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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | October 16, 2007 | Minor revisions by Legal Services. |
| 3 | November 13, 2009 | Modified ‘Related Sections’ and approved suppliers |
| 4 | March 14, 2011 | Minor changes by Legal |
| 5 | June 4, 2012 | Addition of References and Replacement Parts sections on this page |
| 6 | June 28, 2012 | Reformatted to Remove White Space |
| 7 | August 6, 2013 | New Format |
| 8 | October 29, 2013 | AV comments, first draft of update review |
| 9 | April 9, 2014 | DK comments |
| 10 | Dec 1, 2016 | Incorporation of consolidated comments into final draft, full integration of OPSS into specification. Deletion of ductile iron as a pipe material (AV and AAM) |
| 11 | April 12, 2017 | Updating of AWWA Standards (AV and AAM) |
| 12 | June 18, 2021 | 1.11.5 Added payment for tracer wire continuity testing  2.1 Revised pipe specifications and specifications for valves, added tracer wire specifications  2.2 Added requirements for warning mesh  3.1 Added requirements for Swabbing, Flushing, Hydrostatic Testing and Disinfecting Watermains  3.3 Added requirement for confirmation of tracer wire continuity  Revisions and clarifications throughout the document  (DB, BM) |

NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

**Notice:** This Document hardcopy must be used for reference purpose only.

The on-line copy is the current version of the document.

# GENERAL

## Scope of Work

### This Section outlines all exterior watermain Work from the first pipe joint outside of the foundation to the limits of construction. All watermains are to be supplied and installed in accordance with OPSS.MUNI 441 [Nov 2016] as amended by this specification. This section applies to all service pipes and watermains 100mm and greater in diameter.

## Related Sections

### [Under "Related Sections", identify other Sections that are related to, and/or dependent on, the work results or information specified elsewhere. The list should be limited to Sections with specific information that the reader might expect to find in this Section, but is specified elsewhere. For example, if hardware for aluminum entrances is specified in the aluminum entrance Section, a cross-reference would be appropriate in the finish hardware Section. The purpose of this cross-referencing is for information only, to aid in finding those other requirements—not to define the scope of the Section.

### Cross-referencing here may also be used to coordinate assemblies or systems whose components may span multiple Sections and which must meet certain performance requirements as an assembly or system.

### Contractor is responsible for coordination of the Work.

### This Section is to be completed/updated during the design development by the Consultant. If it is not applicable to the section for the specific project it may be deleted.]

#### Section 01300 – Submittals

#### Section 01750 – Disinfection and Testing of Water Retaining Structures and Process Piping

#### Section 01810 – Equipment Testing and Facility Commissioning

#### Section 02230 – Site Preparation for Pipelines, Utilities and Associated Structures

#### Section 02240 – Dewatering General

#### Section 02260 – Excavation Support Systems

#### Section 02315 – Excavation, Trenching and Backfilling

#### Section 02555 – Cathodic Protection

#### Section 02631 – Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers

#### Section 02660 – Excavation Support Systems

#### Section 02701 – Aggregates General

#### Section 03200 – Concrete Reinforcement

#### Section 03300 – Cast in place concrete

### [List Sections specifying related requirements.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: [Optional short phrase indicating relationship].

## References

All standards mentioned in this specification Section are based on the dates below.

*[Consultant Note: The Consultant shall confirm all revision dates and update this specification Section if required.]*

### Ontario Provincial Standard Specifications (OPSS)

#### OPSS.MUNI 441 [Nov 2016] Watermain Installation in Open Cut

#### OPSS.MUNI 493 [Nov 2019] Temporary Potable Water Supply Services

### AWWA ***(Also note AWWA References contained within OPSS.MUNI 441).***

ANSI/AWWA C105-18, Polyethylene Encasement for Ductile-Iron Pipe Systems

ANSI/AWWA C110-12, Ductile-Iron and Gray-Iron Fittings

ANSI/AWWA C111-17, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

ANSI/AWWA C200-17, Steel Water Pipe 6” (150mm) and Larger

#### ANSI/AWWA C203-15, Coal-Tar Protective Coatings and Linings for Steel Water Pipe

#### ANSI/AWWA C207-18, Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm through 3,600 mm)

#### ANSI/AWWA C301-14, Prestressed Concrete Pressure Pipe, Steel-Cylinder Type For Water and other Liquids

#### ANSI/AWWA C500-19, Metal-Seated Gate Valves for Water Supply Service

#### ANSI/AWWA C530-17, Pilot Operated Control Valves

#### ANSI/AWWA C550-17, Protective Interior Coatings for Valves and Hydrants

#### ANSI/AWWA C600-17, Installation of Ductile-Iron Water Mains and Their Appurtenances

#### ANSI/AWWA C602-17, Cement-Mortar Lining of Water Pipelines in Place – 4 In. (100 mm) and Larger

#### ANSI/AWWA C651-14, Disinfecting Water Mains

#### ANSI/AWWA C655-18, Field Dechlorination

#### ANSI/AWWA C900-16, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in-60in (100mm to 1500mm) for Water Transmission and Distribution

#### ANSI/AWWA C906-15, Polyethylene (PE) Pressure Pipe and Fittings, 4 In. through 65 In. (100 mm through 1650mm) for Waterworks

#### ANSI/AWWA C909-16, Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger

#### AWWA M11, Steel Pipe: A Guide for Design and Installation (Fifth Edition)

#### AWWA Manual M9-2008 third edition – Concrete Pressure Pipe

### ASME

#### ANSI/ASME B16.1-2015, Gray Iron Pipe Flanges and Flanged Fittings

#### ANSI/ASME B16.5-2017, Steel Pipe Flanges and Flanged Fittings

### ASTM International ***(Also note ASTM References contained within OPSS.MUNI 441)***

#### ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

#### ASTM A351/A351M-18e1, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts

#### ASTM C117-17, Standard Test Method for Materials Finer than 75 - μm (No. 200) Sieve in Mineral Aggregates by Washing

#### ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN m/m3))

#### ASTM D2657 (07), Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings

#### ASTM F3125/F3125M-19, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

#### ASTM F714-13, Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter

### Plastics Pipe Institute, Second Edition of PE Pipe 2008

### Ministry of the Environment, Conservation and Parks (MECP)

#### Municipal Drinking Water License

#### Watermain Disinfection Procedure (2020)

## Definitions

### OPSS.MUNI 441.03 shall be followed.

## Pre-Ordered Materials

*[Consultant shall indicate if the Region has pre-ordered pipe and material for the project. List all items that have been pre-ordered. Delete this clause if the Contractor is to supply all materials. Where the contract documents or drawings indicate that the Region will supply materials, the Contractor shall pick up the required materials at the designated location and haul such materials to the site as required. The Contractor’s responsibility for material furnished by the Region shall begin F.O.B. at the point of delivery to the Contractor. Materials already on site shall become the Contractor’s responsibility on the day of the execution of the contract. The Contractor shall examine all material furnished by the Region at the time and place of delivery to and shall reject all defective material]*

## Intent

*[Consultant to include instructions related to scheduling or method of construction if project materials have been pre-ordered by the Region.]*

## Material Certification

### Submit the manufacturers’ test data and certification that all pipe materials meet the requirements of this Section at least ten (10) Working Days prior to commencing the Work. Include the manufacturer's drawings, information and shop drawings, where pertinent. Provide Affidavit of Compliance as per:

#### [Section 6.3 – Verification, ANSI/AWWA C301 (Concrete pipe)]

#### [Section 6.3 – Verification, ANSI/AWWA C900 (PVC pipe)]

#### [Section 6.3 – Verification, ANSI/AWWA C906 (PE pipe)]

#### [Section 6.3 – Verification, ANSI/AWWA C909 (PVCO pipe)]

#### [Section 6.3 – Verification, ANSI/AWWA C200 (Steel pipe)]

### *[Ductile Iron pipe is no longer used for watermains, Consultant to amend if ductile iron is required to be included in this Section for project specific requirements.]*

## Materials and Chemicals

### In accordance with the Region’s Municipal Drinking Water License, all chemicals and materials used in the alteration or operation of the drinking water system that come into contact with potable water within the system shall meet all applicable standards set by both ANSI/NSF 61 and ANSI/NSF 60, with the following exemptions:

#### Water pipe and fittings meeting AWWA specifications made from ductile iron, cast iron, PVC, fibre and/or steel wire reinforced cement pipe or high-density polyethylene (HDPE)

#### Cement mortar for watermain lining and for water contacting surfaces of concrete structures made from washed aggregates and Portland cement

#### Gaskets made from NSF approved materials

#### Food grade oils and lubricants, food grade antifreeze, and other food grade chemicals and materials that are compatible for drinking water use that may come into contact with drinking water, but are not added directly to drinking water.

## Shop Drawings

### Submit Shop Drawings in accordance with Section 01300 – Submittals.

### Submit Shop Drawings for all watermain fittings, valves, thrust restraints, couplings, hydrants and all other appurtenances.

### Submit the following for all valves, as applicable:

#### Valve list showing valve torque requirements;

#### Summary list showing valve locations size, type of operator, number of turns to open, valve class and material;

#### Submit Manufacturer’s complete catalogue information, descriptive literature, specifications, and identification of materials of construction.

### Submit shop drawings for precast valve chambers in accordance with Section 02631 - Maintenance Holes, Catch Basins, Ditch Inlets and Valve Chambers.

### Submit certification that materials, including coatings, and chemicals in contact with potable water are National Sanitation Foundation (NSF)/ANSI 61 and NSF/ANSI 60 compliant, unless the materials or chemicals are exempt from NSF/ANSI 60 or NSF/ANSI 61 in accordance with subsection 1.8.

## Scheduling of Work

### Schedule the Work so as to minimize any interruptions to existing services.

### Submit a schedule of expected interruptions to the Consultant for approval and adhere to the approved interruption schedule. Note: during high demand periods approvals may be delayed (at no cost to the Region) to maintain overall system integrity of service to the community. *[Consultant to discuss any planned interruptions to Regional or local municipal watermains with Region staff to determine if there are any restrictions to time of year, special considerations for service interruptions, bypass requirements or system modifications to complete the Work. Details for any restrictions shall be included in this section. Bid items and details shall be provided for additional Works]*

### The Contractor shall provide a minimum of 10 Working Days advance notice to the Region for scheduling operation of any valves or system modifications.

### Notify the Consultant and Region a minimum of 24 hours in advance of any interruptions in service.

### Do not interrupt residential or commercial water service for more than 3 hours and confine this period to between 10:00 hours and 16:00 hours local time unless otherwise authorized by the Consultant.

### Notify the fire department of any planned or accidental interruptions of water supply to hydrants.

### Ensure scheduling of Work accounts for required measures as defined in Section 01550 – Traffic Control and in accordance with the conditions on the local municipal or Regional Road Occupancy Permit. Road crossings shall be staged to minimize impacts to traveled lanes and may require installation outside of normal working hours after 19:00 hours or on weekends. The Contractor shall immediately notify the Region and contact Transportation Roads Operations Dispatch at (877) 464-9675 extension 75200 for any emergency lane restrictions or interference with the movement of traffic outside of the conditions of the Road Occupancy Permit for notification to emergency services, transit authorities and commuter traffic advisories.

### The Contractor will be responsible for dewatering chambers in advance, providing traffic control and safe access to all chambers for all inspections including but not limited to preliminary inspections prior to testing, deficiencies, investigative and warranty inspections.

## Measurement and Payment

### All costs associated with the work of this Section shall be included in the price for Item No. [ ] in the Bid Form.

### For payment purposes, the watermain will be measured along the centreline of the mains in a horizontal plane between specified points of intersection (PI’s), valves, and sloped areas. No allowance in measurement shall be made for sloped or vertical sections.

### Measurement will be based on shop drawing calculations or field measurements and shall terminate at the first joint outside of any and all chamber walls. Pipe through chambers (between the first joints outside of the chamber walls) will be included as part of the chambers. Refer to Section 02631 - Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers.

### Payment shall include full compensation for all labour, materials and equipment required to complete the Work as specified in the Contract Documents.

### Include the following in the unit price bid per metre of watermain:

#### All necessary clearing and grubbing. *[Consultant to confirm whether clearing and grubbing are included in another specification pay item and amend as required]*

#### Excavation to grade and disposal of excess material off Site.

#### Unloading, storage and handling of [pre-ordered] materials (if included in the Contract).

#### Supply and installation of all pipes, fittings, bends, adaptors, reducers, specials, sleeves, intermediate closure pieces, restrainers, thrust blocks, joints, bedding, supporting and protecting existing services, supply and installation of tracer wire and cathodic protection (refer to Section 02555 – Cathodic Protection).

##### Payment for continuity testing of tracer wire shall be measured separately. Payment shall be paid upon acceptance of the tracer wire continuity testing report under Item No. [ ]. *[Consultant to add a lump sum item in the bid form where required]*

#### Hydrants and secondary valves and boxes shall be paid for under Item No. [ ] in the Bid Form (if applicable). *[Consultant to amend as required].*

#### Removal of a plug or blow-off from an existing watermain and connecting to a new watermain shall be included in the price for Item No. [ ] Connection to Existing Watermain in the Bid Form *[Consultant to add lump sum items for connections to existing watermains]*.

# PRODUCTS

## **2.1** For Watermain, **OPSS.MUNI 441** shall be followed with the following amendments:

441.05.03 Concrete Pressure Pipe

**441.05.03 Concrete Pressure Pipe** is amended by the addition of the following:

##### Pipe size and class shall be as specified in the Contract Drawings. Pipe class may be increased as required based on the manufacturers design calculations and layout.

##### Prestressed concrete cylinder pipe including joints and fittings to conform to AWWA C301 and designed in accordance with AWWA C304 and AWWA M9. AWWA C301 pipe shall be Lined-Cylinder Pipe (LCP) or Embedded-Cylinder Pipe (ECP) as designed by the manufacturer.

##### The concrete pressure pipe manufacturer shall provide a comprehensive set of final shop drawings for all materials provided through the completion of the Work. The set shall be marked “Final” in the version table. The set shall include final closures and connections to existing watermains.

##### Approved Suppliers:

###### Forterra Pipe and Precast Ltd.

###### DECAST Ltd.

###### Or Equivalent

441.05.04.02 Polyvinyl Chloride Pipe (PVC)

**441.05.04.02 Polyvinyl Chloride Pipe** is amended by the addition of the following:

##### Pipe size and class shall be as specified in the Contract Drawings.

##### PVC pipe shall conform to AWWA C900, Class 150, DR18 minimum for all pipes 150 mm in diameter to 1500 mm in diameter.

441.05.04.03 Molecularly Oriented Polyvinyl Chloride Pipe

**441.05.04.03 Molecularly Oriented Polyvinyl Chloride Pipe** is amended by the addition of the following:

##### Pipe size and class shall be as specified in the Contract Drawings.

##### Approved Suppliers:

###### *[Consultant to provide three acceptable products]*

###### Or Equivalent

441.05.05 Polyethylene Pipe (PVCO)

**441.05.05 Polyethylene Pipe** is amended by the addition of the following:

##### Pipe size and class shall be as specified in the Contract Drawings.

##### Polyethylene Pipe used for watermains shall be marked with a blue line along the entire length.

##### Approved Suppliers:

###### *[Consultant to provide three acceptable products]*

###### Or Equivalent

441.05.06 Steel Pipe

**441.05.06 Steel Pipe** is amended by the addition of the following:

##### Pipe size and class shall be as specified in the Contract Drawings.

##### Approved Suppliers:

###### *[Consultant to provide three acceptable products]*

###### Or Equivalent

441.05.09 Valves

**441.05.09.01 Genera**l is amended by the replacement of the first paragraph with the following:

##### Valves shall open clockwise in the municipalities of Markham, Richmond Hill and Vaughan. Valves shall open counterclockwise in the municipalities of Aurora, East Gwillimbury, Georgina, King, Newmarket and Whitchurch-Stouffville. Operating nuts on valves shall be red for clockwise opening or black for counterclockwise opening direction. *[Direction based on location within the Region. Consultant to confirm direction of turn with Region’s OMM Branch.]*

*[Consultant Note: All valves, flanges, fittings, couplings, pipe classes and restraint must be specified to meet the test pressure with applicable safety factor.]*

**441.05.09.01 Genera**l is amended by the replacement of the third paragraph with the following:

##### Valve types shall be one of the following:

###### Valves less than 75 mm shall be stainless steel ball valves.

###### Valves greater than or equal to 75 mm, and less than or equal to 300 mm, shall be cast or ductile iron gate valves.

###### Valves greater than 300 mm up to and including 500 mm shall be gate or butterfly valves as specified on the Contract Drawings.

###### Valves greater than 500 mm shall be butterfly valves.

*[Consultant Note: For specialty valves not included in this section, or that include instrumentation and controls, the Consultant shall amend this Section with requirements for the specialty valve(s), instrumentation or controls. Include the requirements for power, controls, network communication, civil works, testing and commissioning under the applicable specification Sections.]*

**441.05.09.03 Gate Valves** is amended by the addition of the following:

##### Gate valves shall include tapping valves and sleeves.

##### Supply and install gate valves in the sizes and at the locations as shown on the Contract Drawings.

##### Gate valves shall be designed, manufactured and tested in accordance with AWWA C509 or AWWA C515.

##### All gate valves shall be NRS (non-rising stem) with resilient seats for bi-directional bubble tight shutoff at the rated pressure.

##### Operating nuts are to be 50 mm square.

##### Valves are to be supplied with flanged ends in accordance with the requirements of ANSI B16.1, Class 125 unless indicated otherwise on the Contract Drawings.

##### Required pressure rating [1,035 kPa] [1,378 kPa] [1,725 kPa] unless noted otherwise on the Contract Drawings.

##### Valve operators shall be a waterproof type suitable for continuous submergence duty. Operators shall be the grease-packed, enclosed gear type. Worm gear and input shafts shall be stainless steel.

##### The valve body, bonnet, and stuffing box shall be composed of ASTM A536 Grade 65-45-12 ductile iron or ASTM A126, Class B gray iron.

##### Shaft spindles are to have O-rings to resilient materials.

##### The valve shall be suitable for potable water applications and conform to the requirements of NSF/ANSI 61.

##### All interior and exterior coatings to be in compliance with the latest edition of AWWA C504 Section 4.4. Components in contact with potable water shall be coated in compliance to NSF/ANSI 61 and the latest edition of AWWA C550.

##### Tapping valve sleeves shall be supplied with stainless steel body, studs and fasteners unless otherwise specified. The tapping gate vale shall have the interior and exterior of the valve coated with two-part liquid or fusion bonded epoxy in accordance with AWWA C550, applied at the valve manufacturer’s facility and provided holiday free. Tapping valves shall have an inlet flange conforming to ANSI B16.1, Class 125 for attachment to a tapping sleeve or cross, unless indicated otherwise on the Contract Drawings.

##### All hardware shall be stainless steel.

**441.05.09.04 Butterfly Valves** is amended by the addition of the following:

##### Supply and install all butterfly valves at the sizes and locations as shown on the Contract Drawings.

##### Valve shall be designed, manufactured and tested in accordance with AWWA C504.

##### All butterfly valves shall be of the resilient seated type for bi-directional bubble tight shutoff at the rated pressure and suitable for throttling and/or on-off service.

##### Valve operators shall be a waterproof type suitable for continuous submergence duty. Operators shall be the grease-packed, enclosed gear type. Worm gear and input shafts shall be stainless steel.

##### Valve bodies shall be of be ASTM A126, Class B gray iron or ASTM A536 Grade 65-45-12 ductile iron.

##### Operating nuts are to be 50 mm square.

##### Valve disc shall be ASTM A536 Grade 65-45-12 ductile iron or ASTM A126 class B, gray iron.

##### Valve to be supplied with flanged ends in accordance with ANSI B16.1, Class 125 unless indicated otherwise on the Contract Drawings.

##### Required pressure rating [1,035 kPa] [1,378 kPa] [1,725 kPa] unless noted otherwise on the Contract Drawings.

##### The valve shall be suitable for potable water applications and conform to the requirements of NSF/ANSI 61.

##### All interior and exterior coatings to be in compliance with the latest edition of AWWA C504 Section 4.4. Components in contact with potable water shall be coated in compliance to NSF/ANSI 61 and the latest edition of AWWA C550.

##### Valve to be supplied with a stem locking device/packing retainer plate designed to allow gear box to be removed from valve while the line is under pressure.

##### Valve to be supplied with position indicator.

**441.05.09.05 Air Release and Air/Vacuum Valves** is amended by the addition of the following:

##### Supply and install all Air Release and Air/Vacuum Valves at the sizes and locations as shown on the Contract Drawings.

##### All valves shall be suitable for continuous operation under permanently submerged conditions.

##### All air valves shall be vented to the stainless steel vent stack as indicated on standard drawing [add applicable standard drawing number].

##### Air valves shall be designed, manufactured and tested in accordance with the latest revision of AWWA C512.

##### Provide isolation gate or ball valves with each air valve in accordance with the Contract Drawings.

##### The interior and exterior of the valve shall be coated with two-part liquid or fusion bonded epoxy in accordance with AWWA C550. Coating shall be applied at the valve manufacturer’s facility and provided holiday free.

##### The valve body and cover shall be constructed of ASTM A126 Class B, grey iron or ASTM A536 Grade 65-45-12 ductile iron.

##### The valve shall be suitable for potable water applications and conform to the requirements of NSF/ANSI 61.

##### All internal working components shall be stainless steel.

##### The valve body shall be threaded or flanged with NPT inlets and outlets, as shown on the Contract Drawings. If flanged, flanged ends shall be in accordance with ANSI B16.1, Class 125 unless indicated otherwise on the Contract Drawings.

##### Required pressure rating [1,035 kPa] [1,378 kPa] [1,725 kPa] unless noted otherwise on the Contract Drawings.

##### All air release or air/vacuum valves 50mm and larger shall have a threaded port on the body of the valve with a 316L stainless steel elbow and drain valve installed to drain the valve.

**441.05.09 Valves** is amended by the addition of the following:

##### **441.05.09.06 Pressure Reducing/Back Pressure Sustaining Valves**

###### Sizes of Pressure Reducing/Back Pressure Sustaining Valves shall be as shown on the contract drawings.

###### The main valve and bonnet shall be constructed of ASTM A536 Grade 65-45-12, ductile iron or ASTM A126 class B, gray iron.

###### Rating: maximum of [     ] L/s, with inlet pressure of [     ] kPa (gauge). Outlet pressure set at [     ] kPa (gauge).

###### Hydraulically operated, diaphragm actuated, pilot controlled globe valve, rated 1,208 kPa, ASME B16.1 flanged ends, stainless steel stem, externally mounted strainers with cocks.

Pressure Reducing: bronze or stainless steel trim and maintain a constant downstream pressure regardless of fluctuations in flow or upstream pressure.

Back Pressure Sustaining: stainless steel trim, and maintain a constant downstream pressure while maintaining a minimum upstream pressure.

###### The interior and exterior of the valve shall be coated with two-part liquid or fusion bonded epoxy in accordance with AWWA C550. Coating shall be applied at the valve manufacturer’s facility and provided holiday free.

###### The valve shall be suitable for potable water applications and conform to the requirements of NSF/ANSI 61.

###### Valves to be supplied with position indicator with air release.

##### **441.05.09.07 Check Valves**

###### Flexible Disc Check Valves

Supply and install all flexible disc check valves, size and location, as shown on the Contract Drawings.

The flexible disc check valve shall be of the full body flanged type, with only one moving part, the flexible disc.

Non-slam closing characteristics shall be provided through a short 35-degree disc stroke and memory disc return action, seating on a 45-degree angle.

Valve shall be provided with flanged ends in accordance with ANSI B16.1, Class 125.

Valve shall be designed, manufactured and tested in accordance with AWWA C508.

The valve shall be suitable for potable water applications and conform to the requirements of NSF/ANSI 61.

The valve body and cover shall be ASTM A536 Grade 65-45-12, ductile iron or ASTM A126 class B, gray iron.

The top access port shall be full size, allowing removal of the disk without removing the valve from the line.

A threaded port with plug shall be provided on the top of the valve to allow for field installation of an open/close mechanical indicator without special tools or removing the valve from the line.

The valve body shall have 100% pipe flow area, with no restrictions at any point through the valve.

The resilient disc shall feature a fully encapsulated steel pressure plate with nylon reinforcements and an integral molded O-ring on the face of the elastomer.

The interior and exterior of the valve shall be coated with two-part liquid or fusion bonded epoxy in accordance with AWWA C550. Coating shall be applied at the valve manufacturer’s facility and provided holiday free.

All hardware shall be stainless steel.

The valve is to be supplied with a backflow actuator, and the following options:

A mechanical position indicator

A disc accelerator

###### Swing Check Valves

Supply and install all Swing Check Valves, size and location, as shown on the contract drawings.

Valve shall be designed, manufactured and tested in accordance with AWWA C508.

Valve shall be provided with flanged ends in accordance with ANSI B16.1, Class 125.

The valve shall be suitable for potable water applications and conform to the requirements of NSF/ANSI 61.

The interior and exterior of the valve shall be coated with two-part liquid or fusion bonded epoxy in accordance with AWWA C550. Coating shall be applied at the valve manufacturer’s facility and provided holiday free.

The valve body shall have 100% pipe flow area, with no restrictions at any point through the valve.

All hardware shall be stainless steel.

The valve body, cover and disc shall be constructed of ASTM A536 Grade 65-45-12 ductile iron or ASTM A126 class B, gray iron.

Valves to be supplied with [bronze] [stainless steel] body seat ring, [bronze] [Buna-N] [EPDM] disc seat ring.

Valves to be supplied with the following option:

gravity operated

air cushion

oil cushion

adjustable outside lever and weight

adjustable outside lever and spring

##### **441.05.09.08 Ball Valves**

###### Supply and install all ball valves, size and location, as shown on the Contract Drawings.

###### Ball valves shall be Two Piece ASTM A276-17 GR 316 or ASTM A351/A351M-18e1 GR CF8M stainless steel body and end piece, threaded ends, full port, ASTM A276-17 Type 316 stainless steel ball, reinforced PTFE seats, PTFE packing, blowout proof stainless steel stem, stainless steel lever operator with locking hasp and vinyl grip, rated [1,035 kPa] [1,378 kPa] [1,725 kPa] unless noted otherwise on the Contract Drawings.

**441.05.12 Service Connection Fittings and Appurtenances** is amended by the addition of the following:

##### Main stops shall be the Ball Valve type.

###### Supply and install all main stops at the sizes and locations as shown on the Contract Drawings.

###### Approved Suppliers:

Cambridge Brass Inc.

Ford Meter Box Company Inc.

Mueller Canada Limited.

Or Equivalent.

##### Curb Stops

###### Supply and Install all curb stops at the sizes and locations as shown on the Contract Drawings.

###### Where curb stops are indicated for temporary or permanent blow-offs that are above grade or susceptible to freezing, a curb stop with draining capability shall be installed if above the ground water table.

###### All curb stops shall have operating stems extended where required, the depth shall not exceed 1.5m.

###### Approved Suppliers:

Cambridge Brass Inc.

Ford Meter Box Company Inc.

Mueller Canada Limited.

Or Equivalent

##### Couplings (Water Service Pipe)

###### Supply and install all water service pipe couplings at the sizes and locations as shown on the Contract Drawings.

###### Approved Suppliers:

Cambridge Brass Inc.

Dresser Inc.

Ford Meter Box Company Inc.

Mueller Canada Limited

Smith-Blair Inc.

Victaulic Company of Canada Limited

Or Equivalent

##### Service Boxes

###### Supply and install all service boxes at the locations as shown on the Contract Drawings.

###### Approved Suppliers:

Clow Canada.

Mueller Canada Limited.

Or Equivalent

##### Valve boxes:

###### Supply and Install all valve boxes at the locations as shown on the Contract Drawings.

###### Cast iron three piece sliding type adjustable over a minimum of 450 mm complete with valve operating extension rod, 25 mm minimum diameter or 25 x 25 mm cross section, of such length that when set on the valve operating nut the top of the rod will not be more than 450 mm below the cover.

###### Valve boxes shall be watertight with gaskets or solid pipe where subject to ground water. Any infiltration shall be sealed by the Contractor at no additional cost to the Region.

###### The top of the box shall be marked "WATER".

###### Refer to Standard Drawing [enter applicable standard drawing number].

###### Approved Suppliers:

Bibby-Ste-Croix division of Canada Pipe Company Ltd.

Cedar Infrastructure Products Inc.

Star-Pipe Products Inc.

Or Equivalent

##### Sampling Station

###### Supply and install all sampling stations at the locations as shown on the Contract Drawings*. [Consultant to provide details for any required sampling stations and approved suppliers]*

Tracer Wire

##### Tracer wire is to be installed for all pipe materials.

##### Tracer wire is to be stranded copper (8 gauge), plastic coated, on all watermains. Tracer wire shall be secured to the pipe using suitable tape or ties. At valve chambers, tracer wire shall be clipped securely to the chamber walls with plastic clips and tapcons, and a lead from each direction shall extend to the underside of the frame and cover. Provide 600 mm free ends and brass tags on each lead.

##### All splices or connection of tracer wire ends shall be protected with a dielectric putty and waterproof cover.

### Couplings (Watermain)

#### All couplings shall be lined and coated with fusion-bonded epoxy in accordance with AWWA C213. Coupling linings shall be suitable for use in potable water systems and the manufacturer shall provide NSF/ANSI 61 certification with shop drawing submissions.

#### All couplings shall meet the requirements of AWWA C219 or AWWA C227 and the design requirements. The manufacturer shall supply an affidavit of compliance that the couplings supplied meet the requirements of AWWA C219 or AWWA C227.

#### All couplings shall be supplied with 304 stainless steel fasteners unless otherwise indicated on the Contract Drawings.

#### Insulator kits shall be provided for contact between dissimilar metals where required.

#### Approved Suppliers:

##### [The Consultant shall provide approved suppliers for applicable couplings based on pipe materials, specific diameters, restraint requirements and test pressures]

##### Or Equivalent

### Mechanical Restrainers

#### Sizes and locations of mechanical restrainers installed as per the manufacturers’ recommendations and at all locations shown on the Contract Drawings.

#### The Contractor shall install additional restraint as required depending on exact location of bends, fittings or valves.

## Warning Mesh

### Continuous blue Plyage Hz warning mesh 500mm wide shall be installed above all watermain, 1500mm above the crown of the pipe.

## Valve Chambers

### Valve Chambers shall be in accordance with Section 02631 – Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers.

# EXECUTION

## For Watermains, **OPSS.MUNI 441** shall be followed with the following amendments:

.1 441.07.02 Site Preparation is deleted and replaced with the following:

Site Preparation shall be in accordance with Section 02230 - Site Preparation for Pipelines, Utilities and Associated Structures.

### **441.07.07 Transporting, Unloading, Storing and Handling Pipe** is amended by the addition of the following:

For handling of concrete pipe, refer to relevant sections of AWWA Manual M9 (3rd edition) – Concrete Pressure Pipe.

For handling of plastic pipe, refer to relevant sections of the Plastics Pipe Institute (PPI) Second Edition Handbook of PE Pipe 2008

Manufacturer's recommendations for transporting, unloading, storing, and handling of materials shall be followed.

The Contractor shall take delivery of pipes and fittings near to the trench. Do not impede traffic.

Unload pipe using mechanical equipment. Do not use chains for slinging pipe.

Place materials in safe storage.

Follow the pipe manufacturer’s handling and storage recommendations. Provide the Consultant a copy of such handling and storage recommendations.

The Contractor is responsible for the safe handling and storage of all pipes, specials, fittings, gaskets, etc., at its own expense and risk.

The Contractor shall not store materials or quantities that will impact traffic, public safety or site access and all materials shall be secured.

All watermain pipe ends shall be sealed for transport and storage until installed.

The Contractor is responsible for replacing all pipe specials, fittings, gaskets, etc., which, in the opinion of the Consultant, are unsound or damaged, both before or after installation. Any damaged materials shall be removed immediately from the Site at the Contractor’s expense.

441.07.08 Excavation is deleted and replaced with the following:

Excavation for the installation of watermains shall be in accordance with Section 02315 - Trenching, Backfilling and Compacting.

441.07.09 Support Systems is deleted and replaced with the following:

Support Systems shall be in accordance with Section 02260 - Excavation Support Systems.

441.07.10 Dewatering is deleted and replaced with the following:

Dewatering shall be in accordance with Section 02240 - Dewatering-General.

441.07.11 Temporary Protection Systems is deleted and replaced with the following:

The construction of temporary protection systems shall be in accordance with Section 02261 - Excavation Temporary Support Systems.

441.07.13 Backfilling and Compacting is amended by the replacement of the first paragraph with the following:

Backfilling and compacting shall be in accordance with Section 02315 -Trenching, Backfilling and Compacting.

If concrete bedding and/or concrete encasement is shown on the contract drawings:

##### Perform all concrete Work in accordance with Section 03300 - Cast in Place Concrete. Place concrete in accordance with the details as indicated on the Contract Drawings or as directed by the Consultant.

##### Pipe may be positioned on concrete blocks to facilitate the placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

##### Do not backfill over concrete within 24 hours after placing.

#### Upon completion of pipe-laying and after the Consultant has inspected the Work in place, surround and cover pipes as indicated in the Contract Documents.

#### Place surround material in uniform layers not exceeding 150 mm of compacted thickness as indicated on the Contract Drawings.

#### Place layers uniformly and simultaneously on each side of the pipe.

#### Do not place material in frozen conditions.

#### Compact each layer from the pipe invert to the underside of the backfill to at least 98% Standard Proctor Maximum Dry Density (SPMDD).

#### Place backfill material, above the pipe surround, in uniform layers not exceeding 150 mm of compacted thickness up to the grades as indicated in the Contract Documents.

#### Under asphalt pavement, gravel shoulders and sidewalks, compact backfill to at least 98% SPMDD. In other areas, compact to at least 95% SPMDD unless indicated otherwise on the Contract Drawings.

441.07.14 Installation of Pipe is amended by the addition of the following:

Lay pipes on the prepared bed, true to line and grade. Correct any pipe which is not in true alignment or grade.

Lower pipe into the trench so that neither the pipe nor the trench will be damaged or displaced.

Keep all pipe clean during the progress of the Work and throughout the Contract. Handle pipe with special care during temperatures below freezing.

Keep trenches dry and do not lay pipe in water.

Whenever the Work is suspended and at the end of each Working Day, install a removable watertight bulkhead at the open end of the last pipe laid.

Do not lay pipe until the preceding pipe joint has been completed and the pipe is carefully embedded and secured in place.

Do not lay pipe upon a foundation into which frost has penetrated, nor at any time when the Consultant shall deem that there is danger of the formation of ice or the penetration of frost at the bottom of the excavation.

Provide temporary bracing or supports when necessary to adequately support the pipe during installation. Prevent damage to the pipe and pipe coatings and to any adjacent structures and appurtenances. Complete pipe bedding before any temporary supports and bracings are removed.

Remove all lumps, blisters and excess coating from the ends of each pipe and wire brush, wipe clean and dry and free from oil and grease.

Log and maintain all pipes, etc., in accordance with the Contract Drawings.

The Contractor shall record any deviations or field changes from the approved layout drawings. These changes shall be updated on the final layout drawings that are to be submitted.

Lay pipes in accordance with the manufacturer's standard instructions and specifications. Do not use blocks. Provide the Consultant a copy of such instructions.

Handle pipe by methods approved by the Consultant and recommended by the pipe manufacturer. Do not use chains or cables passed through the pipe barrel so that the weight of the pipe bears on the pipe-ends.

Sufficient cover shall be placed on any watermain prior to return to service or testing in accordance with the manufacturers’ recommendation and approval by the Consultant.

441.07.15 Jointing

**441.07.15.01 General** is amended by the addition of the following:

##### Do not exceed the permissible deflection at joints as recommended by the pipe manufacturer.

##### Position and join pipes with equipment and methods approved by the Consultant and in accordance with the manufacturer’s recommendations.

##### Align pipes carefully before jointing.

##### Install gaskets in accordance with the manufacturer's recommendations. Support pipes with hand slings or a crane as required in order to minimize lateral pressure on the gasket and maintain concentricity until the gasket is properly positioned.

##### Avoid displacing the gasket or contaminating it with dirt or other foreign material. Gaskets disturbed or contaminated shall be removed and replaced before jointing is attempted again. Pipe joints that are disconnected shall have new gaskets provided prior to jointing again where required.

##### Apply sufficient pressure in making the joints in order to ensure that the joint is completed to the manufacturer's recommendations. Pull or push pipe only by hand or by power operated winch. Do not use excavators for pushing pipe.

##### Prevent joints from opening after the pipe has been laid.

##### When a stoppage of the Work occurs, block pipes in an appropriate manner to prevent creep during down time.

**441.07.15.02 Ductile Iron Pipe** is amended by the addition of the following:

##### Mechanical Joints:

###### The minimum wall thickness for pipe with mechanical and push-on joints shall be Class 50.

###### The minimum wall thickness for pipe with flanged joint or plain end and Victaulic coupling shall be Class 53.

###### Joints - ANSI/AWWA C111/A21.11 rubber gasket mechanical.

###### Fittings - ANSI/AWWA C110/A21.10 gray iron fittings.

##### Bell and Spigot Joints:

###### Joints - ANSI/AWWA C111/A21.11 rubber gasket push-on-joints.

###### Flanges - ANSI B16.1, Class 150.

###### The outside coating shall be a petroleum asphaltic coating approximately 1 mil (25 μm) thick.

###### Polyethylene encasement shall be in accordance with ANSI/AWWA C105/A21.5.

**441.07.15.03 Concrete Pressure Pipe** is amended by the replacement of all contents with the following:

##### Bell and Spigot Joints:

###### Restrain all joints within the limits shown on the Contract Drawings. Additional joint restraint shall be included based on the design calculations and layout drawings as submitted by the manufacturer.

###### The Contractor shall install all Concrete Pressure Pipe in accordance with the manufacturers’ recommendations.

##### **441.07.15.03 Concrete Pressure Pipe** is further amended by the addition of the following:

###### Welded Joints:

Welding of joints is to be carried out by a certified pressure vessel welder, in strict accordance with the pipe manufacturer’s instructions for performing the weld. The Contractor shall submit a copy of the welder’s certification in advance of the welding. The joint shall be cement grouted after the welding is completed.

###### Grouting Inside Joint Recesses:

The inside joint recess of the concrete watermain 1500mm and larger shall be finished by placing joint mortar within the recess. When the pipe has been laid in place, the joint shall be finished off smooth with the inside surface of the lining. The joint mortar shall be composed, by volume, of one part cement, two parts sand and dry mixed with sealbond and moistened with just enough water to provide a stiff plastic mix which will not fall out of the joint. The Contractor shall submit materials and method of installation prior to performing the Work.

###### Flanged Joints:

Flanges in accordance with AWWA C207 Steel Pipe Flanges; ANSI B16.5 Steel Flanges and Flanged Fittings, Class 150 unless indicated otherwise on the Contract Drawings.

###### Mechanical Closure Couplings:

For grooved end pipe; grooved Victaulic end to accept a Victaulic style 31 or 44 coupling unless indicated otherwise on the Contract Drawings.

Maximum allowable pipe end separation 6 mm. The minimum separation shall be in accordance with the coupling manufacturers’ recommendations.

###### Approved Suppliers: *[Consultant to review suppliers depending on type of coupling]*

Victaulic Company of Canada Ltd,

Cascade Waterworks Manufacturing Company.

Or Equivalent

**441.07.15.04 Polyvinyl Chloride Pressure Pipe (PVC and PVCO)** is deleted in its entirety and replaced by the following:

##### If gaskets are supplied separately; new clean gaskets shall be inserted into the clean groove of the bell end of the pipe.

##### The bell, spigot or gasket shall be lubricated with an NSF/ANSI 60 certified product in accordance with the manufacturer’s recommendations.

##### The spigot end shall be inserted and pushed into the bell up to but not beyond the depth of the stop reference mark.

##### Field cut pipe shall be uniform and square; bevel and insertion distance mark shall correspond to that of the factory pipe of the same diameter.

##### All metallic fittings and mechanical restraints on PVC pipes shall be treated with cathodic protection in accordance with Section 02555 – Cathodic Protection.

##### Fittings:

###### PVC fittings in accordance with CSA B137.3 / AWWA C900.

###### Cast iron fittings in accordance with ANSI/AWWA C110/A21.10.

##### Mechanical Joints:

###### All mechanical joints shall be installed in accordance with the manufacturers’ recommendations.

###### Tighten all nuts uniformly to the torque specified in AWWA C111/A21.11.

###### Approved Suppliers:

Baker Couplings Co. Inc.

Ford Meter Box Company Inc.

Dresser Inc.

Romac Industries Inc.

Smith-Blair Inc.

Viking Johnson (part of Crane Ltd. U.K.)

Or Equivalent

##### Bell and Spigot Joints:

###### Joining of pipe segments is to be completed in accordance with the manufacturers’ recommendations.

###### Push-on joints gasket in accordance with CAN / CSA B137.3, PVC series 160, 1.1 MPa elastomer gasket.

**441.07.15.05 Polyethylene Plastic Pressure Pipe** is amended by the addition of the following:

##### Approved only in special applications.

**441.07.15.06 Steel Pipe** is deleted in its entirety and replaced by the following:

##### Joint pipe in accordance with AWWA Manual M11, Steel Pipe, Chapter 12.

##### Bell and spigot joints:

###### Follow procedure recommended by pipe manufacturer.

##### Field welded joints:

###### To latest revision of AWWA C206.

###### Expansion and contraction joints in accordance with AWWA Manual M11, Steel Pipe, Chapter 8.

##### Restrained Joints:

###### Flexible welded joints or harness fabricated by pipe manufacturer in accordance with AWWA Manual M11, Steel Pipe, Chapter 13.

###### Conform to AWWA C206, for field welding.

###### Installation of Flanged Joints:

Flange faces to bear uniformly on the gasket.

Tighten bolts uniformly.

Take care to prevent bending or torsional strains on the flanges.

Align accurately and properly restrain connecting pipes and flanged fittings, valves and specials.

Clean all bolts, nuts, couplings, gaskets and connecting pieces thoroughly before installation.

Support all flanged joints.

###### Cement mortar lining for field joints to AWWA C205, Appendix A.

441.07.16 Cutting of Pipe is amended by the addition of the following:

The method of cutting and cutting equipment is subject to the approval of the Consultant.

441.07.18 Installation of Valves and Fittings

#### **441.07.18.01 General** is deleted in its entirety and replaced by the following:

##### The work of installing valves shall include the valves, valve boxes and rods. Valves shall be installed at the locations shown in the Contract. Valves and connecting pipes shall be aligned accurately and supported as specified.

##### Damage to Epoxy coating shall be repaired prior to installation, as per manufacturer’s recommendations and certified correct by the manufacturer.

#### 441.07.21 Shutting Down or Charging Mains is amended by the addition of the following:

##### All existing valves are to be operated by the Region or other licensed operating authorities within their respective jurisdictions. The Contractor is not permitted to operate valves within the existing systems.

##### Provide a minimum of 10 Working Days advance notice of a request to have an existing system made operational.

441.07.22 Connections to Existing Watermains is amended by the addition of the following:

#### Prior to finalizing shop drawings or commencing with pipe laying, expose the existing watermain in order to confirm the location of the pipe joints, determine if any modifications are required to the procedures and to allow field measurements to be taken. Any temporary isolation or pressure reduction for exposing the watermain shall be requested and coordinated a minimum of 20 Working Days in advance of the work of this Section and subject to approval by the Region.

#### Connections of new watermain to the existing watermain or potable water system cannot be performed until the new watermain has been successfully hydrostatically tested, disinfected and all microbiological samples have been reviewed and approved to the satisfaction of the Region.

#### Where the length of the connection is less than or equal to 6m or one pipe length, the connection must be completed in accordance with Section 4.10.1 of ANSI/AWWA C651. The connection must remain isolated from the existing Drinking Water System, except while being flushed or sampled, until satisfactory results are received from one microbiological sample taken by an MECP Certified Operator from water that has been directed through the connection, unless otherwise directed by the Region where the disinfection requirements were witnessed by a Certified Operator.

#### Where the length of the connection is greater than 6m or one pipe length, the connection shall be completed in accordance with Section 4.10.2 of ANSI/AWWA C651. At the sole discretion of the Region, an exception may be used for a total length of up to 40m where: the connection crosses a transportation corridor which could result in significant community impacts, or, where the connection cannot be constructed to within one pipe length of the existing watermain due to the potential for destabilizing an existing thrust block. Upon approval by the Region, the Contractor shall follow the procedure in accordance with 1.1.4.2 of the MECP Watermain Disinfection Procedure. Where hydrostatic testing is required per the Contract Documents, hydrostatic testing of the connection shall not be undertaken against the isolating valve until satisfactory results from the microbiological samples have been received and approved by the Region.

#### Prior to connecting to the existing watermains, the Contractor must provide the Consultant with a detailed installation and disinfection procedure for approval. The procedure shall include the following at a minimum:

##### Anticipated schedule and duration of the connection(s),

##### The length of the connection(s)

##### Methods, materials and staging to make the final connection(s),

##### Disinfection method and chemicals, and

##### Location(s) and plan for microbiological and disinfectant residuals sampling.

##### Identify any Subcontractors or welders that will be performing Work with the connection. Submit current certifications for welders or licensed operators.

#### The procedure submittals shall be provided a minimum of 20 Working Days in advance of the Work to allow for review and scheduling for valve isolation. Work shall not proceed without final approval by the Region and may be subject to day or time restrictions.

#### Coordinate with the Region which residences and businesses will be affected by the shutdown. The Contractor must make arrangements for the supply of temporary water to those affected in accordance with OPSS.MUNI 493. *[In the event compliance with OPSS.MUNI 493 requires extensive or long term work the Consultant shall provide a design and amend the Bid Form to include this Work as a separate pay item.]*

#### Prior to making the connections to the existing watermain, the Contractor must review the proposed procedure in detail with the Region, who must be thoroughly convinced that all provisions and stand-by equipment are in place and operating satisfactorily. The Region reserves the right to request modifications to the proposed plan to address any perceived problems and the right to refuse to allow connection to the existing watermain until all concerns have been addressed. The Region reserves the right to take additional microbiological or other water quality tests to confirm the water quality contained in the watermain.

#### Any revisions to the connection procedure which are requested by the Region, or delays resulting from such requests, does not entitle the Contractor to an increase in the Contract Time or Contract Price.

#### Provide all labour, materials and equipment to make connections in accordance with the submitted procedure, in accordance with the pipe manufacturer’s recommendations and any other associated Works both temporary and permanent. No extra payment will be made for construction methods to keep excavations dry, stable and free from unwanted substances. No extra payment will be made for the time of day or day of the week that the connections can be made.

#### Undertake all field welding in accordance with the general requirements of AWWA C206.

#### Undertake the Work on a continuous basis until the connections are complete or until the supply of water is established, unless otherwise approved by the Region. Complete all connections in the time allowed.

#### All connection fittings and closure pieces are to be swabbed and chlorinated with a minimum 1% sodium hypochlorite solution immediately prior to installation in accordance with Section 4.10 of ANSI/AWWA C651 and witnessed by a Region Certified Operator.

#### Provide suitable illumination for any Work undertaken during the hours of darkness.

#### All thrust restraints must be thoroughly established, and any thrust block must have reached the required compressive strength prior to the recharging of the watermain.

#### Restore any damage to existing watermains, including pipe, linings, coatings, encasement, bedding, etc., to the original pre-construction conditions or better and to the satisfaction of the Consultant.

#### The Contractor shall bear the sole responsibility for any claims which can be directly attributed to an interruption in service. This includes, but is not limited to, personal losses, business losses and fire losses.

#### Coordinate the order and delivery of all special equipment and fittings required for the connections well in advance.

#### Take delivery of all materials, fittings, etc., near the location of use. Do not impede traffic. If required, establish a traffic control plan. Refer to Section 01550 - Traffic Control.

#### Whenever cutting of pipe is required, cut pipes as recommended by the pipe manufacturer.

#### The method of cutting and cutting equipment is subject to the approval of the Consultant.

#### Discharge water in accordance with the requirements of this Section.

#### For potable water service pipes of diameter less than 100mm, the Contractor shall ensure that sanitary conditions are maintained during installation and flushing is conducted prior to being placed in service or as otherwise directed by the Region.

#### Within 5 Business days following completion of hydrostatic testing, flushing and disinfection, the Contractor shall submit the following records on the Record of Watermain Installation and/or Connection form, included as a supplement to this specification section:

##### The total length of the connection;

##### Confirmation that sanitary construction practices were followed;

##### Confirmation that proper disinfection was performed;

##### Name of the Certified Operator present for the installation of the connection if on Site to witness the connection;

##### Results of microbiological samples (if taken);

##### Post flushing disinfectant residual samples (if performed by the specialist Subcontractor);

##### Where an exception was made as outlined in subsection 3.1.11.4, the reason for the exception;

##### Disinfectant residual after the watermain was flushed and

##### Date and time the watermain was placed into service.

441.07.23 Thrust Restraints is amended by the addition of the following:

#### Protect all connections, caps and bends that are liable to draw or blow-off by means of mechanically restrained joints or concrete thrust blocks as specified on the Contract Drawings, in accordance with the manufacturer’s recommendations and as directed by the Consultant.

#### All mechanical restrainers shall be cathodically protected in accordance with Section 02555 – Cathodic Protection.

#### Mechanical restrainers shall be used for restraint unless otherwise approved by the Region or as indicated on the Contract Drawings.

#### Perform concrete Work in accordance with Section 03300 - Cast in Place Concrete and York Region Standard Drawing [enter applicable standard drawing number].

#### Keep joints, fasteners and couplings free of concrete.

#### Do not backfill over concrete within 24 hours after placing or until the concrete has reached the minimum compressive strength.

#### Install a polyethylene bond breaker between thrust blocks and fittings.

441.07.24 Hydrostatic Testing and 441.07.25 Flushing and Disinfecting Watermains are deleted and replaced by the following:

#### **441.07.24 Swabbing, Flushing, Hydrostatic Testing and Disinfecting Watermains**

##### All Work within this section shall be completed in accordance with ANSI/AWWA C651, Disinfecting Water Mains as modified by the MECP Watermain Disinfection Procedure (August, 2020)

##### Prior to filling the watermain and starting testing, the Contractor shall request the Consultant to coordinate a preliminary inspection of the valve chambers with the Region. The inspection will be conducted to confirm that the watermain, chambers, valves, supports, thrust blocks, required cover and all appurtenances are installed correctly and in accordance with the Contract Drawings. Any deficiencies identified by the Region shall be corrected immediately. Filling and testing shall not commence until written approval is provided by the Region.

##### The Contractor shall coordinate the Work to minimize time between disinfection and final connections. Unless otherwise approved by the Region, any delays beyond seven (7) Calendar Days after receipt of acceptable microbiological testing results for the disinfection of the watermain; the final connections shall be completed. If not completed within this time frame, the watermain may require additional flushing or disinfection and sampling at the discretion of the Region and at the Contractor’s cost.

##### All PVC or Polyethylene watermains 100mm or greater shall be swabbed. Only new swabs will be permitted for use. All swabs must be numbered and inspected prior to their insertion and immediately after they exit the watermain to ensure that they have remained intact and to ensure that pieces of the foam do not stay in the pipe.

##### The following shall be used as a guideline in swabbing newly installed piping:

|  |  |
| --- | --- |
| Type of Swab | Open cell polyurethane foam having a density of 24 kg/m3 (1.5 lb/ft3) |
| Length of Swab | 1.5 x swab diameter |
| Diameter of Swab | (diameter of pipe) + 50 mm |
| Flow Rate | 0.5 to 1.0 m/s using potable water |
| Minimum No. of Swabs for a New Piping | 3 new foam swabs (after 3rd swab, the water should be clear if not, additional swabbing is required at the Contractor’s expense) |

##### Any watermain that cannot be swabbed, or flushed with a scouring velocity of 0.91m/s, must be internally inspected by closed circuit television (CCTV), remotely operated vehicle (ROV) or other approved means after installation and approved by the Consultant prior to performing any hydrostatic tests. All equipment used for the inspection shall be dedicated for that purpose only, shall be suitable for disinfection and disinfected with a minimum 1% sodium hypochlorite solution immediately prior to insertion. A detailed plan for the internal inspection shall be submitted by the Contractor 20 Working Days in advance of the work of this Section. The plan shall include at a minimum, details of the equipment to be used, points of access, disinfection procedures for equipment, schedule and post inspection disinfectant residual confirmation.

##### The Contractor shall perform any temporary pipe or valve removals, modifications or excavation to complete the inspections*. [Consultant to review this requirement with the Region based on the project specific requirements. Delete if not required or provide a provisional lump sum item in the bid form for watermain internal inspection or include a separate CCTV or ROV inspections specification Section.]*

##### The Contractor shall make all arrangements to obtain water for the purpose of filling, hydrostatic testing, flushing, disinfection, de-chlorination and sampling for all portions of newly installed watermains. If water will be sourced from a local municipal fire hydrant, the Contractor shall be responsible for obtaining the required hydrant permit and paying for the water. If the Contractor will source water from a Regional watermain, they shall submit a work plan for any related alterations, modifications, installation of a meter and a CSA certified reduced pressure principle (RP) backflow preventer in accordance with CSA Standards B64.10 and B64.10.1. The Contractor shall arrange for field testing of the backflow preventer on the Site in accordance with CSA Standard B64.10 and B64.10.1 by a tester with an Ontario Water Works Association (OWWA) Certified Cross Connection Control Specialist Certificate or Ministry approved equivalent. Alternatively, a Certified Operator or a Water Quality Analyst with a backflow prevention tester’s license can be authorized to test, install, relocate, repair or replace backflow preventers.

##### The initial water meter values shall be reported to the Region upon installation of the backflow preventor and the final water meter values prior to removal.

##### The Contractor shall ensure that the backflow preventer certification is provided to the Region. The Contractor will be responsible for supplying all necessary equipment and plumbing including measures for temperature control and security to prevent tampering.

##### For the purposes of disinfection and sampling, imported potable water by water truck will only be permitted where there is no other practical means to source water and only at the express approval of the Region.

##### Any operation of valves must be performed by a Regional or local municipal certified water operator having ownership of the watermain.

##### The test section shall be filled slowly with water and all air shall be expelled from the pipeline. A 24-hour absorption period in advance of testing is required for concrete pressure pipe after the pipe has been filled and all air expelled.

##### Hydrostatic testing may only precede disinfection where the new segment of watermain is physically separated from the existing municipal water system. A closed valve is not considered physical separation.

##### Test pressure shall be 1,035kPa. [The Consultant shall provide the Operating, Surge and Test pressures for the watermain in this section or on the Contract Drawings. Where test pressures may exceed 1,035 kPa, the Consultant shall list test pressures for each segment of watermain between line valves, stations or node points. The minimum pipe class must be indicated on the Contract Drawings for each segment of watermain. All valves, fittings, couplings, pipe classes and restraint must be specified to meet the test pressure with applicable safety factor] The Contractor shall ensure that the maximum pressure at any point along the test sections does not exceed the pipe rating, valves or coupling class during the testing. Watermains 1200mm and greater shall be tested individually in sections between valves. Watermains less than 1200mm shall be tested either in sections between valves or the completed watermain subject to approval by the Consultant.

##### The test section shall be subjected to the specified continuous test pressure for 2 hours. The leakage is the amount of water added to the test section to maintain the specified test pressure for the test duration. The allowable leakage is 0.082 litres per millimeter of pipe diameter per kilometer of pipe for the 2 hour test period. If the measured leakage exceeds the allowable leakage, then the section of watermain fails the hydrostatic test.

##### Polyethylene Pipe shall be hydrostatically tested in accordance with OPSS.MUNI 441.07.24.02.

##### If the hydrostatic test fails, the Contractor shall identify and rectify the problem at their expense. The Contractor shall then conduct subsequent pressure tests, at their costs, until a satisfactory result is achieved. The Contractor shall obtain approval from the Consultant prior to manipulating any valves on the new watermain. Under no circumstances shall the Contractor operate any valves on or connected to the existing municipal potable water system. Once satisfactory results are achieved, the Contractor shall coordinate with the specialist Subcontractor to re-test the same section of the watermain with the Region and Consultant on Site to witness the test results. A minimum of two Working Days advance notification is required for scheduling the test.

##### Following successful hydrostatic testing, each valve must be leak tested for 10 minutes by closing the valve and introducing a pressure differential of a minimum of 200 kPa on one side of the valve. If there is no pressure loss that exceeds the allowable rate for 10 minutes, then the valve passes the leakage test. Multiple valves may be tested at one time; however, if the leakage exceeds the leakage rate for 10 minutes, then each valve must be tested individually.

##### Hydrostatic testing, flushing, disinfection, de-chlorination and microbiological sampling shall be completed by a specialist Subcontractor who has a minimum of five years of demonstrated experience in providing disinfection services for water retaining structures and potable watermains. The specialist Subcontractor shall provide references for disinfection work completed in Ontario upon request. The specialist Subcontractor shall provide staff that are certified as a licensed water operator by the MECP. Unless stated otherwise in the Contract Documents, the licensed Subcontractor shall collect and submit all water samples for laboratory analysis in accordance with AWWA C651, Disinfecting Water Mains. Sample results and chain of custody documentation shall be submitted to the Region promptly upon receipt. The specialist Subcontractor performing hydrostatic testing, flushing and disinfection shall provide all the required calibrated equipment for measuring chlorine residuals, turbidity and other parameters as indicated in the Contract Documents.

##### The Contractor shall submit a comprehensive Site specific plan for the hydrostatic testing and disinfection of the watermain a minimum of twenty (20) Working Days in advance of undertaking the work of this Section to allow for the review and approval of the plan for scheduling any valve operation. The Region and Consultant shall be provided a minimum of 2 Working Days advance notice to witness the hydrostatic testing and disinfection. The plan must be approved prior to commencement of testing. The plan shall include the following at a minimum:

###### Identification of the MECP licensed Subcontractor performing the hydrostatic testing and disinfection. Current operator certification under Ontario Regulation 128/04 for the Site staff who will be supervising the Work may be requested by the Region.

###### Identification of the source and set up for potable water supply including a flow meter and the CSA-certified reduced pressure principle (RP) backflow preventer (or air gap, as defined in CSA B64.10) with certification on Site.

###### The anticipated flow rate, schedule and duration for filling of the watermain, soaking period (where applicable) and flushing.

###### Identify the hydrostatic testing sequence and testing procedure dependent on pipe materials, segment test pressures and valve testing.

###### Where any section of the new watermain is not physically separated from the existing drinking water system (a closed valve is not considered physical separation), disinfection and a minimum of 2 consecutive passing microbiological sample results must precede hydrostatic testing. A specific plan must be developed to demonstrate mitigation measures to prevent the potential contamination of the potable water system with super-chlorinated water during disinfection, de-chlorination and sampling. The plan shall include active pressure monitoring on either side of the live valve.

###### A schematic drawing of the watermain showing testing sequence, valve chambers, hydrants, connections, chlorine injection points, Microbiological and disinfection residual sampling points and discharge locations.

###### Monitoring flushing to achieve less than 1.0 NTU for turbidity at all sampling and monitoring locations.

###### Identification of the mixing equipment and disinfection chemicals to be used for the disinfection including certification that the chemical products meet both AWWA and NSF/ANSI/CAN 60 standards.

###### The method of disinfection in accordance with AWWA Standard C651.

###### The setup, method and chemicals to dechlorinate discharge water including monitoring chlorine residual after treatment in accordance with AWWA C655.

###### Monitoring and recording of the time, location and chlorine residual upon completion of disinfection and after the required contact time. Total chlorine residual to be between 0.50 mg/L and 2.5 mg/L.

###### The microbiological sampling procedures including details where any staged sampling is required due to distances between sampling locations.

##### Within 5 Business days following completion of flushing, disinfection, sampling, connections or tapping a watermain; the Contractor or the specialist Subcontractor shall submit the applicable records on the Record of Watermain Installation and/or Connection form included as a supplement to this specification section:

###### The Certificate(s) for the CSA-certified reduced pressure principle (RP) backflow preventer that has been selected and field tested in accordance with CSA Standards B64.10 and B64.10.1. on Site shall be appended to the Record.

###### Confirmation that swabbing was completed where applicable.

###### Confirmation that preliminary flushing was completed and that turbidity readings at each sampling/monitoring location were less than 1.0 NTU prior to disinfection.

###### Record the high level chlorine residual at the beginning and end of the contact period at each sample location including the decrease in chlorine concentration in mg/L or a percentage as applicable.

###### Attach the schematic drawing that was prepared for the disinfection procedure including any field modifications that may have occurred during the commissioning phase.

###### The chain of custody and all preliminary and final microbiological sample results from the laboratory for each sample location shall be appended to the record.

###### For staged sampling, record the flow rate, time each sample was taken and calculated length.

###### All NSF/ANSI 61 certification for materials in contact with potable water and certification that the chemical products used for disinfection meets the requirements for both the AWWA and NSF/ANSI/CAN 60 standards.

##### All bacteriological water sampling must be performed in accordance with AWWA C651, Disinfecting Water Mains. All samples for new watermains shall be tested at a minimum for Escherichia Coli (E. Coli), Total Coliform, Background Colony Counts, and Heterotrophic Plate Count (HPC). Sample results must meet the parameter levels below.

|  |  |
| --- | --- |
| **Microbiological Parameter** | **Standard** |
| E. Coli | 0 CFU/100 mL |
| Total Coliform | 0 CFU/100 mL |
| Background Colony Counts | < 20 CFU/100 mL |
| HPC | < 50 CFU/100 mL |

##### All water chemistry sample results must meet the parameter levels below.

|  |  |
| --- | --- |
| **Water Chemistry Parameter** | **Standard** |
| pH | 7-8.5 |
| Turbidity | < 1.0 NTU |
| Chlorine (free or combined) | 0.50 to 2.5 mg/L |

##### Within 5 (five) Working Days following the completion of hydrostatic testing of the watermain and valves, the Contractor shall submit a comprehensive report summarizing the following information:

###### The name of the specialist Subcontractor firm who performed the testing, their representative on Site performing the test and any Consultant or Region staff who witnessed testing.

###### The Contract Number and watermain description.

###### The date(s) that testing was performed.

###### In tabular format, record the following results as applicable:

The diameter(s), pipe material and lengths of watermain for each test segment

Identification of the limits of each test segment (example: unique identifiers such as valve chamber numbers, node points or stations).

Pressure at the start and finish (or intermediate) of each test prior to adding make up water.

Start and finish times for each test.

Start and finish test water meter readings.

The volume of make up water added to bring the test segment back to the start pressure.

Identification as a pass or fail for each test segment based on the allowable leakage criteria outlined in this Section.

Description of each valve (unique) that is tested and the results of testing as a pass or fail; whether included as part of a 2 hour hydrostatic test or as individual valve tests.

##### The Consultant may permit or require flushing, hydrostatic testing or disinfection to be carried out in stages as sections of the system are completed. Ensure that no deleterious matter is allowed to enter any sections that have been flushed or disinfected. All flushing of sections of completed watermain that are connected to the municipal potable water system shall be performed by a licensed water operator and subject to approval by the Region.

##### After connections have been made and the system has been recharged, the Region may take bacteriological samples. If there is an indication of contamination, the Region may require the disinfection procedure to be repeated at the Contractor’s expense for the affected sections of watermain.

##### All tapping sleeves and valves 100 mm diameter and larger are subject to hydrostatic pressure and leakage test by the Contractor or specialist Subcontractor prior to the tapping being carried out. The tapping saddle hydrostatic test pressure shall not exceed 10% above the operating pressure of the watermain. The test pressure must remain unchanged for 10 minutes to pass. All parts of the tapping valve and sleeve that will be in contact with potable water shall be disinfected using a minimum of 1% sodium hypochlorite solution immediately prior to installation. The tapping sleeve and valve installation must be performed and documented by a Certified Operator or directly supervised by a Regional licensed operator, the Contractor shall provide a minimum 10 Working Days advance notice to schedule the work. All watermain tapping for concrete pressure pipe must be performed by a certified pressure vessel welder.

##### Any relined watermains shall follow the procedures for hydrostatic testing as outlined in this section. Flushing, swabbing, disinfection and microbiological sampling shall be performed in accordance with the MECP Watermain Disinfection Procedure, Section 1.2 Relining of Watermains. A return to service prior to receiving all satisfactory microbiological sample results would be solely at the Region’s discretion and only if all conditions in Section 1.2 Relining of Watermains mentioned above are met.

441.07.26 Site Restoration is amended by the addition of the following:

#### After installing and backfilling over watermains, restore the surface to its original pre-construction condition unless indicated otherwise in the Contract Drawings.

441.07.27 Management of Excess Material is amended by the addition of the following:

Disposal of Water

##### Dispose of safely, all chlorinated water from draining operations or used for testing, flushing or disinfecting waterworks.

##### Dechlorinating agents for the neutralization of disinfecting agent shall be in conformance with AWWA C655.

##### Do not discharge untreated chlorinated water into any storm sewer, drainage ditch, water course or sanitary sewer.

##### Provide acceptable equipment and additives to neutralize any chlorinated water which is to be wasted. Residual chlorine in the discharge water must not exceed 0.02 mg/L. The Contractor shall monitor and record the chlorine residual of the discharged water in the presence of the Consultant. Contractor to ensure no excess de-chlorinating agent is added such that there is any impairment of the environment.

## Valve Chambers

### Valve chamber installation shall be in accordance with Section 02631 – Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers.

## Confirm Continuity of Tracer Wire

### The Contractor shall retain the services of a Subterranean Utility Engineering (SUE) Subcontractor, or approved alternative, to confirm the continuity of all installed tracer wire from chamber to chamber or node points. This shall be done using electronic instruments made for this purpose. The Subcontractor shall follow the entire length of all watermains installed to ensure that tracer wire is intact and effective. The Subcontractor shall prepare a signed report stating its findings and conclusions, a copy of which shall be delivered to the Consultant prior to commissioning.

### Should the Subcontractor find breaks or faults in the continuity of the tracer wire, the Contractor shall do whatever is required to repair the breaks or faults, and to deliver a properly functioning system of tracer wire to the Region. After the repairs have been completed, the testing shall be repeated at no additional cost to the Region.

## Supplement

### The supplement listed below, attached following “END OF SECTION”, forms a part of this Section

#### Section 02511A – Record of Watermain Installation and/or Connection

**END OF SECTION**