

**Part 1 General**

**1.1 DESCRIPTION**

- .1 This Section specifies requirements for supplying and constructing force main piping and appurtenances, including:
  - .1 Supplying and installing pipes, fittings and specials;
  - .2 Excavating, bedding, tracer wire, backfilling and compacting trench;
  - .3 Disposal of surplus excavated materials; shoring and bracing trench as required;
  - .4 Supporting and protecting existing services, Site preparation, connecting to existing pipelines; and
  - .5 Restoring and cleaning up Site and all other Work necessary to complete yard piping as specified.

**1.2 RELATED REQUIREMENTS**

- .1 Bid Opportunity 177-2024
  - .1 Process Piping
  - .2 Bypass Pumping Vault

**1.3 MEASUREMENT AND PAYMENT**

- .1 Sewerage force main and fittings supply and installation will be measured on a length basis for each size, material, method of installation, type of bedding and type of backfill and paid for at the Contract Unit Price per metre for “Force Main” as shown in Form B: Prices, installed in accordance with this Specification, accepted and measured by the Contract Administrator.
  - .1 Measurement for length of force main installed in a trench will be made horizontally at grade above the centreline of the pipe through fittings.
  - .2 Measurement for length of force main installed using trenchless methods will be made horizontally above the centreline of the pipe through shafts. Measurement where the type of backfill used in shafts changes will be from the midpoint distance between adjacent shafts.
  - .3 Extraction of existing pipe required to install new pipe will be included with payment for trenchless method of installation.
  - ~~.4 Force mains specified to be installed using trenchless methods but were installed in a trench due to field conditions will be paid for at the Contract Unit Price per metre for trenchless installation.~~
  - .5 Repair of damage to underground and surface structures due to surface subsidence and soil heaving caused by trenchless methods will be at the Contractor’s own expense.
  - .6 Correction of alignment and grade exceeding the allowable variance will be at the Contractor’s own expense.
- .2 Hydrostatic leakage testing will be included with payment for “Force Main”

- .3 Cutting off and plugging existing force mains will be included with payment for “Force Main”
- .4 Connecting new force mains to existing structures will be included with payment for “Force Main”
- ~~.5 Supply and installation of the Internal Drop Pipe in existing manhole will be measured and paid for as a lump sum.~~
- ~~.6 Renewal of existing concrete pavement slabs will be measured on a surface area basis per square metre in accordance with CW 3230 and CW 3235. Renewal of existing concrete curbs will be measured on a length basis per linear metre in accordance with CW 3240. No separate measurement or payment will be made for Drilled Dowels or Tie Bars, the cost for which shall be included in the prices Bid for the renewal of the concrete pavement.~~
- .7 Restoration of boulevards and grassed areas disturbed by construction activities will be included with the force main work being done.

#### 1.4 REFERENCE STANDARDS

- .1 ASTM International (ASTM):
  - .1 ASTM C136-[06], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates;
  - .2 ASTM D-3035-[21]. Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; and
  - .3 ASTM F-1055-[16a]. Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing.
- .2 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB-8.2-[M88], Sieves Testing, Woven Wire, Metric; and
  - .2 CGSB 41-GP-25M-[77], Pipe, Polyethylene, for the Transport of Liquids.
- .3 CSA Group (CSA):
  - .1 CAN/CSA-B70-[06], Cast Iron Soil Pipe, Fittings, and Means of Joining; and
  - .2 CSA B137 Series-[09], Thermoplastic Pressure Piping Compendium.
- .4 City of Winnipeg Standard Construction Specifications (CW):
  - .1 CW 2030 – Excavation Bedding and Backfill; and
  - .2 CW 3230 – Full-Depth Patching of Existing Slabs and Joints.

#### 1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
  - .1 Schedule Work to minimize interruptions to existing services.
  - .2 Maintain existing flow during construction.
  - .3 Submit schedule of expected interruptions to Contract Administrator for approval a minimum of three (3) weeks prior to commencement of Work and adhere to approved schedule.

- .4 Notify Contract Administrator a minimum of twenty-four (24) hours in advance of interruption in service.

## **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 At least two (2) weeks prior to commencing Work, inform the Contract Administrator of proposed source of bedding materials and provide access for sampling.
- .4 Test and Evaluation Reports:
  - .1 At least four (4) weeks prior to commencing Work, submit manufacturer's test data and certification that pipe materials meet the requirements of this Section.
  - .2 Include manufacturer's Drawings, information and Shop Drawings where pertinent including pipe thrust restraint details and locations.
- .5 Certification to be marked on pipe.
- .6 Construction Waste Management in accordance with 01 74 19 – Waste Management and Disposal.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Bid Opportunity 177-2024.
- .2 Delivery and Acceptance Requirements: deliver materials to Site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect pipes from damage.
  - .3 Replace defective or damaged materials with new.
  - .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 19 – Waste Management and Disposal.

## **1.8 PROJECT RECORD DRAWINGS**

- .1 Provide data to produce Project Record Drawings, in accordance with Section 01 78 00 – Closeout Submittals.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Supply pipe in size and class as shown on Contract Drawings and/or as specified.

- .2 Supply pipe of material as indicated.
- .3 Supply fittings suitable for and compatible with class and type of pipe with which they will be used.

## **2.2 POLYETHYLENE PRESSURE PIPES (HDPE)**

- .1 High density polyethylene (HDPE) pipe: to CSA B182-6 and CGSB 41-GP-25.
  - .1 Size: as indicated.
  - .2 All Nominal pipe sizes to be outside diameters.
  - .3 Class: DR17 unless specified elsewhere
  - .4 Manufacturer: to CSA B137, ASTM D 3035 and D3350, and CGSB 41- GP-35M.
- .2 Pipe shall be made from polyethylene resin compound with a minimum cell classification of PE 345464C for PE 3408 materials in accordance with ASTM D3350. This material shall have a Long Term hydrostatic Strength of one thousand six hundred (1,600) pounds per square inch when tested and analyzed by ASTM D2837, and shall be Plastic Institute (PPI) listed compound.
- .3 The raw material shall contain a minimum of two percent (2%), well dispersed, carbon black. Additives which can be conclusively proven not to be detrimental to the pipe may also be used, provided the pipe produced meets the requirements of this standard.
- .4 The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same Specification and from the same raw material supplier. Compliance with the requirements of this Specification shall be certified in writing by the pipe supplier, upon request.
- .5 The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 1.5 metres: name and/or trademark of the pipe manufacturer, nominal pipe size, dimension ratio, letters PE followed by the polyethylene grade per ASTM D3350 followed hydrostatic design basis in 100's of PSI, manufacturing standard reference, and production code from which the date and place of manufacture can be determined.
- .6 The pipe manufacturer shall provide upon request, an outline of quality control procedures performed on polyethylene system components.
- .7 Pipe Joints:
  - .1 Thermal butt fusion welded, except flanged joints where necessary.
  - .2 Flanged joints: HDPE/steel and HDPE/HDPE flanges designed for pressure rating of each pipe dimension ratio.
  - .3 Blind flanged connections: to ANSI/AWWA C207 ductile iron, with flanged drilled to ANSI B16.5.
  - .4 Mechanical Connections: butt fused polyethylene stub end with slip-on metal flange (see "Fittings"). DR rating of stub end to match DR rating of pipe.
- .8 Pipe Fittings:
  - .1 Polyethylene: to CGSB 41-GP-25-M.
  - .2 Slip-on Metal Flanges: ANSI B16.1 Class 125, Stainless Steel

- .3 Bolts to ANSI 18.2.1, nuts to ANSI 18.2.2 Material: 304 grade stainless steel to ASTM F593-02e1 and ASTM F594 for Duckbill Valve.
- .4 Gaskets: three (3) millimetres EPDM Garlock 3700 or approved equal.
- .5 Bolts for concrete ballast as indicated on Drawings.

### **2.3 SLEEVE/TRANSITION COUPLINGS**

- .1 Sleeves: Carbon steel to ASTM A 53-90b; epoxy coated.
- .2 Followers: Malleable iron ASTM A 47-90, ductile iron ASTM A 536-84(1993), or steel.
- .3 Gaskets: Rubber suitable for intended service.
- .4 Bolting: Stainless steel studs and nuts to ASTM A 193/A 193M-94b.
- .5 Finish:
  - .1 Sleeves: fusion bonded epoxy to an average 0.3 millimetres thickness, suitable for potable water system.
  - .2 Followers: Shop coat enamel. .6
- .6 Provide joint harnesses where shown on the Drawings and where required to prevent pipe movement.
- .7 Joint harness design and construction to be in accordance with AWWA Manual M11, Steel Pipe Manual, Chapter 19.
- .8 Acceptable products: Dresser, Rockwell, Baker, or approved equal.

### **2.4 PIPE BEDDING AND SURROUND MATERIALS**

- .1 Granular material or sand according to CW 2030.

### **2.5 BACKFILL MATERIAL**

- .1 Class 1 Backfill using granular material or sand according to CW 2030. The exposed force main segment is to be supported by this material down to native material to prevent settlement of the fill around the force main and corresponding stress on the pipe

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Follow pipe manufacturer's handling and storage recommendations.
- .2 Pipes and fittings to be clean and dry.
- .3 Prior to installation, obtain Contract Administrator's approval of pipes and fittings.
- .4 The Contractor shall verify all topographical survey information and confirm the depth and location of the buried facilities in the field prior to construction.

### **3.2 SHAFTS AND TRENCHING**

- .1 Excavate shafts and trenching in accordance with CW 2030

### **3.3 GRANULAR BEDDING**

- .1 Place bedding materials to CW 2030.
- .2 Place granular bedding in unfrozen condition.
- .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 at least ninety-five percent (95%) of Standard Proctor Density.
- .6 Keep pipe joints clear of bedding materials to permit jointing. After jointing is complete, place bedding material as specified.

### **3.4 INSTALLATION**

- .1 Pipe shall be installed using standard trenching methods in accordance with CW 2030.
- ~~.2 Provide locations and sizes of shafts to the Contract Administrator for review prior to excavating.~~
- ~~.3 Join pipe sections together before inserting into the installation hole. Pull or push the entire length of pipe from the end of the last pipe into installation hole with bell ends facing away from the pulling or pushing direction. Installation methods where tension is applied to a pipe section will not be permitted.~~
- ~~.4 Apply force to the section of pipe being pulled or pushed into the installation hole according to manufacturer's requirements.~~

### **3.5 CUTTING OF PIPE**

- .1 Whenever cutting of pipe is required, cut pipes using acceptable trade practices, and as recommended by pipe manufacturer. .2
- .2 Method of cutting and cutting equipment to be subject to approval of Contract Administrator.

### **3.6 CHANGE IN LINE AND GRADE**

- .1 Provide fabricated bends for change in line and grade greater than pipe manufacturer's recommended joint deflection.
- .2 Deflections within manufacturer's recommended tolerances may be made by pipe joint deflection.
- .3 Do not exceed pipe manufacturer's recommendation in deflecting pipe joints.

### **3.7 THRUST BLOCKS**

- .1 Restrain bends, tees and fittings using concrete thrust blocks per SD-004.
- .2 Place concrete for thrust block against undisturbed ground.
- .3 Keep pipe couplings free of concrete.
- .4 Bearing area of thrust blocks to be as indicated.

### **3.8 PIPE SURROUND**

- .1 Place surround material in unfrozen condition.
- .2 Place cover materials from pipe bedding to two hundred (200) millimetres above top of pipe.
- .3 Hand place surround material in uniform layers simultaneously on each side of pipe not exceeding one hundred fifty (150) millimetres compacted thickness as indicated.
- .4 Do not dump material directly on top of pipe.
- .5 Place cover materials simultaneously on each side of pipe to prevent later displacement of pipe.
- .6 Compact each layer to ninety-five percent (95%) Standard Proctor Density in accordance with ASTM D698.
- .7 Provide three hundred (300) millimetres layer of cover material above pipe before using mechanical compactor on top of pipe.

### **3.9 BACKFILL**

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in uniform layers not exceeding one hundred fifty (150) millimetres compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least ninety-five percent (95%) Standard Proctor Density to ASTM D698. In other areas, compact to density of surrounding unexcavated material.

### **3.10 UNDERCROSSING**

- .1 Excavate working pit outside right-of-way to be crossed.
- .2 Excavate working pit to minimum of 0.5 metres below lowest invert of encasing pipe.
- .3 Dewater excavation.
- .4 Dewater area of undercrossing.
- .5 Install heavy timber backstop.
- .6 Place pipe to exact line and grade as indicated.
- .7 Join sewage force main pipe one length at time outside encasement pipe. Push sewage force main into position.

### **3.11 FIELD TESTING OF FORCE MAIN**

- .1 Testing of force main to be carried out in presence of Contract Administrator.
- .2 Before commencing the test and only after a visual inspection by the Contract Administrator, backfill the trench enough to prevent movement of the pipeline, with joints, valves and fittings exposed. Strut and brace caps, bends and tees, to prevent movement when test pressure is applied.
- .3 All pipes shall be thoroughly flushed prior to pressure testing.
- .4 Expel air from force main, by slowly filling main with water.

- .5 Apply hydrostatic test pressure of one hundred fifty percent (150%) of operating pressure, but not less than seven hundred (700) kPa (one hundred (100) pounds per square inch).
- .6 Apply pressure for two (2) hours for pressure test and two (2) hours for leakage test.
- .7 Examine exposed pipe, joints and fittings while system is under pressure.
- .8 Remove defective joints, pipe and fittings and replace with new sound material.
- .9 Define leakage as amount of water supplied in order to maintain test pressure for two (2) hours.
- .10 Do not exceed allowable leakage of 257.5 L/km of pipe.
- .11 Locate and repair defects if leakage is greater than amount specified.
- .12 Repeat test until leakage is within specified allowance for full length of force main.
- .13 Complete backfill.
- .14 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.

### **3.12 SURFACE RESTORATION**

- .1 Re-establish existing roads and all ground surfaces. Place sufficient backfill material over constructed outside services, to provide protection until final grading and finishes are completed.

### **3.13 PLUGGING AND ABANDONING FORCEMAINS**

- .1 Complete plug each end of forcemain with mortar or concrete a minimum of 300 mm thick.

### **3.14 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – 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 00 – Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 – Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**