

SPECIAL PROVISIONS

SP. 39

SUPPLY AND INSTALLATION OF SEWAGE FORCEMAIN

39.1

Description

This Special Provision shall cover all operations relating to the supply and installation of a sewage forcemain across the St. Vital Twin Bridge Northbound Structure.

The work to be done by the Contractor under this Special Provision shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

39.2

Materials

The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Special Provision.

39.2.1

Steel Forcemain Pipe

Steel forcemain pipe shall conform to the requirements of the following American Waterworks Association (AWWA) Specifications:

- C200 - Standard for Steel Water Pipe 6 inches and larger
- C207 - Steel Pipe Flanges for Water Works Service
- C208 - Standard for Dimensions for Fabricated Steel Water Pipe Fittings

The steel pipe shall be either mill pipe, electric welded or seamless, or fabricated pipe, and shall conform to the latest revision of AWWA C200. The pipe shall have an outside diameter of 508 mm with a minimum wall thickness of 9.525 mm.

The tensile requirements of the pipe shall conform to Grade B or C as specified in the latest revision of ASTM A 283.

The pipe ends shall be either plain or beveled for field butt welding.

Pipe shall be furnished in lengths as required for installation procedure.

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Materials (Cont'd.)

39.2.2

Steel Forcemain Piping Elbows and Fittings

Elbows and fittings shall be fabricated in accordance with AWWA C208, latest revision.

The steel used for the elbows and fittings shall meet or exceed the requirement of the steel pipe specified.

Flanges where required shall conform to AWWA C207, latest revision, Class D.

39.2.3

Steel Pipe Protection

Uninsulated steel pipe and fittings in underground installations shall be protected by heat shrink tape. Tape shall be completely coated and sealed with approved mastic.

39.2.4

Air Relief Piping and Fittings

Galvanized threaded steel pipe shall conform to the requirements of CSA Z245.3. Malleable iron screwed fittings shall conform to the requirements of ASTM A197. Galvanizing to CSA G163. Pipe and fittings shall have certification from the appropriate specified standards agency. Between the steel forcemain piping and the air release valve, piping shall be of brass to ASTM B43 and ANSI D16.15. Use EPCO "FX" unions, or approved equal, dielectric type connection where steel and brass pipe and fittings are joined.

39.2.5

Air Release Valve

Air release valve shall be a 50 mm  $\emptyset$  gate valve, bronze, non-rising stem, inside screw, solid wedge disc, screwed ends, Crane No. 438 or Jenkins Fig. 310.

39.2.6

PVC Forcemain Pipe

PVC forcemain pipe DR25 shall conform to the requirements of CSA B137.3 - M1981 with integral bell gasketed joints. Design operating pressure 1150 kPa. Size as indicated on Drawings.

39.2.7

Cast Fittings

Cast fitting shall conform to the requirements of AWWA C110 and Specification CW2410.

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39.2.8

Bearings

Bearings shall be Acme Elastometal Type 1 sliding bearing with a 65 x 100 x 12 natural rubber pad with a teflon and stainless steel sliding surface meeting the requirements of AASHTO Specification or approved equal. The bearing shall have a total minimum movement capacity of 150 mm. The bearing shall be supplied complete with top bearing saddle, bottom bearing plate, u-bolt strap, hardware, and guide-stops where required. All steel shall be hot-dipped galvanized.

39.2.9

Structural Steel

Structural steel for jacking beam modifications, pipe supports, bearings, and miscellaneous metals shall conform to the requirements of CSA Specification CAN3-G40.21-M81, Grade 300W. Bearing plates and miscellaneous metals shall be hot-dipped galvanized.

39.2.10

Pipe Insulation

Pipe insulation shall be factory applied, rigid, closed cell polyurethane to a minimum thickness of 50 mm, Spiral-8 Shaw Pipe Protection System or Urecon Ltd. "U.I.P." System meeting the following requirements:

- .1 Core density: ASTM D-1622 35 to 48 kg/m<sup>3</sup>
- .2 Compressive strength @ 25°C  
10% deflection, ASTM D1621-64 2.81 kg/cm<sup>2</sup>
- .3 Thermal conductivity @ 25°C  
ASTM D2326-64T 0.00225 W/cm°C
- .4 Upper thermal limit 121°C
- .5 Closed cell content, ASTM D2856 90% minimum
- .6 Water absorption, ASTM D2842 Max. 12 gm/1000 cc
- .7 Dimensional stability, ASTM D2126,  
procedure B & E 3
- .8 Cut-back insulation at each end to  
permit jointing.

Half shells for joint closures, fittings, bracing points, expansion joints, and valves shall be molded for snug fit using polyurethane meeting same requirements. Canusa Heat Shrink pipe sleeve adhesive coated cross-linked polyethylene sleeve to provide a moisture-proof seal at joints.

For above-ground installations, protective jacketing shall be 22 gauge lockseam grade steel, continuously formed and jointed in a spiral pattern using high strength, pressure-grooved single lock seam.

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39.2.10

Pipe Insulation (Cont'd.)

For below-ground installations, the protective jacketing to be either of the following:

1. A 1.14 mm thickness of continuously extruded high density polyethylene over a rubber mastic under-adhesive as manufactured by Shaw Pipe Protection, "Insul-8" system.
2. A 1.27 mm thickness in two layers spirally wrapped high density polyethylene tape, hot applied, counter-wound, overlapped 15% of tape width on each seam, Urecon Ltd. "U.I.P."

Half shells (joint closures, fittings and valves) shall be molded for snug fit using polyurethane meeting same requirements as for pipe.

Heat shrink sleeves shall be Canusa Heat Shrink Pipe Sleeve, adhesive coated cross-linked polyethylene sleeve to provide a moisture-proof seal at joints or approved equal.

Heat shrink tape shall be Raychem thermoclad adhesive coated heat shrinkable tape in 100 mm widths, or approved equal.

Mastic shall be Flintguard No. 110-14 asphalt mastic vapour barrier or approved equal.

All ends shall be sealed to ensure insulation is water-tight.

39.2.11

Reinforcing Steel

Reinforcing steel shall be supplied in accordance with the requirements of Special Provision SP. 16.

39.2.12

Concrete

Concrete shall be supplied in accordance with the requirements of Special Provision SP. 17.

39.2.13

Expansion Joints

Beveled end expansion joints shall be Rockwell Model No. 611 single end expansion joint with stainless steel slip pipe, or approved equal. Bolts and associated hardware shall be Grade 304 stainless steel.

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Materials (Cont'd.)

39.2.14

Pipe Covering Protection Saddle

Pipe covering protection saddle shall be ITT Grinnell Model No. 162 or approved equal. The pipe covering protection saddle shall be hot-dipped galvanized.

39.2.15

Anchor Bolts

Anchor bolts shall be chemical type and consist of a galvanized threaded rod, nut, washer, and a sealed glass capsule containing a polyester resin and quartz sand aggregate filler. The 32 mm  $\emptyset$  threaded rods must have a minimum yield stress of 350 MPa and a minimum tensile strength of 400 MPa. The threaded rods shall be cut-off at an angle at one end to facilitate the mixing of the components within the capsule during the installation of the anchors.

Anchor bolts shall be "Chemset" chemical anchors by Ramset Fastening Systems or approved equal.

39.2.16

Caulking

Caulking shall be grey or black silicone rubber compound, as approved by the Engineer.

39.2.17

Transition Couplings

Transition couplings shall be "Rockwell 413" steel transition coupling or approved equal. Coupling shall be lined and coated with fusion bonded epoxy conforming to the requirements of AWWA C213. All bolts and associated hardware shall be Grade 304 stainless steel. Couplings shall be wrapped with approved corrosion control tape and sealed with approved mastic.

39.2.18

Galvalloy

Galvalloy shall be supplied as available from Welder's Supply Ltd., 25 McPhillips Street, Winnipeg, Manitoba.

39.3

Equipment

All equipment shall be of a type approved by the Engineer and shall be kept in good working order.

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39.4

Construction Methods

39.4.1

General

The installation of a sewage forcemain on the northbound structure of the St. Vital Twin Bridge shall include the following work:

1. Installation of pipe supports.
2. Installation of slider bearings.
3. Installation of insulated steel forcemain pipe and fittings.
4. Jacking beam modifications.
5. Miscellaneous metal fabrication and installation.
6. Construction of reinforced concrete thrust blocks.
7. Installation of underground piping.
8. Installation of air release valves and associated piping.
9. Pressure testing.

39.4.2

Submissions

At least ten (10) days prior to the scheduled commencement of any installation works, the Contractor shall submit to the Engineer, the proposed schedule, sequence and methods of erection that he proposes to follow and the number and character of equipment he proposes to use for review and approval. No erection works shall commence without prior written approval of the Engineer. The review shall not relieve the Contractor of any responsibility for the safety of the proposed method of erection or of the equipment from carrying out the work in full in accordance with the Drawings and these Special Provisions.

39.4.3

Pipe Supports

The pipe supports shall be installed by connecting to field drilled bolt holes drilled through the webs of the existing girders. Prior to bolting the existing painted steel surfaces shall be sandblasted to remove all paint and rust. The pipe supports shall be painted once in place.

Fabrication, erection, and welding of pipe supports shall be carried out in accordance with Special Provision SP. 24.

Surface preparation and painting of pipe support components shall be carried out in accordance with Special Provision SP. 25.

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Construction Methods (Cont'd.)

39.4.4

Insulation

Before installation of insulation, all steel pipe and fittings shall be preheated to remove surface moisture, then shot-blast cleaned to eliminate mill scale and rust. Uninsulated and exposed pipe ends and fittings shall be shielded from moisture and damage with protective polyethylene covers, which shall not be removed until pipe is ready for joining. The supplier of the pre-insulated pipe shall provide certification to the Owner that all materials supplied to the project meet or exceed these Special Provisions.

At joints and fittings, clean all surfaces adequately prior to applying half shells, shrink sleeves or tape.

Remove and replace any materials where proper bond is not attained.

Transport, store and handle insulated components with care to prevent damage to insulation and/or protective jacket.

Repair damaged insulation with field-applied urethane. Repair damaged protective jacket with replacement jacketing sections.

Do jointing as required. Cut back insulation on pipe or half shells to provide snug fit.

Install half shells at joints. Infill gaps and areas at fittings where pre-formed insulation cannot be achieved with field-applied urethane. Use forms where required. Coat field-applied urethane with heat shrink sleeves after curing.

Where the geometry of fittings does not permit use of heat shrink sleeves, install double wrap (counterwound) heat shrink tape with 50% overlap to manufacturer's instructions.

39.4.5

Steel Forcemain Pipe

The delivery, erection and field welding of the steel forcemain pipe shall be in accordance with CSA Specification Z184 (latest edition) and Special Provision SP. 24.

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Construction Methods

39.4.5

Steel Forcemain Pipe (Cont'd.)

The Contractor shall minimize the number of field butt joints by maximizing the length of pipe. Details of all butt joints shall be submitted to the Engineer for his review.

All materials, welding procedures, shop drawings and steelwork fabrication will be inspected by the Engineer to ascertain compliance with the Specifications and Drawings.

A testing agency will work with the Engineer to carry out all welding inspection during installation of the pipe. The Contractor shall co-operate fully with the testing firm.

All butt welds will be inspected by radiographic inspection. Weld inspection will be carried out in accordance with the requirements of CSA Z184.

Welds that are found by any of the inspection methods to be inadequate and unsatisfactory shall be repaired and then re-tested. The cost of the repairs, and of the tests that reveal inadequate and unsatisfactory welds shall be paid by the Contractor. All other testing specified herein will be paid for by the Owner.

No repair shall be made until agreed to by the Engineer.

All uninsulated pipe and fittings in below-ground installations shall be covered with double wrap (counterwound) heat shrink tape with 50% overlap and following heating of tape, the exterior shall be coated and sealed with mastic.

39.4.6

Miscellaneous Metals

Miscellaneous metals shall include all struts, bracing, bolts c/w hardware, and bentplates located at the top 90° elbow of the forcemain.

All components shall be hot dipped galvanized in accordance with CSA Standard G164.M1981 to a retention of 600 gm/m<sup>2</sup>.

Fabrication, erection, and welding of miscellaneous metals shall be carried out in accordance with Special Provision SP. 24.



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Construction Methods (Cont'd.)

39.4.7

Jacking Beam Modifications

Jacking beam modifications shall include the installation of stiffeners, wide-flange beams and the cutting of a 650 mm diameter hole through the web of the existing jacking beams at Piers Nos. 2 through to and including Pier No. 7.

Fabrication, erection, and welding of the jacking beam modifications shall be carried out in accordance with Special Provision SP. 24.

Surface preparation and painting of the steel components shall be carried out after installation and will be paid for under Special Provision SP. 25.

39.4.8

Reinforced Concrete Thrust Blocks

Construction of reinforced concrete thrust blocks shall be carried out in accordance with Special Provisions SP. 16 and SP. 17.

39.4.9

Installation of Underground Piping

Installation of underground piping shall be carried out in accordance with Specification CW 2030, "Excavation and Backfill", (Class 4 Backfill to be provided) and Specification CW 2110, "Installation of Watermains".

39.4.10

Slider Bearings

Shop Drawings [three (3) prints and one (1) reproducible sepia copy] showing fabrication details of the bearings shall be provided to the Engineer for approval at least twenty-one (21) days prior to scheduled commencement of fabrication. No fabrication shall commence until approval from the Engineer has been obtained.

All bearings surfaces shall be smooth, straight and flat so as to ensure uniform bearing.

Prior to and after galvanizing, the surface finish of bearing plates, and other bearing surfaces that come into contact with each other or with concrete shall be in accordance with the bearing suppliers' instructions. Unless specified otherwise by the bearing supplier, the following are minimum requirements based on the American National Standards Institute.

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Construction Methods

39.4.10

Slider Bearings (Cont'd.)

Sliding Surfaces

Pins and Pin Holes:

ANSI125

Milled ends of compression members, stiffeners and fillers

Contact surfaces of bearing

soleplates and girder flanges:

ANSI500

Surfaces bearing on Concrete: Permissible variation in (ignore lead sheet, etc.) flatness 3mm in 1m or ANSI2000

All steel coverplates of the bearings shall be hot dip galvanized.

Galvanizing shall be done in accordance with CSA Standard G164-1965 (R1972) to a retention of 600 gm/m<sup>2</sup> (2 oz./ft.<sup>2</sup>). All metal surfaces to be galvanized shall be thoroughly cleaned of rust, rust scale, mill scale, dirt and other contaminants by commercial sand, grit or shot blasting and/or pickling prior to galvanizing. Heavy deposits of oil and grease shall be removed with solvents prior to blasting or pickling. The surface finish after galvanizing shall conform to that specified hereinbefore.

The new bearings shall be welded to the pipe supports as specified herein in accordance with the details shown on the Drawings.

Prior to installing the bearings, the Contractor shall satisfy himself that the elevations of the pipe supports are in accordance with the Drawings and Special Provisions. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Engineer.

Workmanship and finish shall be in accordance with the Drawings and Special Provisions and shall conform to the best practices of bridge construction. The parts shall be assembled as shown on the Drawings and all match marks shall be observed. The material shall be handled carefully so that no parts will be bent, broken or otherwise damaged.

All galvanizing which is damaged by welding processes and all welds shall be touched by the galvalloy process as described in Special Provision SP. 20.

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Construction Methods (Cont'd.)

39.4.11

Pressure and Leakage Testing

Supply all water, material, equipment and labour required to carry out the tests. Prior to initial operation, all piping shall be pressure tested with water to ensure tightness. Buried lines shall be tested prior to backfilling. All test pressures shall be 1150 kPa.

Underground PVC piping shall be tested in accordance with Specification CW 2310, "Hydrostatic Testing".

For steel forcemain piping, testing shall be completed prior to installation of insulation at joints and fittings.

Pressure shall be maintained on the line for a sufficient time to determine if there are any leaks and to visually locate them, but in any case for a time not less than one hour.

Where leaks are found, the line shall be retested after making repairs, except that where the leaks are minor, the Engineer may, at his sole discretion, waive the retest.

If make-up water is required to maintain pressure, testing shall be continued until leaks are located. Retesting shall not be waived on pipes where complete visual examination is not possible.

Prior to acceptance by the Engineer, the steel forcemain pipe shall be "bottletight" with no visual or measurable evidence of leakage.

The Contractor shall accept full responsibility for introduction of water into a line for testing or other purposes and to provide adequate temporary support, protection from frost and such other measures as are necessary to prevent damage to the line. In a case where damage results, it shall be made good by the Contractor.

39.4.12

Galvanizing

The following items shall be hot-dipped galvanized in accordance with CSA Standard G164-M1981 to a retention of 600 gm/m<sup>2</sup>: