departmental Representative, place surround material at pipe joints.

### **3.5 INSTALLATION**

- .1 Lay pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.
  - .2 Avoid damage to machined ends of pipes in handling and moving pipe.
  - .3 Maintain grade and alignment of pipes.
  - .4 Align pipes carefully before jointing.
  - .5 Joint deflection permitted within limits in accordance with pipe manufacturer's written recommendations.
  - .6 Keep pipe and pipe joints free from foreign material.
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- .7 Support pipes using hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .8 Apply sufficient pressure in making joint to ensure that joint is complete to manufacturer's recommendations.
- .9 Apply restraint to pipe to ensure that joints when completed are held in place, by tamping fill material under and alongside pipe, or otherwise as approved by Departmental Representative.

### **3.6 THRUST BLOCKS**

- .1 Restrain bends, tees and fittings using concrete thrust blocks as indicated.
- .2 Keep pipe couplings free of concrete.
- .3 Bearing area of thrust blocks to be as indicated.

### **3.7 PIPE SURROUND**

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative indicated. Leave joints and fittings exposed until field testing is completed. Scheduled field test along schedule of this Work, to enable backfill to trench.
- .3 Hand place surround material in uniform layers simultaneously on each side of pipe not exceeding 150 mm compacted thickness as indicated.
  - .1 Do not dump material within 1 m of pipe.
- .4 Compact each layer from pipe invert to mid height of pipe to at least 95% corrected maximum dry density maximum density to ASTM D 698.
- .5 Compact each layer from mid height of pipe to underside of backfill to at least 95% corrected maximum dry density maximum density to ASTM D 698.
- .6 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

### **3.8 BACKFILL**

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

- .3 Under paving and walks, compact backfill to at least 95 % corrected maximum dry density maximum density to ASTM D 698. In other areas, compact to at least 100 % corrected maximum dry density maximum density to ASTM D 698.
- .4 Place unshrinkable fill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **3.9 UNDERCROSSING**

- .1 Excavate working pit to dimensions indicated, outside right-of-way to be crossed.
- .2 Excavate working pit to minimum of 0.5 m below lowest invert of encasing pipe.
- .3 Dewater excavation.
- .4 Dewater area of undercrossing.
- .5 Crossing under the water line will require an encasing pipe. The encasing pipe will be to pressure standard of the water line minimum PVC DR18 with the casing pipe centered at the water line and sealed at both ends.
- .6 Water mains and sewage force mains are to be installed in separate trenches. The soil between the trenches shall be undisturbed. Force mains crossing water mains shall be laid to provide a minimum vertical distance of 450 mm between the outside of the force main and the outside of the water main. The water main shall be above the force main. At crossings, one full length of water pipe shall be located so both joints will be as far from the force main as possible.
- .7 Clearance between blocks and encasement pipe: maximum 12 mm when sewage force main is in position.
- .8 Join sewage force main pipe one length at time outside encasement pipe. Push Pull sewage force main into position.
- .9 Couplings of sewage force main: not to rest on levelling pad when sanitary sewer pipe is in position.

### **3.10 FIELD TESTING OF FORCE MAIN**

- .1 Testing of force main to be carried out under supervision in presence of Departmental Representative.
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- .2 Strut and brace caps, bends and tees, to prevent movement when test pressure is applied.
- .3 Expel air from force main, by slowly filling main with water.
  - .1 Drill and tap high points and install suitable cocks to vent air and to be shut when pressure is applied.
  - .2 Remove cocks after satisfactory completion of test and seal holes with tight fitting plugs.
- .4 Apply hydrostatic test pressure of 1035 kPa based on elevation of lowest point in line and corrected to elevation of test gauge for hydrostatic test and 1035 kPa for leakage test for two hours.
- .5 Apply pressure for 1 hour for pressure test and 2 hours for leakage test.
- .6 Examine exposed pipe, joints and fittings while system is under pressure.
- .7 Remove defective joints, pipe and fittings and replace with new sound material.
- .8 Define leakage as amount of water supplied from water storage tank meter in order to maintain test pressure for 2 hours.
- .9 Do not exceed allowable leakage as defined in ANSI/AWWA C600 of.
- .10 Locate and repair defects if leakage is greater than amount specified.
- .11 Repeat test until leakage is within specified allowance for full length of force main.
- .12 Complete backfill.
- .13 Repeat test after completing backfill. Locate and repair defects and backfill. Repeat tests, repairs and backfills as needed until leakage is less than amount specified.

### **3.11 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
    - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management
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and Disposal

- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

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