

**Part 1          General**

**1.1            SECTION INCLUDES**

- .1          Materials and installation for ductile iron sewage forcemains.

**1.2            RELATED SECTIONS**

- .1          Section 01330 - Submittal Procedures.
- .2          Section 02315 – Excavating, Trenching and Backfilling
- .3          Section 11150 – Process Piping
- .4          Section 11160 – Process Valves and Operators
- .5          Section 11955 – Piping Leakage Testing

**1.3            REFERENCES**

- .1          American National Standards Institute/American Water Works Association (ANSI/AWWA)
  - .1          ANSI/AWWA C111/A21.11-00, Standard for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - .2          ANSI/AWWA C151/A21.51-02, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
  - .3          ANSI/AWWA C207-01, Steel Pipe Flanges for Waterworks Service, Sizes 4 Inch Through 144 Inch (100 mm Through 3,600 mm).
  - .4          AWWA C219-17 Bolted Sleeve- Type Couplings for Plain-End Pipe
  - .5          ANSI/AWWA C600-99, Installation of Ductile-Iron Water Mains, and Their Appurtenances.
- .2          American Society for Testing and Materials International, (ASTM)
  - .1          ASTM C136-01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .2          ASTM C117-95, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .3          ASTM D698-00a, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort ((12,400 ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>)).

- .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.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA-B70-02, Cast Iron Soil Pipe, Fittings, and Means of Joining.
  - .2 CSA B182.2, PVC Sewer Pipe and Fittings**
  - .3 CSA B182.7, Multilayer PVC Sewer Pipe**
  - .4 CSA B137.3, Rigid PVC Pipe and Fittings for Pressure Applications**
- .5 City of Ottawa Standard Specifications for Unit Price Contracts
  - .1 F-3147 Granular Materials.

#### **1.4 SUBMITTALS**

- .1 Submit samples and product details in accordance with Section 01330 - Submittal Procedures.
- .2 Provide Consultant at least four (4) weeks prior to beginning Work, with proposed source of bedding materials and provide access for sampling.
- .3 Submit manufacturer's test data and certification at least two (2) weeks prior to beginning Work in accordance with Section 01330 - Submittal Procedures.
- .4 Provide details of cathodic protection (type of anodes, spacing, connection welds, test stations). The submission to be prepared by a specialized supplier.
- .5 Certification to be marked on pipe.

#### **Part 2 Products**

##### **2.1 MATERIALS**

- .1 Bolts, nuts, and fasteners to be 316 stainless steel. Apply anti-galling compound to all stainless steel threads.
- .2 Ductile Iron pipe:
  - .1 Ductile Iron Pipe: to ANSI/AWWA C151/A21.51, Class 53 wall thickness

- .2 Pipe joints: to ANSI/AWWA C111/A21.11, push-on type, mechanical joint, or proprietary restrained joints.
- .3 Synthetic rubber gaskets: to ANSI/AWWA C111/A21.11.
- .4 All joints shall be mechanically restrained.
- .3 PVC Pipe**
  - .1 PVC Pipe to be SDR21 where specified on drawings, to CSA B137.3**
  - .2 Regular gaskets**
  - .3 All joints shall be mechanically restrained**
  - .4 Fittings, bends, couplings, as required and as noted on drawings**
  - .5 Thrust blocks to be as per City of Ottawa standard W25.3, W25.4 and Contract Drawings.**
  - .6 Cathodic protection to be as per City of Ottawa standard W40, W42, this section**
  - .7 Manufacturer:**
    - .1 Series Pipe supplied by Ipex**
    - .2 IPS Series Pressure Pipe supplied by NAPCO**
    - .3 AQUALOCK PVC Series pipe supplied by Next Polymers**
    - .4 Or approved equal**
- .4 Restrained Flexible Couplings to ANSI/AWWA C111/A21.11
  - .1 EBBA Iron Inc., Mega-Coupling Series 3800 supplied by Robar Industries
  - .2 Hymax coupling by Mueller (where specified on drawings)
  - .3 Or approved equal
  - .4 Provide ductile iron mechanical joint restraints rated for minimum 1034 kPa (150 psi). All pressure piping joints shall be mechanically restrained.
- .5 Mechanical Joint Restraint:
  - .1 Ductile iron, wedge action, with breakoff tightening bolts, pressure rating min. 150 PSI
  - .2 Manufacturer:
    - .1 EBAA Iron Inc.; Megalug, Star pipe or approved equals.

- .2 Or approved equal
- .6 Buried ductile iron piping to be compatible with exposed ductile iron process piping (refer to Section 11150 – Process Piping).
- .7 Couplings to be ordered and sized and installed to accommodate existing cast iron, ductile iron, or steel forcemain if present. Contractor shall confirm required restraint prior to ordering.
- .8 Couplings
  - .1 Manufacturer:
    - .1 Hymax coupling by Mueller (where specified on drawings)
    - .2 Or approved equal
  - .2 Suitable for forcemain type and size as found on site.
- .9 Couplings to be ordered and sized and installed to accommodate existing cast iron, ductile iron, or steel forcemain if present. Contractor shall confirm required coupling prior to ordering.

## **2.2 VALVES**

- .1 Supply and install valves as per Section 11160 – Process Valves and Operators

## **2.3 CAMLOCK CONNECTOR**

- .1 Provide 316 stainless steel, male camlock quick connect complete with:
  - .1 316 Stainless steel dust cap
  - .2 316 Stainless steel NPT threaded flange complete with isolation kit
  - .3 150mm long, 316 stainless steel NPT threaded nipple
- .2 Camlock connector shall have a minimum pressure rating of 345kPa (50 psi).

## **2.4 CATHODIC PROTECTION**

- .1 Cathodic protection products (anodes, clamps, thermite welder, test stations, and accessories to be as per the City's approved product listing: Approved Water Distribution Products Listing (M.S. No. MW-19.15).

## **2.5 PETROLATUM PROTECTION SYSTEM**

- .1 Petrolatum primer, tape, and mastic to be as per the City's approved product listing: Approved Water Distribution Products Listing (M.S. No. MW-19.15).

---

**2.6 PIPE BEDDING AND SURROUND MATERIALS**

- .1 Granular material to City Standard Specifications F-3147 - Granular Material.

**2.7 BACKFILL MATERIAL**

- .1 Suitable native material or Select Subgrade Material as per OPSS 1010.

**2.8 INSULATION**

- .1 Where required to compensate for minimum depth of cover: board insulation to be provided. Board insulation to be equal to Styrofoam SM HI-40, 75 mm thick, unless noted otherwise. Joints to overlap by minimum 100 mm. Insulation to be centered over pipe.
- .2 Where required to protect from a nearby pipe or structure: pipe insulation to be provided. Pipe insulation to be 75 mm thick polyurethane foam covered by a polyethylene or PVC jacket.

**2.9 THRUST BLOCKS**

- .1 In areas of unrestrained pipe, provide cast-in-place thrust blocks at all horizontal and vertical bends, fittings, tees, and dead end caps. Thrust blocks are not required for horizontal bends less than 4 degrees.
- .2 Thrust blocks to be placed against compacted Granular 'A' or undisturbed native material.
- .3 Thrust blocks are to be as per City Standard Drawings W25.3 and W25.4, and OPSD 1103.020 and 1103.021.
- .4 Concrete exposure class: N, minimum strength of 20 MPa as per CSA A23.1
- .5 Bond breaker to be used between the concrete and the pipe/fittings
- .6 Thrust blocks to be centered on the thrust force and shall also partially cradle the fitting/pipe to distribute the force. Sides of the block shall be minimum 80mm from the joint on either side of the fitting.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Pipes and fittings to be clean and dry.
- .2 Prior to installation, obtain Consultant's approval of pipes and fittings.

### **3.2 GRANULAR BEDDING**

- .1 Granular bedding and backfill shall be as indicated in Section 02315.
- .2 Place granular bedding in unfrozen condition.
- .3 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.
- .4 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
- .5 Shape transverse depressions as required to suit joints.
- .6 Compact each layer full width of bed to at least 95% corrected maximum dry density.
- .7 Fill excavation below design elevation of bottom of specified bedding with compacted bedding material.

### **3.3 INSTALLATION**

- .1 Lay pipes in accordance with manufacturer's recommendations.
- .2 Join pipes in accordance with manufacturer's recommendations.
- .3 Avoid damage to machined ends of pipes in handling and moving pipe.
- .4 Maintain grade and alignment of pipes.
- .5 Align pipes carefully before jointing.
- .6 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .7 Support pipe firmly over entire length, except for clearance necessary at couplings. Do not use blocks to support pipe.
- .8 Keep pipe and pipe joints free from foreign material.
- .9 Avoid bumping gasket and knocking it out of position, or contaminating with dirt or other foreign material. Remove disturbed gaskets clean, lubricate and replace before jointing is attempted.
- .10 Support pipes using hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .11 Apply sufficient pressure in making joint to ensure that joint is complete to manufacturer's recommendations.

- .12 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 Consultant.
- .13 When stoppage of Work occurs, block pipe as directed by Consultant to prevent creep during downtime.
- .14 Hydro-vac within 1m of the existing forcemain. Mechanical excavation or hand digging within 1m of the existing forcemain is not permitted.

### **3.4 THRUST BLOCKS**

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

### **3.5 PIPE SURROUND**

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Consultant 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 simultaneously on each side of pipe not exceeding 150 mm compacted thickness as indicated. Do not dump material within 0.5 m of pipe.
- .4 Compact each layer from pipe invert to mid height of pipe to at least 95% corrected maximum dry density
- .5 Compact each layer from mid height of pipe to underside of backfill to at least 90% corrected maximum dry density.
- .6 When field test results are acceptable to Consultant, place surround material at pipe joints.

### **3.6 CATHODIC PROTECTION**

- .1 Install cathodic protection on all underground metal components of steel, cast iron and ductile iron piping (valves, fittings, piping) as per manufacturer's instructions and as specified.
- .2 Refer to City's standard drawings and specification for details of cathodic protection.

### **3.7 PETROLATUM PROTECTION**

- .1 Before pressure testing of the system install petrolatum protection at flanges/bolts/restrainers/couplings buried underground and/or located in the underground chambers. Valves may be wrapped following pressure testing.
- .2 Apply Primer, press Mastic into the irregularities to eliminate air pockets and wrap Tape spirally around the surface. A 55% overlap is recommended.
- .3 Follow manufacturer's instructions with respect to temperature of installation and handling of material

### **3.8 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 Under paving and walks, compact backfill to at least 95 % corrected maximum dry density. In other areas, compact to at least 90 % corrected maximum dry density.

### **3.9 FIELD TESTING OF FORCEMAIN**

- .1 Test and commission as per the requirements of Section 11955 – Piping Leakage Testing.
- .2 Newly installed portion of forcemain shall be tested to 1.5 times the maximum operating pressure (calculated to be 107 kPa) using a blind flange, remainder of forcemain through to discharge shall be tested to maximum system operational pressure. The existing operational pressures for the system is as follows:
  - .1 Pressure Between Pump Cycles: 15 kPa
  - .2 Pressure During Pump Cycles: 71 kPa
  - .3 Low Pressure Alarm: 5kPa

**END OF SECTION**