



# *City of Estevan*

## Construction Specifications

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

**1.0 GENERAL**

1.1 Scope:

This section governs the requirement for the supply and installation of water distribution main piping, fittings, fire hydrants, valves, and appurtenances.

1.2 Scheduling of Work:

Schedule and co-ordinate all work to minimize disruption to existing services.

Submit a proposed work schedule as may be stipulated in the Special Provisions of these specifications.

Comply with any special service interruption or other scheduling requirements stipulated within the Special Provisions and City of Estevan bylaws including notifications to customers, Engineering Services Division and Fire Department.

**2.0 MATERIALS**

2.1 Pipe:

Polyvinyl Chloride (PVC)

2.1.1 Sizes 300 mm and smaller - pipe certified to CSA B137.3 and conforming in all respects to AWWA C900 latest edition Class 150 pipe, DR18, unless shown otherwise on the drawings, complete with integral wall thickened bell ends complete with factory installed gaskets and spigot ends for push-on joints conforming to ASTM D3139. Pipe shall have cast iron O.D. and permanently color coded blue.

2.1.2 Elastomeric gaskets shall conform to ASTM F477 for normal conditions of bury. Nitrile gaskets shall be used for watermains buried in soil with or with the potential for hydrocarbon contamination.

2.1.3 Push-on joint gasket lubricant shall be non-toxic, water soluble and approved for use in contact with potable water by the National Sanitation Foundation (NSF).

2.1.4 Approved pipe manufacturers are:

- IPEX
- Royal Flex-Lox Pipe Limited
- or approved equal.

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

2.1.5 Supply pipe in laying lengths of 3.05 or 6.1 meters with short lengths of PVC pipe only to act as connection spools for joining double bell and pipe sections. Length of connection spools to be twice the normal insertion length for spigot end of standard bell and spigot pipe. Bevel both ends of spools to standard 15° chamfer angle. Mark each end of connection spool with an insertion stop.

2.1.6 Do not use PVC pipe that is more than 24 months old.

2.2 Fittings:

2.2.1 Cast Iron: (used only where PVC fittings are unavailable for pipe sizes 300 mm diameter and larger)

Cast or ductile iron shall conform to the latest edition of ANSI/AWWA C110/A21.10.

Push-on joint with a working pressure rating of 1.74 MPa (250 psi).

Rubber gasket material suitable for potable water conforming to ANSI/AWWA C111/A21.1.

Interior coated with fusion bonded epoxy, minimum thickness of 300 microns (12 mils) certified for use in potable water, and recommended by the coating manufacturer for the service. Prepare surfaces and apply lining in strict accordance with the manufacturer's instructions.

Exterior asphaltic coated per AWWA/ANSI C110, latest edition, protected with a sacrificial anode system from electrolytic corrosion in conformance with Section 1500 Corrosion Protection.

2.2.2 PVC:

300 mm and smaller - injection-molded PVC tees, crosses, wyes and bends certified to CSA B137.2 latest revision and in full compliance with AWWA C907 latest revision for a working pressure of 1500 kPa (220 psi).

Fabricated fittings manufactured from segments of AWWA C900 Class 150 (DR18) pipe bonded together shall be over wrapped with fiberglass-reinforced polyester conforming to CSA 137.3.

Fittings shall be manufactured by IPEX Inc. Harrington Corporation (HARCO) or approved equal.

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

2.2.3 Joint Restraints:

Restraint devices shall incorporate a series of machined serrations on the inside diameter to provide proper restraint and contact with the pipe.

Shall be of high strength Ductile Iron, ASTM 536, Grade 64-45-12.

Bolts shall be of high strength, low alloy material in accordance with ANSI/AWWA C111/A21.11.

Shall meet or exceed the requirements on UNI-B-13-92.

Models 1300, 1350, 1360 and 1390 as manufactured by Uni-Flange or approved equal.

Restrain devices shall be protected from electrolytic corrosion by a coating system conforming to Section 1500 Corrosion Protection.

2.3 Thread Compound:

Teflon tape or a teflon based liquid approved for use in contact with potable water by the National Sanitation Foundation (NSF).

2.4 Nuts and Bolts:

2.4.1 304 stainless steel bolts and nuts on direct buried or submerged applications conforming to ASTM A193 Grade B8 or B8M, protected by a coating system from electrolytic corrosion conforming to Section 1500 Corrosion Protection.

2.4.2 Exposed service - galvanized carbon steel bolts conforming to ASTM A307 Grade B7 with galvanized carbon steel nuts conforming to ASTM A307 Grade 2H, semi-finished hex head.

2.5 Couplings and Adaptors:

2.5.1 For coupling PVC to asbestos-cement pipe use molded PVC couplings originally produced under the certification of CSA B137.2 and modified by the manufacturer to adapt to the asbestos cement pipe O.D. while still retaining full test pressure capability. Couplings to be manufactured by IPEX Inc. or approved equal.

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

2.5.2 For coupling asbestos cement to steel or PVC to steel or steel to steel, compression sleeve couplers conforming to ASTM A536-80 Grade 65-45-12 with a rigid steel or ductile iron center sleeve, sized to suit the pipe types, with ductile iron or steel follower rings on either side of the center ring and sized to bolt together while providing a water tight compressive gasket seal on each pipe. Potable approved epoxy lining in the center sleeve and all 304 stainless steel bolting. Compression sleeve couplers as manufactured by Smith-Blair, Robar, Romac or Dresser protected from electrolytic corrosion by a coating system conforming to Section 1500 Corrosion Protection.

2.6 Valves:

2.6.1 Gate Valves - 150 to 300 mm inclusive to be iron body, resilient seated with materials, manufacturing and performance in full compliance with the latest edition of AWWA 509.

- .1) End connections and operators to be fully compatible with the service, location of installation and pipe to which the valve is being attached.
- .2) Direct buried valves to have a non-rising stem with a 50 mm square AWWA standard wrench nut and open with a counter clockwise rotation.
- .3) Direct buried valves shall have corrosion resistant fusion bonded epoxy coating on the inside and be factory coated with asphaltic or fusion bonded epoxy coating on the exterior and protected from electrolytic corrosion by a sacrificial anode system conforming to Section 15 Corrosion Protection.
- .4) 304 stainless steel bolts and nuts.
- .5) All bronze or brass components to conform to Section 2, Table 1, Grade A, D or E with stem material of Grade E as published within AWWA C509 latest edition.
- .6) Approved manufacturers:
  - Mueller
  - Canada Valve
  - McAvity
  - Jenkins

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

2.7 Flange Gaskets:

- 2.7.1 Flange gaskets cloth inserted, red rubber or other material conforming to the latest edition of AWWA C207 and approved for use with potable water.
- 2.7.2 Ring type gaskets for raised face flanges.
- 2.7.3 Full gaskets for flat-faced surfaces.
- 2.7.4 Gasket thicknesses as follows:
  - .1) 150 mm to 600 mm - 1.6 mm thick
  - .2) 750 mm to 1800 mm - 3.2 mm thick

2.8 Valve Boxes and Covers:

- 2.8.1 Valve boxes shall be cast iron, sectional and telescoping, coated on the interior and exterior with asphaltic varnish.
- 2.8.2 Cast iron upper valve casing shall telescope over the lower casing and shall have an overall length of 600 mm with an inside diameter of 150 mm.
- 2.8.3 Lower valve casing shall be PVC having a nominal diameter of 127 mm and be 2440 mm in overall length. Bottom box section shall have an inside diameter of 192 mm.
- 2.8.4 Centering disc shall have a 40 mm diameter hole in the center and have an overall diameter of 145 mm.
- 2.8.5 Valve stem shall be 25 mm square solid steel and length as shown on detailed drawing AW-2. The stem shall be complete with 50 mm bottom operating nut which shall be attached to the stem with a 9 mm 304 stainless steel bolt and nut and sealed with an O-ring.
- 2.8.6 Valve box cover shall be deep style cast iron, Bibby-Ste-Croix Foundries No. VB-826 - 5 ¼" cover. Lid shall be completely coated with asphaltic varnish.
- 2.8.7 Locking ring rubber shall be Bibby-Ste-Croix 5SL locking ring rubber for PVC lower valve casing.
- 2.8.8 Valve boxes, covers and casings shall be protected from electrolytic corrosion by a sacrificial anode system and valve stem by a coating system conforming to Section 1500 Corrosion Protection.

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

2.9 Hydrants:

2.9.1 Dry-barrel, compression type hydrants which are in compliance with the latest edition of AWWA C502.

2.9.2 Hydrants shall be fitted with the following:

- .1) A 150 mm diameter inlet connection with rubber casketed integral bell end.
- .2) Outlet nozzles:
  - fastened onto the hydrant barrel by a threaded connection;
  - consist of one - 100 mm diameter bronze pumper nozzle with integral "Storz" type quick coupling;
  - consist of two - 60 mm diameter bronze hose nozzles 83 mm O.D. with six (6) threads per 25 mm;
  - shall have counter-clockwise opening caps for hose nozzles;
  - pumper nozzle shall have 100 mm cast iron blind cap.
- .3) The bronze operating nut and hose nozzle cover caps shall be counter-clockwise opening, City of Estevan standard 40 mm three sided nuts.
- .4) The interface between removable ports of the main valve assembly and hydrant body shall be bronze to bronze.
- .5) All materials shall conform to applicable AWWA and CSA standards.
- .6) Hydrants shall be flanged at the ground line and the flange shall be break-away type and have break-away bolts.
- .7) Depth of bury as shown on City of Estevan standard drawing AW-3.
- .8) Hydrants shall be supplied with a minimum of one stem guide.

2.9.3 Hydrant Finishes:

- .1) Body: Marine Canary General Paint #10-014.
- .2) Caps and Tops: Aluminum color paint.
- .3) All exterior surfaces below the hydrant flange to be asphaltic coated and protected from electrolytic corrosion by a sacrificial anode system conforming to Section 1500 Corrosion Protection.

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

2.9.4 Hydrant manufacturers:

- .1) McAvity M67
- .2) Canada Valve "Century"
- .3) Mueller

2.10 Concrete for thrust blocks, anchors and underground structure concrete shall conform to CAN3-A23.1

Cement shall be sulphate resistant, Type 50 conforming to CSA CAN3-A5.

Admixtures shall conform to CSA A266.1, A222.2 and ASTM C494.

2.11 Corrosion Protection: Sacrificial anode system in conformance with Section 1500 Corrosion Protection and City of Estevan Standard Drawings.

### **3.0 INSTALLATION**

3.1 Excavation and Backfill:

3.1.1 Carry out excavation and backfill in full conformance with the relevant section(s) of these specifications.

3.1.2 Comply with all safety requirements of:

- City of Estevan bylaws
- Occupational Health and Safety Regulations

3.1.3 Maintain trench excavation and bedding preparation a sufficient distance ahead of the pipe installation to avoid interference.

3.2 Pipe Installation:

Obtain Engineering Services Division's approval of backfill and bedding materials and installation procedures prior to pipe installations.

Prevent dirt or other foreign material from entering installed pipe with temporary blocking.

Install pipe true to line and grade as staked by the Engineering Services Division to within  $\pm 100$  mm horizontally and  $\pm 50$  mm in elevation vertically and at a minimum depth of bury of 2.43 meters from finished grade.

Handle, install and join pipe in accordance with the manufacturer's instructions and any details and/or instructions contained in the contract documents.

Install push-on joint pipe such that the spigot ends are inserted into bell ends.



SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

Modify pipe ends to be installed into push-on fittings as recommended by the pipe manufacturer.

Clean pipe ends of all foreign materials and substances prior to joint make-up.

Remove any pipe which has floated due to trench flooding and reinstall only after acceptable trench and bedding conditions have been re-established.

Provide any pipe or joint deflections required in a manner recommended by the pipe manufacturer and/or as approved by the Engineering Services Division.

Install all special structures such as gate valves, air release valves, drains, blow-offs, hydrants, swabbing facilities and valve chambers at the locations indicated and in accordance with the contract documents. Ensure all valve and hydrant risers are plumb.

Install, bed and backfill pipe such that deflection of pipe is within the manufacturer's tolerances for long term service. Install Class B bedding unless specified otherwise on the drawings.

Provide corrosion protection to cast iron or steel fittings in conformance with Section 1500 and the City of Estevan Standard Drawings.

Protect pipe and fittings from excessive exposure to direct sunlight or other damage. Replace any pipe or fittings which have become discolored, cracked or otherwise marred or damaged.

Ensure proper operation of all fittings and appurtenances having moving parts both prior to and after installation.

3.3 Thrust Blocks:

Restrain all joints that fall within the lengths of horizontal pipes, vertical pipes and appurtenances as shown on standard drawings. Provide corrosion protection to metallic mechanical thrust restrain devices with a coating system in conformance with Section 1500.

Provide only cast-in-place concrete thrust blocks which are sized and located as shown on standard drawings on all push-on and mechanical joint fittings.

Cut bearing soil wall to the proper angle for the fitting and ensure an undisturbed soil bearing surface.

Obtain approval of the Engineering Services Division for all thrust block formwork prior to concrete placement.

Place a minimum 200 micron (8 mil) polyethylene sheet between the full contact face of the fitting and the thrust block.

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

Remove all wooden formwork prior to backfilling.

Use mechanical thrust restraint devices only with the approval of the Engineering Services Division.

3.4 Connection to Existing Watermains:

Adhere to the scheduling stipulations for service interruptions.

Provide written notice to all connected customers whose water service will be interrupted by the connection.

Adhere to standard or special tie-in details contained in the contract documents and confirm acceptability with the Engineering Services Division prior to proceeding.

Provide corrosion protection to all couplings and clamps in conformance with Section 1500.

Make good at no expense to the Owner all damages resulting from an unsuccessful tie-in or failure of materials installed to complete tie-in or damage to existing structures or works caused during performance of the tie-in.

3.5 Hydrant Installation:

Install hydrants in accordance with standard drawings with leads straight and plumb.

Install hydrants and leads straight and plumb.

Install pumper nozzle at right angles to the adjacent street.

Install hydrants such that the hydrant flange is 50 mm above top of curb, walk or finished grade of lot as directed by the Engineering Services Division.

If water table is above hydrant base, plug hydrant drain.

Provide corrosion protection in conformance with Section 1500 and the City of Estevan Standard Drawings.

3.6 Valve Installation:

Install valves in accordance with City of Estevan standard drawings.

Provide corrosion protection in conformance with Section 1500 and the City of Estevan Standard Drawings.

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

**4.0 WATERMAIN PRESSURE AND LEAKAGE TESTS**

4.1 Definitions:

Leakage is defined as the amount of water required to maintain the test pressure in the mains over the duration of the test period to establish that leakage is within allowable limits.

Pressure test is the process to locate defects in material or workmanship, thereby permitting proper repair.

4.2 Procedure:

Water used for disinfecting watermains may be used for leakage test.

Complete watermain leakage test prior to the installation of service connections.

Notify the Engineering Services Division at least twenty-four (24) hours in advance of all proposed tests. Perform tests in the presence of the Engineering Services Division.

When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.

Control rate of filling of pipes to a velocity of less than 0.45 m/sec. (1.5 ft/sec.).

Prior to pressure testing ensure that thrust blocks attain minimum 15 MPa concrete strength.

Ensure that all air is purged from the watermain before performing leakage or pressure testing the system.

If the leakage exceeds the allowable limits, locate and repair leaks and defects. Repeat the test after repairs until the leakage does not exceed the allowable limits. Visible leaks must be repaired even when the leakage is below the allowable limits.

Where new watermain sections cannot be isolated from existing mains, the Contractor may apply to the City to establish an alternate test pressure or have the leakage testing requirement waived. Warranty obligations of the Contractor remain fully in effect in either event.

4.3 Testing:

After backfilling is completed, carry out leakage test on all watermains at an initial test pressure of 692 kPa.

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

Maintain test pressure for at least one hour. At the end of one hour, repressurize the main to 692 kPa with water pumped from a tank. Measure the amount of water used to repressurize the main to the initial test pressure to determine the leakage in the test section. The test will not be accepted if the leakage exceeds the quantity determined by the following formula from the latest edition of AWWA C605.

For PVC Pipe 
$$L = \frac{ND\sqrt{P}}{130,400}$$

L = the allowable leakage (liters per hour)

N = number of joints in the pipeline tested

D = nominal diameter of the pipe (mm)

P = the average test pressure during leakage tests in kilopascals (kPa)

**5.0 DISINFECTION AND FLUSHING OF WATERMAINS**

5.1 Materials:

.1) Disinfection Chemical Tablets:

Calcium hypochlorite tablets, manufactured to AWWA B300 latest revision and having seventy (70%) percent available chlorine by weight.

Olin Matheson HTH-70 or approved equal.

.2) Disinfection Chemical Solution:

Sodium hypochlorite manufactured to AWWA B300 latest revision and having 5 to 15 percent available chlorine by volume. Care must be taken to control conditions and length of storage to minimize its deterioration.

.3) Adhesive:

Waterproof, food grade, one component glue, compatible with disinfection chemical, “Permatex Form-A-Gasket, No. 2, “Permatex Clear RTV Silicon Adhesive Sealant” or approved equal.

5.2 Execution:

Disinfect new watermains and any new branch connections to the requirements of AWWA C651.

**Caution** - do not use calcium hypochlorite in powder form in PVC piping as an explosive reaction may result. Use of this chemical in tablet or solution form is safe in PVC piping.

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

The number of 5 g tablets required per 6.0 m length of pipe for each size of pipe is shown on the following table.

Pipe Diameter	Tablets
150 - 200 mm	2
250 mm	3
300 mm	4

Attach calcium hypochlorite tablets to the inside top surface of the pipe or fitting. Apply adhesive to only one surface of the tablet.

Protect installed tablets from moisture.

Alternatively liquid sodium hypochlorite may be injected into the pipe as it is being filled. Subject to all provisions within AWWA C651 for use of sodium hypochlorite a written description of proposed procedure and equipment used for injection must be submitted to the Engineering Services Division for approval.

Inject the sodium hypochlorite solution near the tie-in(s) to the existing system.

Obtain a chlorine concentration of at least 25 mg/l throughout the system being disinfected and maintain for at least 24 hours. **If the water temperature is less than 5°C, the chlorine solution shall remain in the pipe for a minimum of 48 hours.**

Following this contact period, operate all valves and hydrants on the main to ensure that all parts have been in contact with the chlorine solution.

5.3 Watermain Disinfection and Flushing:

After a 24 hour contact period thoroughly flush the main and test sample to ensure a concentration of total chlorine less than 1.0 mg/l and a minimum of residual chlorine more than 0.1 mg/l is obtained.

The initial fill of water for watermain disinfection and flushing will be supplied by the Owner at no cost to the Contractor. However, any subsequent refills of the line required by failure to meet the requirements of the disinfection or hydrostatic tests will be charged to the Contractor at standard City of Estevan water rates.

**Perform high level chlorine tests at a minimum of two locations or as directed by the Engineering Services Division.**

5.4 Watermain Swabbing:

At locations where it is not possible to disinfect new waterlines, as described, use the following method:

SECTION 1200  
WATER DISTRIBUTION MAINS AND APPURTENANCES

- Disinfect each length of pipe by pulling a chlorine-soaked swab through the inside of the pipe after it has been placed in its final position.
- The configuration of the swab must be of the proper dimensions to ensure firm contact with all portions of the interior of the pipe.

**6.0 MEASUREMENT AND PAYMENT**

- 6.1 The following work items in this section shall be paid in accordance with the Contract Unit Prices, which shall be deemed full compensation for all labour, materials, equipment, supplies, superintendence, overhead and profit for all work incidental to the supply, installation, completion and maintenance during warranty period of the respective items.
- (i) Watermain shall be paid on the basis of lineal meters of pipe of various diameters in place measured as on the Engineering Services Division's grade sheets supplied to the Contractor. The Contract Unit Price shall be deemed to include trench excavation and backfill, pipe thrust blocking, connections, pressure testing, disinfecting, flushing, restoration of surface and all work incidental to a complete installation.
  - (ii) Fittings shall be paid on the basis of size and number. The Contract Unit Price shall be deemed to include trench excavation and backfill, fitting, connections, thrust blocking, cathodic protection, pressure testing, disinfecting, flushing and all work incidental to a complete installation.
  - (iii) Valves shall be paid for as described in Fittings.
  - (iv) Hydrants shall be paid for on the basis of the number of complete assemblies. The Contract Unit Price shall be deemed to include trench excavation and backfill, riser pipe, hydrant, fittings, base, drainage sump, thrust blocking, cathodic protection, pressure testing, disinfecting, flushing, bracing, plugging drain and all work incidental to a complete installation.
- 6.2 All remaining work items described in this section shall be deemed incidental to the items in Article 6.1 of this section.