

PART 1 - GENERAL

1.1 WORK INCLUDED

- .1 This section specified requirements for constructing water mains and services. Work includes supply, installation and testing of pipe, fittings and service connections, and flushing.

1.2 RELATED SECTIONS

- .1 Section 03 30 00 - Cast-in-Place Concrete.
- .2 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ANSI/AWWA C600-2010, Installation of Ductile Water Mains and Their Appurtenances.
 - .2 ASTM B 88-03 Seamless Copper Water Tube.
 - .3 ANSI/AWWA C800-2012, Underground Service Line Valves and Fittings.
 - .4 ASTM B62-2009, Composition Bronze or Ounce Metal Castings.
 - .5 CAN/ULC S701-2011, Thermal Insulation, Polystyrene, Board and Pipe Coverings.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

1.5 CERTIFICATES

- .1 Submit manufacturer's test data and certification that products and materials meet requirements of this Section in accordance with Section 01 33 00 – Submittal Procedures.

1.6 HANDLING AND STORAGE

- .1 Handle and store pipe, valves and fittings, in such manner as to avoid shock and damage. Do not use chains or cables passed through pipe bore. Do not damage coatings or linings.
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- .2 Store gaskets in cool location, out of direct sunlight, and away from petroleum products.

1.7 SCHEDULING OF WORK

- .1 Coordinate and organize work to minimize interruptions to existing services.

1.8 ELECTRICAL GROUNDING TO WATERMAINS

- .1 As of January 1, 2009, the grounding of electrical services to watermains and water services is prohibited.
- .2 Where an electrical services is already grounded to an existing metallic watermain or service and the watermain or services is to be replaced by non-metallic piping, a new electrical grounding system is to be provided. The size and configuration of the new electrical grounding system is to be approved by the PWGSC.

1.9 MEASUREMENT FOR PAYMENT

- .1 Water Main: The supply of labour, materials, plant and equipment for the installation of water line, as indicated on the drawings, will be measured by the Lineal Metre (LM) calculated from actual field measurements.
- .2 Include incidental to the unit price the cost of all couplings, fittings, insulation, marker stakes, anode packs and protective coating as required.
- .3 Also, include incidental to the unit price any costs associated with connection of the new water line to the existing system including any required testing, disinfection, flushing, marking and cathodic protection.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Diameter, material and strength class of pipe and fittings: as indicated.

2.2 SEAMLESS COPPER WATER TUBE

- .1 Pipe: shall conform to ASTM B88, type K annealed, minimum pressure rating 1035 kPa.

2.3 COUPLINGS

- .1 Grooved and shoulder type: to AWWA C606 with malleable iron housing,
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halogenated butyl gasket and heat treated, plated carbon steel bolts and nuts to ASTM A183.

- .2 Collar type: steel with minimum pressure rating 1035 kPa, appropriate to the type and size of pipe being joined, epoxy-coated with type 316 stainless steel bolts and nuts.

2.4 INSULATION

- .1 Insulation: to ULC S701, Type 4, extruded polystyrene.

2.5 MARKER STAKE

- .1 Timber, 40 mm x 90 mm.

2.6 ANODE PACKS

- .1 All sacrificial zinc anodes shall conform to ASTM B-418 Type II and shall be made of high grade electrolytic zinc, 99.99% pure. The standard anode size shall be 10.9 kg. (24lb.) and 1.2 metres (48'') in length, ZN 24-48. The anode lead wire shall be at least 3 metres of No. 10 AWG stranded copper wire having TWH blue insulation. The lead wire shall be connected to the steel core with silver solder.

2.7 PROTECTIVE COATING

- .1 Anti-corrosion petrolatum paste, tape and mastic.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Carefully inspect products for defects and remove defective products from site.
- .2 Confirm pipe, fittings and valves are clean before installation.

3.2 TRENCHING, BEDDING AND BACKFILLING

- .1 Do trenching bedding backfilling to Section 31 23 33.01 – Excavating, Trenching and Backfilling.

3.3 PIPE INSTALLATION

- .1 Lay and join pipe, fittings, and valves as specified herein and according to
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manufacturer's published instructions.

- .2 Lay pipe and fittings on prepared bed, true to line and grade indicated, within following tolerances:
 - .1 Horizontal Alignment: 150mm
 - .2 Vertical Alignment: 75mm
 - .3 Do not exceed maximum joint deflection recommended by manufacturer.
 - .4 Prevent entry of bedding material, water or other foreign matter into pipe. Use temporary watertight bulkheads when pipelaying is not in progress.
 - .5 Install gaskets in accordance with manufacturers published instructions. Use only lubricant supplied by manufacturer. During cold weather store gaskets in heated area to promote flexibility.
 - .6 Align pipes carefully before joining.
 - .7 Support pipes as required to promote concentricity until joint is properly completed.
 - .8 Keep pipe joints free from mud, soil, gravel or other foreign materials.
 - .9 Avoid displacing gasket or contaminating with soil, petroleum products or other foreign material. Remove, clean, reinstall and lubricate gaskets so disturbed.
 - .10 Complete each joint before laying next length of pipe.
 - .11 Where deflection at joints is permitted, deflect only after spigot is fully inserted in bell.
 - .12 At structures provide flexible joint not more than 1 m from outside face of structure. Support pipe between structure wall and first joint with 20 MPa concrete.
 - .13 Cut pipe as required for fittings or closure pieces, square to centerline, and as recommended by manufacturer. Do not damage pipe lining or coating and leave smooth beveled edge.
 - .14 Provide concrete thrust blocks to undisturbed ground on all tees, bends, plugs and caps or as indicated. Construct as indicated and keep joints and couplings free of concrete.
 - .15 Install mechanical joint restraint to AWWA C111 and tighten lug nuts until all
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wedges are in firm contact with pipe surface. Continue to tighten alternating between bolts until lug nuts twist off.

- .16 Install polyethylene tube or sheet on all ductile-iron pipe and fittings and install zinc anodes on all valves.

3.4 HYDROSTATIC AND LEAKAGE TESTING

- .1 Provide labour, equipment and materials required to perform hydrostatic and leakage tests.
- .2 Test after services are installed.
- .3 Backfill prior to testing.
- .4 Notify Departmental Representative at least twenty-four (24) hours in advance of all proposed tests. Perform tests in presence of Departmental Representative.
- .5 Open all valves in test section.
- .6 Expel air from main by slowly filling with potable water. Install corporation stops at high points where no air vacuum release valves are installed. After testing, remove corporation stops and install plugs.
- .7 Apply test pressure of 1035 kPa or pressure equal to 1.5 times working pressure, whichever is greater, measured at lowest point in test section. Conduct the test over a full two (2) hour period, maintaining a constant test pressure. No leakage is permitted by the test process.
- .8 Locate and repair defects if test fails. Retest.
- .9 Repair visible leaks regardless of test results.

3.5 DISINFECTION

- .1 When flushing has been completed to Departmental Representative approval, introduce strong solution of chlorine as approved by Departmental Representative into water main and ensure that it is distributed throughout entire system.
 - .2 Rate of chlorine application to be proportional to rate of water entering pipe.
 - .3 Chlorine application to be close to point of filling water main and to occur at same time.
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- .4 Operate valves, hydrants and appurtenances while main contains chlorine solution.
- .5 Flush line to remove chlorine solution after twenty-four (24) hours.
- .6 Measure chlorine residuals at extreme end of pipe-line being tested.
- .7 Perform bacteriological tests on water main, after chlorine solution has been flushed out.
 - .1 Take samples daily for minimum of two (2) days.
 - .2 Should contamination remain or recur during this period, repeat disinfecting procedure.
- .8 Take water samples in suitable sequence, to test for chlorine residual.
- .9 After adequate chlorine residual not less than 50 ppm has been obtained leave system charged with chlorine solution for twenty-four (24) hours.
 - .1 After twenty-four (24) hours, take further samples to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.

3.6 FLUSHING

- .1 Flush water mains to AWWA C651 and as herein specified. Notify Departmental Representative twenty-four (24) hours in advance of flushing.
- .2 Flush water mains with potable water through available outlets with sufficient flow to produce minimum velocity in water main of 1.5 m/s, for ten (10) minutes. Flush until foreign materials have been removed and water is clear.
- .3 Slowly open and close valves to ensure thorough flushing.
- .4 If satisfactory results cannot be achieved by flushing, swab pipes by approved methods and reflush.

3.7 WATER MAIN MARKING

- .1 All new water mains shall be marked using 3M Ball Marker technology (programmable). Marker balls shall be supplied by the contractor and installed at the following locations:
 - .1 Bends
 - .2 Tees
 - .3 Reducers
 - .4 Corporations
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- .5 Curb Stops
 - .6 Stub ends of pipes
 - .7 Or a Maximum Spacing of 30m
- .2 The balls shall be placed no deeper than 1.5 metres and located directly above the water main or fitting.
 - .3 For curb stops tie straps shall be used to secure the marker ball to the street side of the curb stop box.
 - .4 Prior to the start of the project, the Contractor shall contact the ESD and supply a copy of the construction drawings and a sufficient quantity of marker balls for the project. Upon review the drawings the ESD will program and identify the appropriate markers required for the project.
 - .5 The Departmental Representative shall ensure that the appropriate marker balls are installed in their assigned location. The Departmental Representative shall also record the ID number and location of each marker ball on the As-Built drawings.
 - .6 At completion of the project, the Departmental Representative will locate the markers and collect the data.
 - .7 Marker balls cannot be re-programmed without re-excavation.

3.8 WATER SERVICES INSTALLATION

- .1 Water services shall not be buried shallower than 1.8 metres and no deeper than 2.0 metres.
- .2 When a water service is installed by itself, then the end of the service shall be marked with a marker post, painted red and extending from the service invert to 600mm above finished grade. Each water service shall be suitably plugged or capped to prevent leakage and to prevent dirt or other harmful material from entering the pipe.
- .3 When new PVC mains are being installed, service tees are to be installed for each water service. Installed on mains 400mm and smaller. Service saddles are to be used on mains larger than 400mm. Direct tapping to connect a water service to a new main is prohibited.

3.9 CATHODIC PROTECTION

- .1 Sacrificial anodes shall be installed at the following locations:
 - .1 At the connection point between a non-metallic watermain and the
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- existing metallic watermain;
 - .2 All metallic fittings and bends;
 - .3 All metallic valves;
 - .4 All metal services.
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- .2 Anodes shall be installed horizontally, a minimum of 500 mm to the side of the watermain and at a depth of 30 mm below the watermain and shall be backfilled with native material.
 - .3 Anodes shall be installed complete with their cardboard container and enclosed selected backfill.
 - .4 The anode lead wire shall connected to the watermain, metallic fitting, valve, service. Sufficient slack shall be left in the wire to prevent any stress on either the anode or the wire-to-pipe connection during backfill and subsequent soil settlement.