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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | November 5, 2007 | Minor revisions by Legal Services. |
| 3 | November 13, 2009 | Modified ‘Related Section’ and approved suppliers |
| 4 | June 4, 2012 | Addition of References and Replacement Parts sections on this page |
| 5 | June 29, 2012 | Reformatted to Remove White Space |
| 6 | April 24, 2015 | General Formatting |
| 7 | March 22, 2016 | Changed spec to reflect the corporate name change from Munro Ltd. to DECAST Ltd. (AV) |
| 8 | May 31, 2016 | Changed spec to reflect the corporate name change from Hanson Pipe products Canada Ltd. to Forterra Pipe and Precast. Removed Hyprescon on products list as it was purchased by Forterra Pipe and Precast. (AV) |
| 9 | June 3, 2016 | Changed listing to reflect the corporate name change from Royal Pipe Systems to Royal Building Products. (AV) |
| 10 | February 21, 2017 | Addition of Subsection 1.3 which highlights Contractor responsibilities under the Ontario Underground Infrastructure Notification System Act, 2012. Updated standard references. (AV) |
| 11 | April 12, 2017 | Updated AWWA Standards references. (AV) |
| 12 | April 26, 2018 | Updated AWWA Standards references throughout  2.1.2.4 Removed manufacturers and products  2.3.3 Removed section on Butterfly Valves  2.2.4 Removed manufacturers and products  2.4 Added performance requirements, removed approved suppliers  2.5 Added performance requirements, removed approved suppliers  2.6 Removed section on Sampling Stations  2.7 Removed section on Service Boxes  (BM) |
| 13 | April 8, 2022 | Specification rewritten to align with OPSS.MUNI 412  2.6 Revised requirements for valves  1.10 Added requirement for tracer wire  3.11 Added requirement for tracer wire and warning mesh  3.13 Added requirements for testing  3.17 Added Continuity Testing of Tracer Wire  (BM, DB) |

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 covers all exterior forcemain Work from the first joint outside of the foundation to the limits of construction. All forcemains are to be supplied and installed in accordance with OPSS.MUNI 412 [November 2018] as amended by this specification.

## 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.]

### [List Sections specifying installation of products supplied but not installed under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Execution requirements for ...[item]... specified under this Section.

### [List Sections specifying products installed but not supplied under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Product requirements for ...[item]... for installation under this Section.

### Sections:

#### Section 01300 – Submittals

#### 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 412 [November 2018], Construction Specification for Forcemain Installation in Open Cut

### AWWA (**Also note AWWA References contained within OPSS.MUNI 412)**

#### ANSI/AWWA C104/A21.4-16, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings

#### ANSI/AWWA C111/A21.11-17, Rubber-Gasket Joints for Ductile- Iron Pressure Pipe and Fittings

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

#### AWWA C230-16, Stainless-Steel Full-Encirclement Repair and Service Connection Clamps for 2-In. Through 12-In. (50-mm Through 300-mm) Pipe

#### AWWA C301-14, Prestressed Concrete Pressure Pipe, Steel-Cylinder Type

#### AWWA C303-17, Concrete Pressure Pipe, Bar-Wrapped, Steel Cylinder-Type

#### AWWA C509-15, Resilient-Seated Gate Valves for Water Supply Service

#### AWWA C517-16, Resilient-Seated Cast-Iron Eccentric Plug Valves

#### AWWA C520-19, Knife Gate Valves, Sizes 2 In. (50 mm) Through 96 In (2,400 mm)

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

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

#### AWWA C655-18, Field Dechlorination

#### AWWA C900-16, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution

#### AWWA C906-16, Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,650 mm) for Water Works

### *ASTM* ***(Also note ASTM References contained within OPSS.MUNI 412)***

#### ASTM A536-19, Standard Specification for Ductile Iron Castings.

#### ASTM C136/C136M-19, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

#### ASTM C117-17, Standard Test Method for Materials Finer Than75-um (No. 200) Sieve in Mineral Aggregates by Washing.

#### ASTM D2310-06 (2012), Standard Classification for Machine-Made” Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe

#### ANSI/ASTM D2992-18, Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass Fiber-Reinforced Thermosetting Resin) Pipe and Fitting

#### ASTM D698-12e2, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12400 ft-lbf/ft3 (600 kN-m/m3))

#### ASTM D2996-15, Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe

### ASME

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

#### ANSI/ASME B16.42-2016, Ductile Iron Pipe Flanges and Flanged Fittings.

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

### CSA

#### CAN/CSA B70-19, Cast Iron Soil Pipe, Fittings, and Means of Joining

#### CAN/CSA B137 Series-17, Thermoplastic Pressure Piping Compendium

### Ontario Underground Infrastructure Notification System Act, 2012

### Manufacturers Standardization Society

#### MSS SP-81-2017, Stainless-Steel or Stainless-Steel-Lined, Bonnetless, Knife Gate Valves with Flanged Ends

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

#### Design Guidelines for Sewage Works (2008)

## Definitions

### OPSS.MUNI 412.03 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).]

### *[Consultant Note: Ductile iron pipe is no longer typically used for new forcemains or replacement sections for existing forcemains. Consultant to amend if ductile iron is required to be included in this Section for project requirements.]*

## Shop Drawings

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

### Submit Shop Drawings for all forcemain fittings, valves, thrust restraints, couplings, 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 chambers in accordance with Section 02631 – Maintenance Holes, Catch Basins, Ditch Inlets and Valve Chambers.

## 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 flow periods, inclement weather or significant snow melt events approvals may be delayed (at no cost to the Region) to maintain overall system capacity for service to the community. [Consultant to discuss any planned interruptions to Regional or local municipal forcemains with Region staff to determine if there any restrictions to time of year, special considerations for service interruptions, bypass requirements, off peak or low flow periods, 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 York Region for scheduling operation of any valves or system modifications.

### Notify the Consultant a minimum of 48 hours in advance of any interruptions in service.

### Ensure scheduling of Work accounts for required measures as defined in Section 01550 – Traffic Control. Advise the local police department of any anticipated interference with the movement of traffic. 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 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 forcemain will be measured along the centreline of the forcemain 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 joint 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 forcemain:

#### 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]*

#### Removal of a plug or blow-off from an existing forcemain and connecting to a new forcemain shall be included in the unit price for Connection to Existing Forcemain in the Bid Form *[Consultant to add lump sum items for connections to existing forcemains]*.

# PRODUCTS

For Sewage Forcemain, **OPSS.MUNI 412** shall be followed with the following amendments:

*[The Consultant shall consider internal corrosion protection at high points in the forcemain where gas pocketing can occur and at gravity outfalls where the pipe runs partially full. This section is to be amended as necessary]*

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

### Ductile iron pipe is no longer typically used for new forcemains or replacement sections for existing forcemains. *[Consultant to amend if ductile iron is required to be included in this Section for project requirements.]*

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

##### The pipe class is to be as shown on 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. 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 forcemains.

##### Approved Suppliers:

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

###### DECAST Ltd.

###### Or Equivalent

## **412.05.04 Polyvinyl Chloride (PVC) Pressure Pipe** is amended by adding 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.

## **412.05.05 Polyethylene (PE) Pressure 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 forcemains shall be marked with a green line along the entire length.

##### Approved Suppliers:

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

###### Or Equivalent

## **412.05.06 Steel Pipe** is amended by adding the following:

### Steel pipe is not used for new forcemains or replacement sections for existing forcemains. [Consultant to amend if steel pipe is required to be included in this Section for project requirements.

## **412.05.07 Valves**

### **412.05.07.01 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 counter-clockwise 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 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.]*

### **412.05.07.01 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 plug valves as specified on the Contract Drawings.

##### Valves greater than 500 mm shall be plug 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.]*

### **412.05.07.02 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 B16.42, Class 150 unless indicated otherwise on the Contract Drawings.

#### Required pressure rating 1,035 kPa for 350 mm and larger gate valves or 1,725 kPa for 100 mm to 300 mm gate valves unless noted otherwise on the Contract Drawings.

#### Gate valves and operators, where required, shall be waterproof type suitable for continuous submergence duty. When required, gear-box 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.

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

#### The valve shall be suitable for sewage applications.

#### 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 interior and exterior coatings to be in compliance with the latest edition of AWWA C504 Section 4.4.

#### Tapping valves shall have an inlet flange conforming to ANSI B16.42, Class 150 for attachment to a tapping sleeve or cross, unless indicated otherwise on the Contract Drawings. Tapping valve sleeves shall be supplied with 304 stainless steel body, 304 stainless steel studs and fasteners unless otherwise specified.

#### All hardware shall be 316 stainless steel.

### **412.05.07.04 Knife Gate Valves** is deleted and replaced with the following:

#### **Bi-Directional Knife Gate Valves:**

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

##### Knife Gate valves shall be resilient seated, non-rising stem, solid one-piece cast [304 (CF8)] [316 (CF8M)] stainless steel body, suitable for bi-directional service, conforming to the latest revision of MSS SP-81 and AWWA C520. In order to ensure drip-tight shutoff, a stainless steel to elastomer seal must be attained for flows/pressures in both directions across the valve.

##### Valves shall have a perimeter seat and body casting shall not have any cavities in which debris can build up in.

##### Bi-Directional shut-off pressures as follows; 1035 kPa CWP for 50mm to 600mm and 690 kPa CWP for 750mm and larger.

##### Gate to be [304] [316] stainless steel and fully machined. Seat to be [Neoprene] [Buna-N] [other material].

##### The Knife Gate stem stanchions, gland flange, stem coupling, nuts, screws and bolts shall be constructed of stainless steel.

##### Full lug style body, suitable for drip-tight, dead end service with the downstream pipe flange removed. Lug style body to connect to ANSI B16.5, Class 150 flanges on both the inlet and outlet connections.

##### Packing gland to be made from PTFE material and complete with EPDM O-ring.

##### The valve stem shall be made of stainless steel.

##### Handwheel operated or complete with square nut and extension, where indicated. Bevel gear operators to be used on sizes 400mm and larger, as shown on the Contract Drawings.

##### Valve operators, when required, are to be a waterproof type suitable for continuous submergence duty. When required, gear box operators are to be grease-packed, enclosed gear type.

##### Optional Features:

###### Bonnets

###### Body flush ports

###### V-ports

#### **Uni-Directional Knife Gate Valves:**

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

##### Knife Gate valves shall be resilient seated, non-rising stem, solid one-piece cast [304 (CF8)] [316 (CF8M)] stainless steel body, suitable for uni-directional service, conforming to the latest revision of MSS SP-81 and AWWA C520. Internal casting shall incorporate gate wedges to allow for tighter shutoff between slide and seat.

##### Working shut-off pressures as follows; 1035 kPa CWP for 50mm to 600mm and 690 kPa CWP for 750mm and larger.

##### Gate to be [304] [316] stainless steel and fully machined. Seat to be [Neoprene] [Buna-N] [other material].

##### The Knife Gate stem stanchions, gland flange, stem coupling, nuts, screws and bolts shall be constructed of stainless steel.

##### Full lug style body, suitable for drip-tight, dead end service with the downstream pipe flange removed. Lug style body to connect to ANSI B16.5, Class 150 flanges on both the inlet and outlet connections, unless otherwise shown on the Contract Drawings.

##### Packing gland to be made from PTFE material and complete with EPDM O-ring.

##### The valve stem shall be made of stainless steel.

##### Handwheel operated or complete with square nut and extension, where indicated. Bevel Gear operators to be used on sizes 400mm and larger, as shown on the Contract Drawings.

##### Valve operators, when required, are to be a waterproof type suitable for continuous submergence duty. When required, gear box operators are to be grease-packed, enclosed gear type.

##### Optional Features:

###### Bonnets

###### Body flush ports

###### V-ports

### **412.05.07.05 Air Release and Air/Vacuum Valves** is deleted and replaced by the following:

[Consultant Note: Include either the traditional combination air valves or high performance combination air valves in the specification based on project specific requirements.]

#### **Combination Air Valves:**

##### Supply and install all Combination Air 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 sewage applications.

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

##### The valve body shall be flanged or threaded with full size NPT inlets and outlets equal to the nominal valve size, as shown on the Contract Drawings. If flanged, flanged ends shall be in accordance with ANSI B16.1, Class 125 or ANSI B16.42, Class 150 unless indicated otherwise on the Contract Drawings.

##### Single and Dual Extended body valves shall provide a through flow area equal to the nominal size. Floats shall be unconditionally guaranteed against failure including pressure surges. The resilient seat shall be replaceable and provide drip tight shut off to the full valve pressure rating.

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

##### All combination air 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.

#### **High Performance, Stainless Steel Body Combination Air Valves:**

##### Supply and install all combination air valves, size and location, as shown on the Contract Drawing. Valves shall be suitable for sewage applications.

##### Valves shall be designed, manufactured and tested in accordance with AWWA C512.

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

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

##### Valves shall be extended body, single chamber design with open ended hollow or solid cylindrical floats housed in a tubular stainless steel body with stainless steel flanged ends. Valve body shall be internally constructed to provide an unobstructed circular space between the floats and the inner valve body wall.

##### The valve inlet, outlet, and internal clearance shall each have a cross-sectional area greater than or equal to the cross-sectional area of the valve’s nominal size.

##### The valve shall have a built-in anti-surge device with relief openings designed to automatically prevent the development of hydraulic transients during start-up and pressure surges.

##### Valve floats to be made of UHMWPE. Valve floats designed to ensure the process fluid remains below the seating mechanism during pressure surges and when system pressure is at its maximum operating pressure.

##### The valve shall include an upper gauge port and a lower bleed port, of the same material as the valve body.

##### Air valve bodies shall be coated with an exterior-grade, UV-resistant coating recommended by the manufacturer to resist dirt and grease marks during installation and maintenance.

##### Valve designs employing hinges, levers, or ball type floats are specifically prohibited.

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

##### Valve sizes 50 mm and smaller shall have full size NPT inlets and outlets equal to the nominal valve size.

##### Larger valve sizes shall have bolted flanged inlets and threaded or flanged outlets. Inlet flanges shall be in accordance with ANSI B16.5, Class 150 flanges unless indicated otherwise on the Contract Drawings.

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

##### Optional Features:

###### Vacuum Check – Air discharge only, restrict the admittance of air back into the pipeline

###### Vacuum Only – prevents discharge of air from pipeline

###### Anti-Surge Bias Mechanism – where location of the valve necessitates a bias for the anti-surge feature

###### Internal smooth-bonded, low-density lining to further minimize adhesion of fats and debris

### **412.05.07.06 Eccentric Plug Valves** is added:

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

##### Eccentric plug valves shall be resilient seated, designed, manufactured, and tested in accordance with AWWA C517.

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

##### 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 or ANSI B16.42, Class 150 unless indicated otherwise on the Contract Drawings.

##### Valve shall be rated for operating pressure of 1,035 kPa CWP for 350mm valves and larger and 1,208 kPa CWP for 300 mm valves and smaller.

##### Valves shall be bubble tight at operating pressure in both directions.

##### Valve shall be designed with round or rectangular port with flow area of no less than 80% percent of pipe area.

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

##### Valve body to have holiday free interior and exterior, two-part liquid or fusion bonded epoxy coating, applied at the manufacturer’s facility in accordance with AWWA C550.

### **412.05.07.07 Ball Valves** is added:

#### 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] unless noted otherwise on the Contract Drawings.

## **412.05.08 Concrete** is deleted and replaced with the following:

### Concrete for thrust blocks and fitting and appurtenance supports shall be according to Section 03300 – Cast in Place Concrete with a nominal minimum 28-Day compressive strength of 20 MPa.

### The bearing area of thrust blocks is to be as indicated in the Contract Documents.

# EXECUTION

## **412.07.01 Site Preparation** is deleted and replaced with the following:

### Site preparation shall be according to Section 02230 – Site Preparation for Pipelines, Utilities and Associated Structures.

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

### Delivery and unloading of pipes and fittings at the Site shall cause the least possible delay to traffic.

### All pipes, fittings and gaskets that are unsound or damaged shall be removed from the Site and replaced. Faded and discoloured PVC pipe are unacceptable and shall be removed from Site and replaced.

### Mechanical equipment shall be used to unload the pipe.

### Materials shall be placed in a safe storage location and the manufacturer's handling and storage recommendations shall be followed.

### 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 Plastic 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.

### 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 forcemain 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.

## **412.07.06 Excavation** is deleted and replaced with the following:

### Excavation for placing forcemains shall be according to Section 02315 – Trenching, Backfilling and Compacting.

### Trench alignment and depth require the approval of the Consultant prior to placing bedding material and pipe.

### Do not allow the contents of any sewer or sewer connection to flow into the trench.

## **412.07.07 Support Systems** is deleted and replaced with the following:

### Support systems shall be according to Section 02260 – Excavation Support Systems.

## **412.07.08 Dewatering** is deleted and replaced with the following:

### Dewatering shall be according to Section 02240 – Dewatering General.

## **412.07.09 Temporary Protection Systems** is deleted and replaced with the following:

### The construction of temporary protection systems shall be according to Section 02261 – Excavation Temporary Support Systems.

## **412.07.10 Backfilling and Compacting** is amended by adding the following:

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

### Granular material in accordance with Section 02701 – Aggregates – General.

### Refer to York Region Standard Drawing [Consultant to enter applicable standard drawing numbers].

### 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 spring line of the pipe to at least 98% Standard Proctor Maximum Dry Density (SPMDD).

### Compact each layer from the spring line of the pipe to the underside of the backfill to at least 98% 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 90% SPMDD, unless indicated otherwise on the Contract Drawings.

### Place unshrinkable fill in accordance with Section 02315 – Excavation, Trenching and Backfilling, and as indicated on the Contract Drawings.

## **412.07.11 Installation of Pipe** is amended by adding the following:

### Avoid damage to machined ends of pipes when handling and moving pipe.

### Maintain the grade and alignment of pipes.

### Support pipe firmly over its entire length, except for clearance necessary at couplings. Do not use blocks to support pipe.

### Keep pipe and pipe joints free from foreign material.

### Avoid bumping the gasket and knocking it out of position, or contaminating it with dirt or other foreign material. Gaskets so disturbed are to be removed, cleaned, lubricated and replaced before jointing is attempted.

### Support pipes by means of hand slings or a crane as required in order to minimize the lateral pressure on the gasket and maintain concentricity until the gasket is properly positioned.

### Apply restraint to the pipe to ensure that the joints, when completed, are held in place, by tamping fill material under and alongside the pipe, or otherwise as approved by the Consultant.

### 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 and connections 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.

### 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 bore so that the weight of the pipe bears on the pipe-ends.

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

## **412.07.12 Jointing**

### **412.07.12.01 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. Do not use excavators for pushing pipe.

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

### **412.07.12.02 Ductile Iron Pipe**

#### **412.07.12.02 Mechanical Joints** is amended by the addition of the following:

##### 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.

#### **412.07.12.02.02 Bell and Spigot Joints** is amended by the addition of the following:

##### 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.

### **412.07.12.03 Concrete Pressure Pipe**

#### **412.07.12.03.01 Bell and Spigot Joints** is amended by the replacement of all contents with the following:

##### 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.

#### **412.07.12.03.02 Welded Joints** is added:

##### 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.

#### **412.07.12.03.03 Grouting Inside Joint Recesses** is added:

##### The inside joint recess of the concrete forcemain 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.

#### **412.07.12.03.04 Flanged Joints** is added:

##### 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.

#### **412.07.12.03.05 Mechanical Closure Couplings** is added:

##### 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.

### **412.07.12.04 Polyvinyl Chloride (PVC) Pressure Pipe** 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 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.

### **412.07.12.05 Polyethylene (PE) Pressure Pipe** is amended by the addition of the following:

#### Approved only in special applications.

### **412.07.12.06 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 contract 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 C205-18, Appendix A.

## **412.07.13 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.

## **412.07.15 Installation of Valves**

### **412.07.15.01 General** is amended by the addition of 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 Drawings. 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.

#### 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.

#### Supply and install all valve boxes in accordance with York Region Standard Drawing Nos. [Consultant to amend with applicable standard drawing number].

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

#### Approved Suppliers:

##### Bibby-Ste-Croix.

##### Cedar Infrastructure Products Inc.

##### Star-Pipe Products Inc.

##### Or Equivalent.

### **412.07.15.03 Mechanical Restrainers** is added.

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

#### Mechanical restrainers to conform to ANSI/AWWA C111/A21.11.

#### Ductile Iron per ASTM A536, Grade 65-45-12.

#### Flanges in accordance with AWWA C207, ANSI B16.5, Class 150, unless otherwise shown on the Contract Drawings.

### **412.07.15.04 Tracer Wire** is added.

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

#### Tracer wire is to be stranded copper (8 gauge), plastic coated, on all forcemains. 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 access hatch. 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.

### **412.07.15.05 Warning Mesh** is added.

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

### **412.07.15.06 Valve Chambers** is added.

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

## **412.07.16 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.

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

### Perform concrete Work in accordance with Section 03300 – Cast in Place Concrete.

### Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers and fittings and undisturbed ground or as directed by the Consultant.

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

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

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

## **412.07.17 Hydrostatic Testing** is deleted and replaced with the following:

##### Prior to filling the forcemain 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 forcemain, 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.

##### All PVC or Polyethylene forcemains 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 forcemain 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 forcemain 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. 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 (where applicable).

##### 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 forcemain 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, and de-chlorination for all portions of newly installed forcemains. 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.

### 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.

### Test pressure shall be 1,035kPa. [The Consultant shall provide the Operating, Surge and Test pressures for the forcemain 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 forcemain between line valves, stations or node points. The minimum pipe class must be indicated on the Contract Drawings for each segment of forcemain. 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. Forcemains 1200mm and greater shall be tested individually in sections between valves. Forcemains less than 1200mm shall be tested either in sections between valves or the completed forcemain 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 forcemain fails the hydrostatic test.

### Polyethylene Pipe shall be hydrostatically tested in accordance with OPSS.MUNI 412.07.17.02.

### 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 forcemain. 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 forcemain 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 and flushing shall be completed by a specialist Subcontractor who has a minimum of five years of demonstrated experience in providing services for water retaining structures and potable watermains. The specialist Subcontractor shall provide references for related work completed in Ontario upon request.

### The Contractor shall submit a comprehensive Site specific plan for the hydrostatic testing of the forcemain 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. The plan must be approved prior to commencement of testing. The plan shall include the following at a minimum:

#### 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 forcemain, soaking period (where applicable) and flushing.

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

#### A schematic drawing of the forcemain showing testing sequence, valve chambers, connections, discharge locations.

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

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

### Within 5 Business days following completion of flushing and testing, the Contractor or the specialist Subcontractor shall submit the following records:

#### 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 monitoring location were less than 1.0 NTU.

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

## **412.07.19 Site Restoration** is amended by the addition of the following:

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

## **412.07.20 Management of Excess Material** is amended by the addition of the following:

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

### Neutralization 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 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.

### Approved de-chlorinating agents are as follows:

#### Hydrogen Peroxide

#### Sulphur Dioxide

#### Sodium Sulphite

#### Sodium Metabisulphite

## **412.07.21 Valve Chambers** is added:

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

## **412.07.22 Confirm Continuity of Tracer Wire** is added:

### 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 forcemains 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.

## **412.09 Measurement for Payment**

### This OPSS section is not used, refer to Section 1.10 of this specification Section.

## **412.10 Basis of Payment**

### This OPSS section is not used.

**END OF SECTION**