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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | November 26, 2007 | Correct document uploaded. |
| 3 | January 19, 2011 | Correct document re-uploaded, updated cross references |
| 4 | December 16, 2014 | First draft review comments (AV). |
| 5 | June 8, 2015 | Second Draft for Review (AV) |
| **6** | **September 16, 2015** | **Updated, Finalized Specification – Reference eDOCS #5823643-v4 (AV)** |
| 7 | March 18, 2016 | Updated AWWA Standards (AV) |
| 8 | March 1, 2017 | Updated for references to NSF 372. (AV) |
| 9 | May 18, 2017 | Updated references to ASME B16.3-2016, ASTM A74-16, ASTM A197/A197M-00 (2015), ASTM A307-14e1, ASTM B61-15, ASTM B62-17, ASTM B88-16, ASTM B194-15, ASTM B139/B139M-12(2017), ASTM D1785-15, ASTM D2466-15, ASTM D2855-15, ASTM F1412-16, CISPI 301-12 |
| 10 | August 16, 2017 | Clarified requirements for some cited products (AAM) |

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

## 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.

### *[List Sections specifying related requirements.]*

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

#### Section 01300 – Submittals

#### Section 01561 – Environmental Protection.

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

#### Section 02511 – Watermains

#### Section 02555 – Cathodic Protection.

#### Section 07620 – Sheet Metal Flashing

#### Section 07700 – Roof Specialties and Accessories

#### Section 15080 – Process Piping Insulation

#### Section 15200 – Process Piping and Fittings

#### Section 15201 – Piping Support Systems

#### Section 15205 – Process Valves and Operators

#### Section 15955 – Piping Leakage Testing

## References

*[Delete .1 if Section 01060 – Regulatory Requirements is included in Contract Documents.]*

### Comply with the latest edition of the following statutes, codes, standards, and all amendments thereto:

#### American National Standards Institute (ANSI):

##### ANSI/ASME B1.2-1983 (R2007), Gages and Gaging for Unified Screw Threads.

##### ASME B16.1-2010, Gray Iron Pipe Flanges and Flanged Fittings.

##### ASME B16.3-2016, Malleable Iron Threaded Fittings: Classes 150 and 300.

##### ASME B16.5-2013, Pipe Flanges and Flanged Fittings NPS ½ through NPS 24 Metric/Inch Standard.

##### ASME B16.9-2012, Factory-Made Wrought Steel Buttwelding Fittings.

##### ASME B16.12-2009 (R2014), Cast Iron Threaded Drainage Fittings.

##### ASME B16.22-2013, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

##### ANSI/ASSE 1050-2009, Performance Requirements for Stack Air Admittance for Sanitary Drainage Systems.

#### American Welding Society

##### AWS B2.1.001, Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel. *[Consultant to confirm applicability of Standard and amend as required]*

#### American Society for Testing and Materials (ASTM):

##### ASTM A47/A47M-99 (2014), Standard Specification for Ferritic Malleable Iron Castings.

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

##### ASTM A74-16, Standard Specification for Cast Iron Soil Pipe and Fittings.

##### ASTM A105/A105M-14, Standard Specification for Carbon Steel Forgings for Piping Applications.

##### ASTM A126-04 (2014), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

##### ASTM A179/A179M-90a (2012), Standard Specification for Seamless Cold-Drawn Low-Carbon Steel Heat-Exchanger and Condenser Tubes.

##### ASTM A181/A181M-14, Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.

##### ASTM A197/A197M-00 (2015), Standard Specification for Cupola Malleable Iron.

##### ASTM A234/A234M-14, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

##### ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

##### ASTM A518/A518M-99 (2012), Standard Specification for Corrosion-Resistant High-Silicon Iron Castings.

##### ASTM A536-84 (2014), Standard Specification for Ductile Iron Castings.

##### ASTM A563-07a (2014), Standard Specification for Carbon and Alloy Steel Nuts.

##### ASTM A861-04 (2013), Standard Specification for High-Silicon Iron Pipe and Fittings.

##### ASTM B32-08 (2014), Standard Specification for Solder Metal.

##### ASTM B61-15 Standard Specification for Steam or Valve Bronze Castings.

##### ASTM B62-17, Standard Specification for Composition Bronze or Ounce Metal Castings.

##### ASTM B75/B75M-11, Standard Specification for Seamless Copper Tube.

##### ASTM B88-16, Standard Specification for Seamless Copper Water Tube.

##### ASTM B98/B98M-13, Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.

##### ASTM B127-05 (2014), Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.

##### ASTM B139/B139M-12(2017), Standard Specification for Phosphor Bronze Rod, Bar, and Shapes.

##### ASTM B164-03 (2014), Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.

##### ASTM B194-15, Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar.

##### ASTM B306-13, Standard Specification for Copper Drainage Tube (DWV).

##### ASTM C564-14, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

##### ASTM D1784-11, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

##### ASTM D1785-15, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

##### ASTM D2000-12, Standard Classification System for Rubber Products in Automotive Applications.

##### ASTM D2466-15, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

##### ASTM D2564-12, Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.

##### ASTM D2855-15, Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

##### ASTM E438-92 (2011), Standard Specification for Glasses in Laboratory Apparatus.

##### ASTM F1412-16, Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems.

#### American Water Works Association (AWWA):

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

##### AWWA C110/A21.10-12, Ductile-Iron and Gray-Iron Fittings.

##### AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

##### AWWA C115/A21.15-11, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.

##### AWWA C151/A21.51-09, Ductile-Iron Pipe, Centrifugally Cast.

##### AWWA C203-15, Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.

##### AWWA C207-13, Steel Pipe Flanges for Waterworks Service-Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).

##### AWWA C606-15, Grooved and Shouldered Joints.

##### AWWA C651-14, Disinfecting Water Mains.

#### Plumbing and Drainage Institute (PDI)

##### PDI-WH 201 (R2010), Water Hammer Arresters.

#### NSF International (NSF)

##### NSF 372-2011: Drinking Water System Components – Lead Content

##### NFS 60 Drinking Water Treatment Chemicals – Health Effects

##### NSF 61 Drinking Water System Components – Health Effects

#### Underwriters Laboratory (UL) *[Consultant to review and add relevant sections of UL requirements to the specifications as required]*

#### Manufacturers Standardization Society (MSS):

##### MSS SP-58-2009, Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation (ANSI-approved American National Standard).

#### Cast Iron Soil Pipe Institute (CISPI):

##### CISPI 301-12, Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

#### Conform with the Building Code Act, 1992, O.Reg. 332/12: Building Code, (applicable Plumbing Code sections) and the additional requirements of provincial and local authorities having jurisdiction.

## Measurement and Payment

*[Choose one of the following payment language provisions that best suits the individual project.*

*If this Section is not specifically referenced by an item in the Bid Form, please use the following language:*

.1 The work of this Section will not be measured separately for payment. All costs associated with the work of this Section shall be included in the Contract Price.

*OR If this Section is specifically referenced in the Bid Form, use the following language and identify the relevant item in the Bid Form:*

.1 All costs associated with the work of this Section shall be included in the price(s) for Item No(s). \_\_\_ in the Bid Form.

*If the work of this Section is to be measured and paid for by several different methods, please amend the standard wording given above to reflect the different methods of measurement and payment.*]

## Submittals

### Shop Drawings, in accordance with Section 01300 - Submittals:

#### Product data sheets.

#### Drawings showing changes in location of fixtures or equipment that are advisable in the opinion of the Contractor.

#### Isometric riser diagrams.

### Quality Control Submittals:

#### Changes in location of equipment or piping that affect connecting or adjacent work, before proceeding with the work.

#### Complete list of products proposed for installation.

#### Test records produced during testing.

# PRODUCTS

## Piping

### Piping Schedule: Refer to Section 15200 - Process Piping and Fittings [B: Article—Supplements.

### Piping Material: Refer to Piping Data Sheet(s) *[to be provided by Consultant]*, Article—Supplements *[to be provided by Consultant if applicable]* [and Section 15200 - Process Piping and Fittings].

## Hose Valves and Hydrants

### HV-[ ], Post Hydrant:

#### Bronze casing, [ ] mm inlet and outlet, for [ ] 30 cm of bury.

#### Manufacturers and Products:

##### Jay R. Smith Mfg. Co.; Figure 5910. *[Consultant to confirm]*

##### Zurn Industries, LLC; ZN-13. *[Consultant to confirm]*

##### Approved Equivalent.

### HV-[ ], Wall Hydrant:

#### Non-freeze exposed with chrome plated face, integral vacuum breaker, bronze casing, T handle key, and 20 mm inlet and hose connection.

#### Manufacturers and Products:

##### Jay R. Smith Mfg. Co.; Figure 5609. *[Consultant to confirm]*

##### Zurn Industries, LLC; 1310. *[Consultant to confirm]*

##### Approved Equivalent.

### HV-[ ], Wall Hydrant:

#### Non-freeze box type with chrome-plated face, integral vacuum breaker, bronze casing, T handle key, and 20 mm inlet and hose connection.

#### Manufacturers and Products:

##### Jay R. Smith Mfg. Co.; Figure 5509. *[Consultant to confirm]*

##### Zurn Industries, LLC; ZN-1303. *[Consultant to confirm]*

##### Approved Equivalent.

### HV-[ ], Hydrant:

#### Sill faucet with removable T handle, polished chrome finish, and 20 mm inlet and hose connection.

#### Manufacturers and Products:

##### Chicago Faucets, a Geberit Company; No. 387, with No. E27 vacuum breaker. *[Consultant to confirm]*

##### Acorn Engineering Company; No. 8121. *[Consultant to confirm]*

##### Approved Equivalent.

### HV-[ ], Hose Valve:

#### Cast bronze globe valve, 25 mm size, with NPT screwed ends, union bonnet, rising stem, Teflon disc, hand wheel, and NPT x NST hose thread adapter outlet connection.

#### Rated 1,034 kPa service water pressure, 2,069 kPa WOG.

#### Manufacturers and Products:

##### Crane Co.; Stockham; Figure B 22T. *[Consultant to confirm]*

##### Crane Co.; Catalog No. 7TF. *[Consultant to confirm]*

##### Approved Equivalent.

### HV-[ ], Hose Valve:

#### Cast bronze globe valve, 40 mm size, with NPT screwed ends, union bonnet, rising stem, Teflon disc, hand wheel, and NPT x NST hose thread adapter outlet connection.

#### Rated 1,034 kPa SWP, 2,069 kPa WOG.

#### Manufacturers and Products:

##### Crane Co.; Stockham; Figure B 22T. *[Consultant to confirm]*

##### Crane Co.; Catalog No. 7TF. *[Consultant to confirm]*

##### Approved Equivalent.

### HV-[ ], Hose Valve:

#### Cast bronze globe valve, 50 mm size, with NPT screwed ends, union bonnet, rising stem, Teflon disc, hand wheel, and NPT x NST hose thread adapter outlet connection.

#### Rated 1,034 kPa SWP, 2,069 kPa WOG.

#### Manufacturers and Products:

##### Crane Co; Stockham; Figure B 22T. *[Consultant to confirm]*

##### Crane Co.; Catalog No. 7TF. *[Consultant to confirm]*

##### Approved Equivalent.

### HV-[ ], Hose Valve:

#### Cast bronze globe valve, 65 mm size, with NPT screwed ends, union bonnet, rising stem, Teflon disc, hand wheel, and NPT x NST hose thread adapter outlet connection.

#### Rated Class 150 SWP, Class 300 WOG.

#### Manufacturers and Products:

##### Crane Co.; Stockham; Figure B 22T. *[Consultant to confirm]*

##### Crane Co.; Catalog No. 7TF. *[Consultant to confirm]*

##### Approved Equivalent.

### YH-[ ], Yard Hydrants (Freeze-proof):

#### Material: Removable bronze nozzle with standard pipe thread, variable flow plunger, galvanized steel pipe operating rod and casing, and automatic drain.

#### Bury Depth: [ ]feet.

#### Manufacturer and Product:

##### Woodford Manufacturing Co., division of WCM Industries Inc.; Models MK 7 (20 mm), MK 71 (25 mm), and MK 715 (40 mm). *[Consultant to confirm]*

##### Approved Equivalent.

### YH-[ ], Sanitary Yard Hydrants (Freeze-proof):

#### Freestanding freeze-proof sanitary yard hydrant with automatic draining, integral ANSI/ASSE 1050-2009 compliant double check backflow preventer, diverter spout, and drainage reservoir below frost line.

#### The entire working portion of the hydrant shall be removable without excavation.

#### Bury Depth: [ ] m.

#### Manufacturer and Product:

##### Woodford Manufacturing Co., division of WCM Industries Inc.; Model S4H (25 mm). *[Consultant to confirm]*

##### Approved Equivalent.

## Pipe Hangers and Supports

### As specified in Section 15201 - Piping Support Systems.

### Hangers:

#### Clevis Type: MSS SP-58-2009, Type 1 or 6. *[Consultant to confirm]*

##### Anvil International Company; Figure 104 or 260, sizes 12 mm through 750 mm. *[Consultant to confirm]*

##### Eaton Corporation; B Line; Figure B3198H or B3100, sizes 10 mm through 750 mm. *[Consultant to confirm]*

##### Approved Equivalent.

#### Hinged Split-Ring Pipe Clamp: MSS SP-58-2009, Type 6 or 12. *[Consultant to confirm]*

##### Anvil International Company; Figure 104, sizes 20 mm through 200 mm. *[Consultant to confirm]*

##### Eaton Corporation; B Line; Figure B3198H, sizes 10 mm through 75 mm. *[Consultant to confirm]*

##### Approved Equivalent.

#### Hanger Rods, Clevises, Nuts, Sockets, and Turnbuckles: In accordance with MSS SP-58-2009.

#### Attachments:

##### I Beam Clamp: Concentric loading type, MSS SP 58-2009 , Type 21, 28, 29, or 30, which engage both sides of flange. *[Consultant to confirm]*

##### Concrete Insert: MSS SP-58-2009, Type 18, continuous channel insert with load rating not less than that of hanger rod it supports. *[Consultant to confirm]*

### Saddle Supports:

#### Pedestal Type: Schedule 40 pipe stanchion, saddle, and anchoring flange.

##### Non-adjustable Saddle: MSS SP 58, Type 37 with U bolt. *[Consultant to confirm]*

###### Anvil International Company; Figure 259, sizes 100 mm through 900 mm. *[Consultant to confirm]*

###### Eaton Corporation; B Line; Figure B3090, sizes 65 mm through 900 mm. *[Consultant to confirm]*

###### Approved Equivalent.

##### Adjustable Saddle: MSS SP-58-2009, Type 38 without clamp. *[Consultant to confirm]*

###### Anvil International Company; Figure 264, sizes 65 mm through 900 mm. *[Consultant to confirm]*

###### Eaton Corporation; B Line; Figure B3093, sizes 65 mm through 900 mm. *[Consultant to confirm]*

###### Approved Equivalent.

### Wall Brackets:

#### Welded Steel Bracket: MSS SP-58, Type 33 (heavy-duty). *[Consultant to confirm]*

##### Anvil International Company; Figure 199, 1360 kg rating. *[Consultant to confirm]*

##### Eaton Corporation; B Line; Figure B3067, 1360kg rating. *[Consultant to confirm]*

##### Approved Equivalent.

#### One Hole Clamp: Anvil; Figure 126, sizes 10 mm through 100 mm.

#### Channel Type:

##### Atkore International Inc., Unistrut *[Consultant to confirm]*

##### Anvil International Company; Power Strut. *[Consultant to confirm]*

##### Eaton Corporation; B Line; Strut System. *[Consultant to confirm]*

##### Commercial Industrial Supply; Aickinstrut (FRP). *[Consultant to confirm]*

##### Approved Equivalent.

### Pipe Clamps:

#### Riser Clamp: MSS SP-58-2009, Type 8.*[Consultant to confirm]*

##### Anvil International Company; Figure 261, sizes 20 mm through 600 mm. *[Consultant to confirm]*

##### Eaton Corporation; B Line; Figure B3373, sizes 12 mm through 750 mm. *[Consultant to confirm]*

##### Approved Equivalent.

### Channel Type Support Systems:

#### Channel Size: 12 gauge, 41 mm wide minimum steel, 38 mm wide, minimum FRP.

#### Members and Connections: Design for all loads with safety factor of 5.

#### Manufacturers:

##### Eaton Corporation; B Line; Strut System. *[Consultant to confirm]*

##### Atkore International Inc., Unistrut *[Consultant to confirm]*

##### Anvil International Company; Power Strut. *[Consultant to confirm]*

##### Atkore International Inc., Aickinstrut (FRP System). *[Consultant to confirm]*

##### Approved Equivalent.

### Accessories:

#### Insulation Shields:

##### Type: Galvanized steel or stainless steel, MSS SP-58, Type 40. *[Consultant to confirm]*

##### Manufacturers and Products:

###### Anvil International Company; Anvil; Figure 167, sizes 10 mm through 600 mm. *[Consultant to confirm]*

###### Eaton Corporation; B Line; Figure B3151, sizes 10 mm through 600 mm. *[Consultant to confirm]*

###### Approved Equivalent.

#### Welding Insulation Saddles:

##### Type: MSS SP-58, Type 39. *[Consultant to confirm]*

##### Manufacturers and Products:

###### Anvil International Company; Anvil; Figure Series 160, sizes 25 mm through 900 mm. *[Consultant to confirm]*

###### Eaton Corporation; B Line; Figure Series B3160, sizes 10 mm through 600 mm. *[Consultant to confirm]*

###### Approved Equivalent.

### Galvanize hangers, rods, clamps, protective shields, and hanger accessories.

### Trapeze Hangers:

#### Assembly consisting of structure attachments with rod size dependent upon total weight supported, and spacing of assemblies determined by minimum pipe size included in group supported.

#### Trapeze Horizontal: Structural angle or channel section of sufficient size to prevent measurable sag between rods.

#### Manufacturers:

##### Atkore International Inc., Unistrut. *[Consultant to confirm]*

##### Eaton Corporation; B-Line; Strut System. *[Consultant to confirm]*

##### Anvil International Company; Anvil-Strut, Power-Strut. *[Consultant to confirm]*

##### Commercial Industrial Supply; Aickinstrut (FRP System). *[Consultant to confirm]*

##### Approved Equivalent.

## Insulation

### As specified in Section 15080 – Process Piping Insulation.

### Indoor Piping Systems:

#### Piping:

##### Rigid fibreglass insulation wrapped with factory-applied, kraft reinforced vapor barrier jacket with pressure-sensitive, self-sealing lap, UL rated.

##### Circumferential Joints: Matching pressure-sensitive butt strips.

##### Manufacturers and Products:

###### Owens-Corning Canada LP; Fiberglass ASJ/SSL 11. *[Consultant to confirm]*

###### Johns Manville, a Berkshire Hathaway Co.; Micro Lok 650 with AP T jacket. *[Consultant to confirm]*

###### Approved Equivalent.

#### Fittings: Pre-molded insulation or mitered segments and pre-molded PVC covers.

##### Manufacturers:

###### Brock White Canada Co.; Zeston. *[Consultant to confirm]*

###### Speedline Corporation. *[Consultant to confirm]*

###### Approved Equivalent.

#### Inserts: Pre-formed rigid pipe insulation of thickness equal to adjoining insulation, 250 mm long, and including vapor barrier.

### Outdoor Piping Systems:

#### Piping and Insulation Cover: Aluminum jacket 0.4 mm thick.

#### Fitting Covers: Matching preformed aluminum jackets, two-piece elbows and flange covers, secured with stainless steel bands.

##### Manufacturers:

###### Childers Specialty Construction Brands, Inc. *[Consultant to confirm]*

###### Brock White Canada Co.; Permaclad. *[Consultant to confirm]*

###### Approved Equivalent.

## Valves

### [Refer to Section 15205 - Process Valves And Operators.]

### General:

#### Furnish complete with necessary operating hand wheels, chain wheels, extension stems, floor stands, worm and gear operators, operating nuts, chains, counters and wrenches.

#### Renewable Parts Including Discs, Packing, and Seats: Types shall be as recommended by valve manufacturer for intended service.

#### Units shall have name of manufacturer and size of valve cast on the body or bonnet or shown on a permanently attached plate in raised letters.

### Design Features:

#### Brass and bronze components, including appurtenances in contact with water.

#### Alloys containing less than 16 percent zinc and 2 percent aluminum.

#### Alloys shall be of the following ASTM designations:

##### ASTM B61-15, ASTM B62-17, ASTM B98/B98M-13 (Alloy A, B, or D), ASTM B139/B139M-12(2017) (Alloy A), ASTM B164-03 (2014), ASTM B194-15, and ASTM B127-05 (2014).

##### Stainless steel Alloy 18 8 may be substituted for bronze as an option with approval of Consultant.

#### Gland Bolts on Iron Body Valves: Bronze, fitted with brass nuts.

### Valve Operators:

#### Open by turning counterclockwise.

#### Worm and Gear Operators On Manually Operated Valves: Totally enclosed design, so proportioned as to permit operation of valve under full operating head with maximum pull of 18 kg on hand wheel or crank.

#### Self-locking type to prevent the disc or plug from creeping.

#### Self-Locking Worm Gears:

##### One-piece design of gear bronze material, accurately machine cut.

##### Worm: Hardened alloy steel, with thread ground and polished.

##### Reduction gearing shall run in a proper lubricant.

#### Galvanize hand wheels.

### Gate Valves:

#### 75 mm and Smaller for Water and Air Services:

##### All-bronze with screwed bonnet, single solid wedge gate with non-rising stem, and hand wheel operator.

##### Rated Class 125 SWP, Class 200 WOG.

##### Manufacturers for Threaded Ends:

###### Crane Co.; No. 438. *[Consultant to confirm]*

###### Crane Co.; Stockham; B 103. *[Consultant to confirm]*

###### Approved Equivalent.

##### Manufacturers for Soldered Ends:

###### Crane Co.; No. 1324. *[Consultant to confirm]*

###### Crane Co.; Stockham; B 104. *[Consultant to confirm]*

###### Approved Equivalent.

#### 100 mm and Larger for Water and Air Services:

##### Iron body, bronze mounted, with flanged ends, solid wedge gate with non-rising stem, and hand wheel operator.

##### Rated Class 125 SWP, Class 200 WOG.

##### Manufacturers and Products:

###### Crane Co.; No. 461. *[Consultant to confirm]*

###### Crane Co.; Stockham; G 612. *[Consultant to confirm]*

###### Approved Equivalent.

### Ball Valves:

#### 50 mm and Smaller for Water and Air Services:

##### All-bronze, top entry body type and straight-through flow passage, with Buna N seats and O ring seals with hand lever operator.

##### Rated Class 200 CWP, Class 150 WOG.

##### Manufacturers for Threaded Ends:

###### Crane Co.; Catalog No. 2330TF. *[Consultant to confirm]*

###### Cincinnati Valve Company; Lunkenheimer; Figure 700SB. *[Consultant to confirm]*

###### Approved Equivalent.

##### Manufacturers for Soldered Ends:

###### Crane Co.; Gem No. 2182. *[Consultant to confirm]*

###### NIBCO Inc.; Figure S 580. *[Consultant to confirm]*

###### Approved Equivalent.

#### 75 mm and Smaller for Vacuum Service:

##### Brass body and trim, replaceable double TFE seals and seats.

##### Furnish screwed ends and rate for service to 0.01 micron.

##### Manufacturers and Products:

###### Metso Automation; Jamesbury; Style A. *[Consultant to confirm]*

###### Flowserve Corporation; Worchester; Series 400. *[Consultant to confirm*]

###### Approved Equivalent.

#### Thermoplastic Ball Valves 50 mm and Smaller for Water Service:

##### Rated 1,034 kPa at 87 degrees Celsius, with ASTM D1784-11, Type I, Grade 1 polyvinyl chloride (PVC) body, ball, and stem.

##### End entry, double union design, with replaceable Teflon seats and Viton or Teflon “O” ring stem seals.

##### Furnish with hand lever operator.

##### Single union ball valves with flanged ends drilled to ANSI Class 150 Standard are acceptable.

##### Manufacturers:

###### Asahi/America Inc. *[Consultant to confirm]*

###### *[Consultant to provide two additional acceptable products]*

###### Approved Equivalent.

#### Deionized Water Ball Valve (10 to 50 mm):

##### True Union ball valve, size as shown on the Contract Drawings.

##### Manufactured from virgin polypropylene using no antioxidants, plasticizers, or pigments.

##### Socket-weld type electrically fused. Factory sealed in a protective wrap.

##### Minimum pressure rated of 965 kPa at 21 degrees Celsius.

##### Manufacturers:

###### *[Consultant to provide two additional acceptable products]*

###### Chemline Plastics Ltd. *[Consultant to confirm]*

###### Approved Equivalent.

### Globe Valves:

#### 75 mm and Smaller:

##### Bronze body, replaceable composition disc, screwed ends, union bonnet, inside screw rising stem, and TFE disc.

##### Rated Class 150 SWP and Class 300 WOG.

##### Manufacturers and Products:

###### Crane Co.; No. 7TF. *[Consultant to confirm]*

###### Crane Co.; Stockham; Figure B 22. *[Consultant to confirm]*

###### Approved Equivalent.

#### 100 mm Through 200 mm:

##### Iron body, bronze mounted with flanged ends, renewable composition disc, outside screw and yoke, bolted bonnet, and hand wheel operator.

##### Rated Class 125 SWP, Class 200 WOG.

##### Manufacturers and Products:

###### Crane Co.; Stockham; G 514T. *[Consultant to confirm]*

###### Crane Co; Catalog No. 351. *[Consultant to confirm]*

###### Approved Equivalent.

### Angle Valves 75 mm and Smaller:

#### Bronze body, threaded ends, union bonnet, and rising stem.

#### Rated Class 150 SWP and Class 300 WOG.

#### Manufacturers for Threaded End:

##### Crane Co.; No. 17TF. *[Consultant to confirm]*

##### Crane Co.; Stockham; Figure B 222. *[Consultant to confirm]*

##### Approved Equivalent.

### Check Valves 75 mm and Smaller:

#### Bronze body, wye pattern, threaded ends and cap, regrinding seat, and swing type disc.

#### Rated Class 125 SWP, Class 200 WOG.

#### Manufacturers and Products:

##### Crane Co.; No. 37. *[Consultant to confirm]*

##### Walworth; Figure 406. *[Consultant to confirm]*

##### Approved Equivalent.

### Balancing Valves (Recirculating Hot Water):

#### Bronze, calibrated balancing type with provisions for connecting a portable differential pressure meter. Meter connections shall have built in check valves.

#### An integral pointer shall register the degree of valve opening.

#### Construct with internal seals to prevent leakage around rotating element.

#### Rated for 862 kPa working pressure at a maximum temperature of 120 degrees Celsius.

#### Furnish one pressure gauge type readout meter in carrying case.

#### Furnish with preformed polyurethane insulation valve enclosure, suitable for use on hot water systems.

#### Manufacturers and Products:

##### Xylem Inc.; Bell & Gossett; No. CB circuit setter. *[Consultant to confirm]*

##### Taco Inc.; Series 790. *[Consultant to confirm]*

##### Approved Equivalent.

### Water Pressure Reducing Valves 12 mm Through 65 mm:

#### Spring controlled, with a neoprene diaphragm.

#### Sizes and Ratings:

##### PRV-[ ] [ ] 12 mm IPS, maximum [ ] L/s, with inlet pressure[ ] kPa; outlet pressure [ ] kPa.

#### Manufacturers and Products:

##### Emerson Electric Co.; Fisher; Type 75. *[Consultant to confirm]*

##### Watts Water Technologies; No. 223 S. *[Consultant to confirm]*

##### Approved Equivalent.

### Gauge Cock Valves 3 mm To Class 125:

#### Bronze body, hexagon male and female ends and tee head.

#### Rated for 125 pound SWP.

#### Manufacturers and Products:

##### John C. Ernst Gage Co., Inc.; [ ].*[Consultant to confirm]*

##### Cincinnati Valve Company; Lunkenheimer. *[Consultant to confirm]*

##### Approved Equivalent.

### Manual Air Vent Valves:

#### With coin-operated air vent.

#### Manufacturers and Products:

##### Xylem Inc.; Bell & Gossett No. 4V. *[Consultant to confirm]*

##### Eddington Industries LLC; Dole; No. 9. *[Consultant to confirm]*

##### Approved Equivalent.

### Solenoid Valves:

#### Two-way, full line size, normally [closed,] [open,] [ ] kPa body pressure, [ ]kPa operating differential, for use with cold water.

#### Suitable for 115 volt, 60 Hz, ac power supply.

#### Manufacturers:

##### Asco Valve Inc. *[Consultant to confirm]*

##### Parker Hannifin Corp.; *[Consultant to confirm]*

##### Approved Equivalent.

### Thermostatic Mixing Valve Assembly:

#### Function: Provide tempered water at 0.2 to 3.15 L/s.

#### Components:

##### High flow mixing valve for 1 to 3.15 L/s.

##### Low flow mixing valve for 0.2 to 0.45 L/s.

##### Pressure reducing valve.

##### Pressure gauge.

##### Isolation valve.

##### Thermometer.

##### Pipe fittings.

##### Heavy-gauge steel cabinet with access door and manufacturer's standard baked enamel finish.

#### Inlets: One each, 20 mm NPT, cold and hot water.

#### Outlets: 25 mm NPT.

#### Self-contained; no electrical requirements.

#### Performance: With 60 degrees Celsius hot inlet and 16 degrees Celsius cold inlet, deliver 38 degrees Celsius at inlet pressures between 210 and 690 kPa. Set outlet at 35 degrees Celsius.

#### Compliant with ASME A112.18.1/CSA B125.1, ASSE 1017, CSA B125.3, NSF 372-11, NSF 61.

#### Manufacturer and Product:

##### *[Consultant to provide current acceptable product]*

##### Symmons Industries Inc., TemControl Series. *[Consultant to confirm]*

##### Approved Equivalent

## Miscellaneous Piping Specialties

### Strainers for Water Service:

#### Iron body, Y pattern, Class 125 rated, with screwed bronze or bolted iron cap.

#### Screen: Heavy-gauge stainless steel or monel, 30 mesh.

#### Manufacturers and Products:

##### Crane Co.; No. 988 1/2. *[Consultant to confirm]*

##### Asco Valve Inc.; Red Hat. *[Consultant to confirm*]

##### Approved Equivalent.

### Flexible Connectors for Stainless Steel Gas Lines:

#### Corrugated, Type 316 stainless steel hose, with 250 mm live length and Type 316 stainless steel male NPT pipe connectors at each end.

#### Manufacturers:

##### Senior Flexonics Ltd. *[Consultant to confirm]*

##### North American Mfg. Co. *[Consultant to confirm]*

##### Approved Equivalent.

### Vacuum Breakers 50 mm and Smaller:

#### Angle type, as required.

#### ASSE compliant

#### Manufacturers:

##### Watts Water Technologies; *[Consultant to confirm]*

##### Approved Equivalent.

### Water Hammer Arrestors:

#### Compliant with PDI WH-201 (2010), ANSI A112.26.1M and ASSE 1010, ANSI Series 300 for flanged joints.

#### Manufacturers and Products:

##### Jay R. Smith Mfg. Co.; Series 5000. *[Consultant to confirm]*

##### Zurn Industries, LLC; Z-1700. *[Consultant to confirm]*

##### P.P.P. Inc., SS Series. *[Consultant to confirm]*

##### Approved Equivalent.

### Water Hose:

#### Furnish[ ] 15 m length(s) of 25 mm and [ ] 15 m length(s) of 40 mm, EPDM black cover and EPDM tube, reinforced with two textile braids. Furnish each length with brass male and female NST hose thread couplings to fit hose nozzle(s) and hose valve(s) specified.

#### Rated minimum working pressure of 1,369 kPa.

#### Manufacturers:

##### Goodyear Tire & Rubber Company. *[Consultant to confirm]*

##### Eaton Corporation; Boston industrial hose products. *[Consultant to confirm]*

##### Approved Equivalent

### Hose Nozzles:

#### Furnish [ ] 25 mm and [ ] 40 mm cast brass satin finish nozzle(s) with adjustable fog, straight stream, and shut off features and rubber bumper. Provide nozzle(s) with female NST hose thread.

#### Manufacturers:

##### Fire-End & Crocker Corporation *[Consultant to confirm]*

##### Elkhart Brass Manufacturing Company Inc. *[Consultant to confirm]*

##### Approved Equivalent

### Sleeves:

#### Compliant with ASME A112 [Consultant to provide appropriate detail for ASME A112]

#### Manufacturers and Products:

##### Jay R. Smith Mfg. Co.; Figure 1720. *[Consultant to confirm]*

##### Zurn Industries, LLC; Z198. *[Consultant to confirm]*

##### Approved Equivalent

### Flashing Sleeves for Roof Penetrations:

#### Built-Up Bituminous Roofing: Fabricate of lead as specified in Section 07620 - Sheet Metal Flashing.

#### Single-Ply Membrane Roofing: Pipe seals as specified in Section 07700 - Roof Specialties and Accessories.

### Insulating Dielectric Unions and Flanges:

#### Galvanically compatible with piping to which attached and pressure ratings suitable for system working pressures.

#### Unions 50 mm and Smaller: Screwed or solder-joint type.

#### Unions 65 mm and Larger: Flanged type, complete with bolt insulators, dielectric gasket, bolts, and nuts.

#### Manufacturers:

##### Epco Sales, Inc., Cleveland, OH.

##### Capitol manufacturing, a member of The Phoenix Forge Group; Insulation Unions.

##### Approved Equivalent.

### Joint Solder:

#### 95 5 wire solder, ASTM B32-08 (2014), Grade 95 TA.

#### Do not use cored solder.

### Pipe Joint Sealer:

#### Compound insoluble in water [or Teflon tape];

#### Approved by NSF (NSF 60 or NSF 61 or NSF 372 as applicable) for use in potable water.

### Rubber Gaskets: ASTM C564-14.

## Metering and Measuring Devices

### Thermometers:

#### Adjustable angle, red reading non-mercury type with 225 mm case and scale range in degrees Celsius, as shown.

#### Furnish with 90 mm stem length and separable NPT brass thermowell.

#### Manufacturers:

##### Ashcroft Inc.; Weksler. *[Consultant to confirm]*

##### H.O. Trerice Co.; *[Consultant to confirm]*

##### Approved Equivalent.

### Pressure Gauges:

#### 90 mm gauge size, 0 to 690 kPa, 0 to 1,103 kPa range, steel case, glass crystal, brass movement, and 6 mm NPT lower connection.

#### Furnish with 6 mm brass gauge cock.

#### Minimum accuracy 1% of scale.

#### Manufacturers and Products:

##### Ashcroft Inc.; Ashcroft; Type 1000. *[Consultant to confirm]*

##### Marshall Instruments Inc.; Marsh; J80. *[Consultant to confirm]*

##### Approved Equivalent.

# EXECUTION

## General

### Field Obstructions:

#### The Drawings do not attempt to show exact details of piping. Provide offsets around obstructions.

#### Do not modify structural components, unless approved by the Consultant.

### Sleeves:

#### Pipe sizes shown on the Drawings are nominal sizes, unless shown or specified otherwise.

#### Provide piping passing through walls, floors, or ceilings with standard-weight pipe sleeves.

#### Provide pipes passing through finished walls with chrome-plated canopy flanges.

#### Dry pack sleeves in existing work in place and provide finished appearance.

#### Pack holes left by removal of existing piping with grout and finish to match adjacent surface.

### Provide unions in piping systems at connections to equipment.

### Provide insulating dielectric unions and flanges between ferrous and nonferrous piping and where otherwise required for electrically insulated connection, as shown on the Drawings.

### Pipe air release valves, water-lubricated bearings, and other appurtenances having water effluent to nearest drain with copper tubing.

### Trench Excavation and Backfill: As specified in Section 02315 - Excavation and Trenching and Backfilling.

## Installation

### Steel Pipe:

#### Ream, clean, and remove burrs and mill scale from piping before making up.

#### Seal joint with pipe joint sealer of Teflon tape.

### Copper Tubing:

#### Cut tubing square and remove burrs.

#### Clean both inside of fittings and outside of tubing with steel wool and hydrochloric acid before soldering.

#### Prevent annealing of fittings and hard-drawn tubing when making connections.

#### Do not use mitered joints for elbows or notching of straight runs of pipe for tees.

### Rigid PVC or CPVC:

#### Cut, make up, and install in accordance with pipe manufacturer's recommendations.

#### Ream, clean, and remove burrs from cut ends before joining pipe.

#### Lay in trench by snaking pipe from one side to other.

#### Offset: As recommended by the manufacturer for maximum temperature variation between the time of solvent welding and final use.

#### Do not lay pipe when the temperature is below 4.5 degrees Celsius or above 32 degrees Celsius when exposed to direct sunlight.

#### Shield ends shall be joined away from direct sunlight prior to and during laying operation.

#### Use strap wrenches only for tightening threaded plastic joints. Do not over tighten fittings.

### Water System Balancing: Provide a qualified registered engineer or firm specializing in testing and balancing to adjust domestic water system. Balance system for required water flows at each plumbing fixture, terminal device, and recirculating hot water loop.

### Water Hammer Arrestors:

#### Install in piping systems where shown on the Drawings and adjacent to pieces of equipment where quick closing valves are installed.

#### Install at all emergency safety showers and eyewashes.

#### Size and install in accordance with Plumbing and Drainage Institute Standard PDI-WH 201 (revised 2010).

#### Shock arresters to have access panels or to be otherwise accessible.

### Valves: Install in accordance with the manufacturer's recommendations.

### Miscellaneous Piping Specialties: Install in accordance with the manufacturer's recommendations.

### Metering and Measuring Devices: Install in accordance with the manufacturer's recommendations.

## Sanitary and Waste Drains and Vents Piping

### Installation:

#### Set piping occurring above floor slab true and plumb.

#### Set exposed risers as close to walls as possible.

#### Where vent stacks pass through roof slab, fit with flashing sleeve secured to roof.

#### Extend vents a minimum of 305 mm above the roof.

#### Provide cleanouts where shown on the Drawings and where required by the Ontario Building Code.

## Acid-Resistant Drains and Vents

### Install in accordance with the manufacturer’s recommendations.

### Drainage Vents: Same piping system as used for acid-resistant drains.

### Make connections between polypropylene piping systems and other acid-resistant drainage systems with adapters recommended by the manufacturer.

### Buried Polypropylene Pipe:

#### Heat join and test for leakage before placing in trench.

#### Snake slightly on long runs placed in trench.

#### When installed in extremely hot or cold weather, make proper allowance for expansion or contraction.

### Buried Acid-Resistant Cast Iron Pipe With Teflon-Lined Couplings:

#### Install in accordance with the manufacturer’s instructions.

#### Do not allow acid waste to contact pipe and Teflon until installation has been completed and tested.

### Buried Polypropylene Drain and Vent Pipe:

#### Install in accordance with manufacturer’s recommendations.

#### Trench shall have a clean sand bed graded to proper pitch.

#### Completely cover pipe with clean sand prior to backfilling.

#### Compact sand by flooding with water.

#### Do not permit sharp stones in backfill surrounding pipe.

## Water Supply Piping

### Water supply piping includes potable [W1,] [hot water (HW),] [return hot water (RHW),] [tempered water (TW)] systems and non-potable [W2] [and W3] systems.

### Flush water piping systems clean of internal debris, clean faucet aerators, and adjust plumbing fixture valves for the manufacturer’s recommended flow.

### Do not run water piping through electrical rooms, stairwells, or immediately over or within a 1 m horizontal clearance of electrical panels, motor starters, or environmental control panels.

### Provide exterior water piping with a minimum of [ ] m of cover or install below frost line, whichever is greater.

### Hose Valves and Hydrants: Attach handle with setscrew and provide manufacturer’s recommended gravel fill around drain hole of post hydrants.

### Provide valve operators with position indicators, where indicated on the Drawings, to show position of valve disc or plug.

### Provide bypass with globe valve for emergency throttling around each reducing valve.

### Protect buried copper and steel pipe and fittings with a single wrap of coal tar saturated felt in accordance with AWWA C203-08.

### Vacuum Breakers 50 mm and Smaller: Install a minimum of 150 mm above the flood line of equipment they serve.

### Provide manual air vents at high points in the domestic hot water system.

## Gas Piping

### Slope piping 2 percent downward in direction of flow toward respective drip traps.

### Provide union adjacent to each flexible connector hose.

## Insulation

### As specified in Section 15060 - Process Piping Insulation.

### Piping and Equipment:

#### Do not install insulation until piping system has been pressure tested and leaks corrected.

#### Insulate in accordance with the manufacturer’s instructions, including types of insulating cements, lagging adhesives, and weatherproof mastics if different from those specified in the Contract Documents.

#### Apply insulation over clean, dry surfaces with joints butted firmly together.

#### Do not extend insulation beyond flanges nor cover nameplates or code inspection stamps.

#### Run insulation continuous through wall openings, ceiling openings, and pipe sleeves, unless otherwise noted.

#### Insulate valve bodies, flanges, and pipe couplings.

#### Provide removable insulation sections on devices that require access for maintenance of equipment or removal, such as unions and strainer end plates.

#### Do not insulate flexible pipe couplings.

### Indoor Piping:

#### Insulate where indicated on the Drawings.

#### On fittings, wire in place and finish with thin coat of insulating cement or wrap with soft fibreglass insulation inserts covered with pre-molded PVC fitting covers.

#### Secure cover and wrap throat and seams with matching PVC tape.

### Roof and Overflow Drains: Insulate underside of roof drain and overflow drain sumps with 25 mm thick, 48 kg/m3 density rigid fibreglass.

### Existing Piping:

#### Where connection is shown on the Drawings to existing piping, cut back existing insulation to remove portion damaged by piping revisions, and install new insulation.

#### Finish joint between old and new insulation as specified in this Section.

### Outdoor Piping:

#### Insulate piping and fittings same as specified above for indoor piping systems.

#### Hold jacket in place by a continuous friction type joint, providing a positive weatherproof seal over entire length of jacket.

#### Secure circumferential joints with preformed snap straps containing weatherproof sealant.

### Hangers:

#### Install precut, sized sections of closed cell rigid insulation with vapor barrier under piping and centred at each hanger location.

#### Provide continuous vapor barrier at joints between rigid insulation and pipe insulation.

### Finish:

#### Finished Appearance of Insulation: Smooth and continuous.

#### Provide coating of insulating cement where needed to obtain result.

#### Lap joints and maintain integrity of vapour seals in accordance with the manufacturer's instructions.

#### Do not use staples or screws to secure components of systems that are vapour sealed.

### Fitting Covers:

#### Apply insulation and vapour barrier coating on exterior piping so it will not be damaged when prefabricated aluminum fitting covers are applied.

#### Prefabricated aluminum covers shall serve as weatherproof enclosures over fittings.

#### Do not use screws or rivets in fastening fitting covers.

#### Install removable prefabricated aluminum covers on exterior flanges and unions.

#### Insulation Schedule:

|  |  |  |  |
| --- | --- | --- | --- |
| Description | Pipe Size | Insulation Thickness | |
| Indoor | Outdoor |
| Cold Water (W1) | 12 – 150 mm | 25 mm | 50 mm |
| Cold Water (W2) | 12 – 200 mm | 25 mm | 50 mm |
| Cold Water (W3) | 12-200 mm | 25 mm | 50 mm |
| Hot Water (HW) | 12-50 mm | 25 mm | 50 mm |
| Hot Water (HW) | 65-100 mm | 40 mm | 65 mm |
| Recirculating (RHW) Hot Water | 5-50 mm | 25 mm | 50 mm |
| Roof Drain Rain Leader (RD) | 80-200 mm | 12 mm | — |
| Overflow Drain Rain Leader (OD) | 80-200 mm | 12 mm | — |

## Hangers and Supports

### Install pre engineered support equipment in accordance with the manufacturer's recommendations.

### Hanger Rod Sizing and Spacing for:

#### Steel Pipe:

|  |  |  |
| --- | --- | --- |
| Pipe Size | Max. Hanger Spacing | Min. Rod Size |
| 25 mm & smaller | 2 m | 6 mm |
| 32 through 65 mm | 25 m | 6 mm |
| 80-100 mm | 3.0 m | 10 mm |
| 150 mm | 3.7 m | 10 mm |
| 200 mm | 3.7 m | 12 mm |

#### Copper Pipe:

##### Same as for steel pipe.

##### Spacing: 0.6 m less per size than for steel pipe, with pipes 25 mm and smaller supported every 2 m.

#### Cast Iron Pipe:

##### Same as for steel pipe.

##### Locate hanger rods at each hub and change of direction.

#### Plastic Pipe:

##### Same as for steel pipe.

##### Spacing: As recommended by the manufacturer for flow temperature in pipe.

#### No metal portion of hanger shall contact pipe directly.

### Attach Support Rods For Horizontal Piping:

#### To steel beams with I clamps.

#### To concrete with inserts, or with flanges fastened with flush shells.

#### To wood 65 mm or more thick, with bolts or angle clips.

### Trapeze Hangers:

#### Trapeze hangers may be used in lieu of individual hangers where horizontal piping is arranged with two or more parallel lines.

#### Attach lines to horizontal with U bolts or one-hole clamps.

### Vertical Piping:

#### Support by channel type support system and pipe clamps on 3 m maximum centres.

#### Copper, and Plastic Piping: Isolate from channels and pipe clamps with pipe isolators.

### Insulated Piping: Furnish galvanized protection shield and oversized hangers under insulated piping.

## Interim Cleaning

### As specified in Section 15200 - Process Piping and Fittings.

### Prevent the accumulation of weld rod, weld spatter, pipe cuttings and filings, gravel, cleaning rags, and other foreign material within piping during fabrication and assembly.

### Examine piping to assure removal of foreign objects prior to assembly.

### Shop cleaning may employ conventional commercial cleaning method if it does not corrode, deform, swell, or otherwise alter physical properties of material being cleaned.

## Testing

### As specified in Section 15955 - Piping Leakage Testing.

### General:

#### Conduct pressure and leakage tests on newly installed pipelines.

#### Provide necessary equipment and material and make taps in pipe, as required.

#### The [Consultant] will monitor the tests. Provide advance notice of start of testing.

#### Test Pressures: As specified in the Contract Documents. *[Consultant to ensure test procedure and testing pressures are clearly indicated in the Contract Documents].*

#### Test Records: Make records of each piping system installation during the test to document the following:

##### Date of test.

##### Description and identification of piping tested.

##### Test fluid.

##### Test pressure.

##### Remarks, including:

###### Leaks (type, location).

###### Repairs made on leaks.

##### Certification by the Contractor and signed acknowledgment by the [Consultant] that tests have been satisfactorily completed.

### Testing New Pipe Connected to Existing Pipe: Isolate new pipe with grooved end pipe caps, spectacle blinds, or blind flanges.

### Preparation and Execution:

#### Buried Pressure Piping:

##### Conduct final hydrostatic acceptance tests after trench has been completely backfilled.

##### An initial service leak test may be conducted with a partially backfilled trench and the joints left open for inspection, if field conditions permit, as determined by the Consultant.

##### Expose joints for the acceptance test on buried pressure piping to be pneumatically tested or subjected to an initial service leak test.

#### Exposed Piping: Conduct tests after piping has been completely installed including supports, hangers, and anchors, but prior to insulation.

### Hydrostatic Leak Tests:

#### Equipment: Provide the following:

|  |  |
| --- | --- |
| Amount | Description |
| 2 | Graduated containers |
| 2 | Pressure gauges |
| 1 | Hydraulic force pump |
| As required | Suitable hose and suction pipe |

#### Procedure:

##### Use water as the hydrostatic test fluid.

##### Provide clean test water of such quality in order to minimize corrosion of the materials in the piping system.

##### Open vents at high points of the piping system to purge air pockets while the piping system is filling.

##### Venting during the filling of the system may also be provided by loosening flanges with a minimum of four bolts or by the use of equipment vents.

##### Test piping systems at the test pressure specified in the Piping Schedule. *[Consultant to provide Piping Schedule and append to the Specifications]*

##### Maintain hydrostatic test pressure continuously for 30 minutes minimum and for such additional time as necessary to conduct examinations for leakage.

##### Examine joints and connections for leakage.

##### The piping system, exclusive of possible localized instances at pump or valve packing, shall show no visual evidence of weeping or leaking.

##### Correct visible leakage and retest to the satisfaction of the [Consultant] at no additional cost to the Region.

#### Buried Water Lines:

##### A limited amount of leakage is permissible according to the formula specified in subsection 3.10.5.3 10.

##### Conduct hydrostatic testing as follows:

###### Pipe with Concrete Thrust Blocking: Do not make the pressure test until a minimum of five Days after the thrust blocking is installed.

###### If high-early strength cement is used for thrust blocking, the time may be reduced to 2 days.

##### Cement-Mortar Lined Piping: Slowly fill test section with water and allow to stand for 24 hours under slight pressure to allow cement-mortar lining to absorb water.

##### Expel air from piping system prior to testing.

##### Apply and maintain specified test pressure with hydraulic force pump.

##### Valve off the piping system when test pressure is reached.

##### Conduct pressure test for 2 hours, re-opening isolation valve only as necessary to restore test pressure.

##### Accurately measure the amount of water required to maintain test pressure by placing pump suction in a barrel or similar device, or by metering.

##### The measurement represents leakage, defined as the quantity of water necessary to maintain the specified test pressure for the duration of the test period.

##### Determine maximum allowable leakage in litres per hour from the following formula:

![](data:application/x-msmetafile;base64,)

Where:

Lm = Testing Allowance (makeup water), in litres per hour

S = Length of pipe tested, in meters

D = Nominal diameter of pipe, in millimeters

P = Average test pressure during the hydrostatic test, in kPa

These formulas are based on a testing allowance of 1.079 L/d/km/mm of nominal diameter at a pressure of 1,034 kPa.

##### Correct leakage greater than the allowable determined under this formula, and retest to the satisfaction of the [Consultant].

#### Test Pressure for Water: 1.5 times system pressure.

#### Gravity Sewers and Drains:

##### Test by water or air exfiltration tests as prescribed by Ontario Building Code and visually examine for leaks.

##### Repair leaks and retest system until no further leakage is evident.

### Pneumatic Leak Tests:

#### Perform on compressed air, natural gas, and vacuum piping.

#### Equipment: Provide the following:

|  |  |
| --- | --- |
| Amount | Description |
| 1 | Pneumatic compressor separator-dryer system capable of providing oil-free dry air and equipped with one or more full capacity safety relief valves set at a maximum pressure of 105 percent of the required primary test pressure |
| 1 | Calibrated test gauge |

#### Procedure:

##### Perform pneumatic testing using accurately calibrated instruments and oil-free, dry air.

##### Perform tests only on exposed piping, after piping has been completely installed, including supports, hangers and anchors, and inspected for proper installation.

##### Test piping system at the test pressure specified in the Piping Schedule.

##### Take necessary precautions to protect test personnel [and Region's operating personnel] from hazards associated with air testing.

##### Secure piping to be tested to prevent damage to adjacent piping and equipment in event of a joint failure.

##### Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by test.

##### Apply maximum 172 kPa preliminary pneumatic test to piping system prior to final leak testing, to locate major leaks.

##### Examine joints and connections for leakage with soap bubbles.

##### Correct visible leaks and retest to the satisfaction of the [Consultant].

##### Gradually increase pressure in the system to a maximum of one-half of test pressure.

##### Thereafter increase pressure in steps of approximately 10% of maximum test pressure until the required test pressure is reached.

##### Maintain pneumatic test pressure continuously for minimum of 10 minutes and for such additional time as necessary to conduct a soap bubble examination for leakage.

##### The piping system, exclusive of possible localized instances at pump or valve packing, shall show no evidence of leakage.

##### Correct visible leakage retest to the satisfaction of the [Consultant].

##### Following pneumatic testing, thoroughly purge, with nitrogen, lines that are to carry flammable gases to assure no explosive mixtures will be present in the system during the filling process.

## Cleaning and Disinfection

### As specified in Section 02511 – Watermains.

### Prior to final acceptance, following assembly and testing, flush pipelines with water, except for plant process air lines and instrument air lines, and remove accumulated construction debris and other foreign matter.

### Minimum Flushing Velocity: [0.76] [1.52] metres per second.

### Insert cone strainers in the connections to attached equipment and leave until cleaning has been accomplished.

### Remove accumulated debris through drains 50 mm and larger or by dropping spools and valves.

### Immediately following drainage of flushed lines, dry piping with compressed air.

### Plant process air and instrument air piping shall be blown clean of loose debris with compressed air.

### Disinfect pipelines intended to carry potable water before placing in service:

#### Meet the requirements of AWWA C651-14, unless otherwise specified in the Contract Documents.

#### Disinfecting Mixture:

##### A chlorine-water solution having a free chlorine residual of 40 ppm to 50 ppm.

##### Prepare by injecting one of the following:

###### Liquid chlorine gas-water mixture.

###### Dry chlorine gas. Sodium hypochlorite and water mixture.

##### Inject mixture into pipeline at a measured rate while freshwater is allowed to flow through the pipeline at a measured rate so the combined mixture of freshwater and chlorine solution or gas is of the specified strength.

##### Apply liquid chlorine gas-water mixture by means of a chlorinating device.

##### Feed dry chlorine gas through proper devices for regulating the rate of flow and providing effective diffusion of gas into water within pipe being treated.

##### Chlorinating devices for feeding solutions of chlorine gas or gas itself must prevent backflow of water into the chlorine cylinder.

##### Sodium Hypochlorite: If this procedure is used, dilute liquid with water to obtain a 1 percent solution.

##### The following proportions of hypochlorite to water will be required:

|  |  |  |
| --- | --- | --- |
| Product | Quantity | Water |
| *[other options as approved by Consultant]* | TBD | TBD |
| Sodium Hypochlorite 1 (5.25 percent Cl) | 3.8 Litres | 16 Litres |
| 1 Known as liquid laundry bleach, Clorox, and Purex or Approved Equivalent. | | |

### Point of Application:

#### Inject chlorine mixture into pipeline to be treated at the beginning of the line through a corporation stop or suitable tap in the top of pipeline.

#### Control clean water from the existing system or another source so it flows slowly into newly installed piping during chlorine application.

#### Manipulate valves so the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Use check valves if necessary.

### Retention Period:

#### Retain treated water in pipeline for a minimum period of 24 hours or long enough to destroy non-spore-forming bacteria.

#### At the end of the retention period, the disinfecting mixture shall have a concentration of at least 10 ppm of chlorine.

#### Testing of all chlorine residuals shall be performed by a licensed York Region operator qualified to conduct such tests.

#### Operate valves, hydrants, and other appurtenances during disinfection to assure disinfecting mixture is dispersed into all parts of the pipeline including dead ends, new services, and similar areas that otherwise may not receive the disinfecting solution.

#### Do not place concentrated quantities of commercial disinfectants in pipeline before filling with water.

#### After chlorination, flush the water from the permanent source of supply until water through pipeline is equal chemically and bacteriologically to the permanent source of supply.

### Disposal of Disinfecting Water:

#### Dispose of disinfecting water in an acceptable manner that will protect the public and receiving waters from harmful or toxic concentrations of chlorine.

#### Do not allow disinfecting water to flow into a waterway without adequate dilution or other satisfactory method of reducing chlorine concentrations to a safe level.

#### The disposal of disinfecting water shall be in accordance with Section 01561 – Environmental Protection.

## Corrosion Protection

### As specified in Section 15200 - Process Piping and Fittings.

## Bonding

### Buried Piping: As specified in Section [      ] - Pipe Bonding and Test Stations**.**

## Cathodic Protection

### Buried Piping: As specified in Section 02555 – Cathodic Protection.

## Protection of Installed Work

### Protective Covers:

#### Provide over floor and shower drains during construction in order to prevent damage to drain strainers and to keep foreign material from entering drainage system.

#### Cover roof drains and emergency overflow drains during roofing process so roofing material and gravel do not enter drain piping.

#### Remove protective covers at time of Substantial Performance of the Work.

## Piping Schedule

### Refer to Section 15200 - Process Piping and Fittings.

## Field Finishing

### In accordance with Section 15200 - Processing Piping and Fittings.

## Supplements

### The supplements listed below, attached following “End of Section,” form part of this Section.

#### [Piping Schedule.]

#### Plumbing Piping Data Sheets. *[Consultant to provide sheets]*

|  |  |
| --- | --- |
| Section Number | Title |
| -01 | Polyvinyl Chloride Drain Waste and Vent (PVC-DWV) Pipe and Fittings |
| -02 | Cast Iron Soil Pipe (CISP) and Fittings |
| -03 | Acid-Resistant Cast Iron Pipe and Fittings |
| -05 | Acid-Resistant Polypropylene Waste and Vent Pipe and Fittings |
| -06 | Perforated Polyvinyl Chloride (PVC) Pipe and Fittings |
| -07 | High Density Polyethylene (HDPE) Pipe and Fittings—Gas Service |
| -08 | High Purity Polypropylene (HP-PP) Pipe and Fittings |
| -09 | Carbon Steel Tubing and Fittings (High Pressure) |
| -10 | Galvanized Steel Drain and Vent Pipe and Fittings |

**END OF SECTION**