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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | November 16, 2009 | Modified ‘Related Sections’ |
| 3 | March 15, 2011 | Minor changes from Legal |
| 4 | August 18, 2014 | First draft review comments (AV) |
| 5 | June 8, 2015 | Second Draft for Review (AV) |
| 6 | September 16, 2015 | Updated, Finalized Specification – Reference eDOCS #5823601-v4 (AV) |
| **7** | **March 18, 2016** | **Updated AWWA Standards** |
| 8 | March 1, 2017 | Updated for reference to NSF 372. (AV) |
| 9 | May 25, 2017 | Updated references to standards ASME B16.1-2015, ASTM A153/A153M-16a, ASTMA276/A276M-17 **(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.

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**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 01430 – Operation and Maintenance Data

#### Section 01640 – Manufacturers’ Services.

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

#### Section 03200 – Concrete Reinforcement

#### Section 03300 – Cast-in-Place Concrete

#### Section 09900 – Painting and Protective Coatings

#### Section 15200 – Process Piping and Fittings

#### Section 15201 – Piping Support Systems.

## 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 Society of Mechanical Engineers (ASME):

##### ASME B16.1-2015, Grey Iron Pipe Flanges and Flanged Fittings.

##### ASME B16.5-2013, Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

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

##### AWWA C153/A21.53-11, Ductile-Iron Compact Fittings.

##### AWWA C210-15, Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.

##### AWWA C213-15, Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.

##### AWWA C219-11, Bolted, Sleeve-Type Couplings for Plain-End Pipe.

##### AWWA Manual M11 4th edition, Steel Pipe—A Guide for Design and Installation.

#### ASTM International (ASTM):

##### ASTM A153/A153M-16a, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

##### ASTMA276/A276M-17, Standard Specification for Stainless Steel Bars and Shapes.

#### National Fire Protection Association (NFPA):

##### NFPA 24 (2013), Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

#### NSF International (NSF):

##### NSF 61-2013: Drinking Water System Components—Health Effects.

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

## 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

### Action Submittals:

#### Manufacturer’s data on materials, construction, end connections, ratings, overall lengths, and live lengths (as applicable). Refer to Section 01300 – Submittals.

### Informational Submittals:

#### Coupling Harness:

##### Details, ratings, calculations and test reports for thrust restraints relying on welded bars or rings.

##### Weld procedure qualifications.

##### Load proof-testing report of prototype restraint for any size coupling.

#### Basket Strainer:

##### Manufacturer’s written/printed installation instructions.

##### Manufacturer’s Certificate of Proper Installation as specified in Section 01640 - Manufacturers’ Services.

#### Operation and Maintenance Data as specified in Section 01430 - Operation and Maintenance Data.

#### Refer to Section 01300 – Submittals.

## Extra Materials

### Furnish, tag, and box for shipment and storage the following spare parts and special tools for basket strainer:

|  |  |  |
| --- | --- | --- |
| Item |  | Quantity |
| **[Basket]** |  | **[One] [    ]** for each strainer |
| **[Disc seals]** |  | **[One] [    ]** for each strainer |
| **[    ]** |  | **[    ]** |
| Special tools required to maintain or dismantle |  | **[One] [    ]** complete set |

### [Delivery:] [Consultant to insert all delivery limitations, precautions and requirements]

# PRODUCTS

## General

### Provide required piping specialty items, whether shown or not shown on the Drawings, as required by the applicable codes and standard industry practice.

### Rubber ring joints, mechanical joints, flexible couplings, and proprietary restrained ductile iron pipe joints are considered flexible joints; welded, screwed, and flanged pipe joints are not considered flexible.

## Connectors

### Teflon Bellows Connector:

#### Type: Two convolutions, unless shown otherwise, on the Drawings, with metal reinforcing bands.

#### Flanges: Ductile iron, drilled Class 150 ASME B16.5-2013 standard.

#### Working Pressure Rating: 965 kPa (140 psi), minimum, at 49 degrees Celsius (C).

#### Thrust Restraint: Limit bolts to restrain force developed by the specified test pressure.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Elastomer Bellows Connector:

#### Type: Fabricated spool, with single filled arch.

#### Materials: Nitrile tube and wrap-applied neoprene cover.

#### End Connections: Flanged, drilled Class 125 ASME B16.1-2015 standard, with full elastomer face and steel retaining rings.

#### Working Pressure Rating: 965 kPag (140 psig), minimum, at 82 degrees C (180 degrees F) for sizes 300 mm and smaller.

#### Thrust Restraint: Control rods to limit travel of elongation and compression.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Metal Bellows Connector:

#### Type: Single-ply, annular corrugated metal bellows with limit rods. Circumferential convolution welds are not permitted.

#### Material: Type 316 stainless steel.

#### End Connections: ANSI Class 150 carbon steel flanges.

#### Minimum Design Working Pressure: 1,035 kPa at 398 degrees C (750 degrees F).

#### Length: A minimum of four convolutions and the minimum manufacturer recommendations for vibration isolation.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Flexible Metal Hose Connector:

#### Type: Close pitch, annular corrugated with single braided jacket.

#### Material: Bronze.

#### End Connections: Female copper solder joint.

#### Minimum Burst Pressure: 3,450 kPa at 20 degrees C (70 degrees F).

#### Length: The minimum manufacturer recommendations for vibration isolation.

#### Manufacturers:

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

##### Approved Equivalent.

### Closure Collar Concrete: As specified in Section 03300 - Cast-in-Place Concrete and Section03200 – Concrete Reinforcement.

### Quick Connect Couplings for Chemical Services:

#### Type: Twin cam arm actuated, male and female, locking, for chemical loading and transfer.

#### Materials: Glass-filled polypropylene or PVDF with EPDM, Viton A or Teflon gaskets as recommended by the manufacturer for the type of service.

#### End Connections: NPT threaded or flanged to match the piping connections. Hose shank for chemical installations.

#### Plugs and Caps: Female dust cap for each male end; male dust plug for each female end.

#### Pressure Rating: 860 kPa, minimum, at 20 degrees C (70 degrees F).

#### Manufacturers and Products:

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

##### Approved Equivalent.

## Couplings

### General:

#### Coupling linings for use in potable water systems shall be in conformance with the requirements of NSF 61 and NSF 372.

#### Couplings shall be rated for working pressure not less than indicated in Piping Schedule for the service and not less than 1,035 kPa.

#### Couplings shall be [lined and coated with fusion-bonded epoxy in accordance with AWWA C213-07][lined and coated with liquid epoxy in accordance with AWWA C210-07][ ].

#### Unless thrust restraint is provided by other means, couplings shall be harnessed in accordance with requirements of AWWA Manual M11 4th edition, and restrained with retainer bar or ring welded to pipe end, or as shown on the Drawings.

#### Sleeve type couplings shall conform to AWWA C219-11 and shall be hydraulically expanded beyond minimum yield for accurate sizing and proofing of tensile strength.

### Flexible Sleeve Type Coupling:

#### Manufacturers and Products:

##### Steel Pipe:

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

###### Approved Equivalent.

##### Ductile Iron Pipe:

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

###### Approved Equivalent.

### Bolted Split Sleeve Type Coupling:

#### Manufacturers and Products:

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

##### Approved Equivalent

### Transition Coupling for Steel Pipe:

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Flanged Coupling Adapter:

#### Manufacturers and Products:

##### Steel Pipe:

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

###### Approved Equivalent.

##### Ductile Iron Pipe:

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

###### Approved Equivalent.

### Restrained Flange Adapter:

#### Pressure Rating:

##### Minimum Working Pressure Rating: Not less than 1,035 kPa.

##### Safety Factor: Not less than two times working pressure and shall be supported by manufacturer’s proof testing.

#### Thrust Restraint:

##### Provide hardened steel wedges that bear against and engage outer pipe surface, and allow articulation of pipe joint after assembly while wedges remain in their original setting position on pipe surface.

##### Products employing set screws that bear directly on pipe will not be acceptable.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Dismantling Joints:

#### Pressure Rating:

##### Minimum working pressure rating shall not be less than rating of the connecting flange.

##### Proof testing shall conform to the requirements of AWWA C219-11 for bolted couplings.

#### Manufacturers and Products:

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

##### Approved Equivalent.

## Expansion Joints

### Elastomer Bellows:

#### Type: Reinforced molded wide arch.

#### End Connections: Flanged, drilled Class 125 ASME B16.1-2015 standard, with split galvanized steel retaining rings.

#### Washers: Over retaining rings to help provide leak-proof joint under test pressure.

#### Thrust Protection: Control rods to protect the bellows from overextension.

#### Bellows Arch Lining: Buna N, nitrile, or butyl.

#### Rated Temperature: [120] [ ] degrees C.

#### Rated Deflection and Pressure:

##### Lateral Deflection: 19 mm, minimum.

##### Burst Pressure: Four times the working pressure.

##### Compression deflection and minimum working pressure as follows:

|  |  |  |
| --- | --- | --- |
| Size (mm) | Deflection (mm) | Pressure (kPa) |
| 65 to 300 | 27 | 1,035 |
| 35 | 42 | 837 |
| 400 to 500 | 42 | 759 |

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Approved Equivalent Teflon Bellows:

#### Type:

##### Three convolutions, with metal reinforcing bands.

#### Flanges:

##### Ductile iron,

##### Drilled Class 150 ASME B16.5-2013 standard.

#### Working Pressure Rating:

##### 690 kPa, minimum, at 49 degrees C. (120 degrees F.)

#### Thrust Restraint:

##### Limit bolts to restrain force developed by the specified test pressure.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Metal Bellows:

#### Type: Single-ply, annular corrugated metal bellows with limit rods. Circumferential convolution welds are not permitted.

#### Material: Type 316 stainless steel.

#### End Connections: ASME Class 150 carbon steel flanges.

#### Minimum Design Working Pressure: 1,035 kPa at 398 degrees C (750 degrees F).

#### Length: Minimum of four convolutions and the minimum manufacturer recommendations for vibration isolation.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Copper Pipe Expansion Compensator:

#### Material: Stainless steel bellows with female copper solder joint ends.

#### Working Pressure Rating: 1,200 kPa, minimum.

#### Accessories: Anti-torque device to protect bellows.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Galvanized and Black Steel Pipe Expansion Compensator:

#### Material: [Carbon steel with stainless steel bellows.] [All stainless steel.]

#### Working Pressure Rating: 1,200 kPa, minimum.

#### Accessories: Anti-torque device to protect bellows.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Flexible Metal Hose:

#### Type: Close pitch, annular corrugated with single braided jacket.

#### Material: Stainless steel, ASTM A276/A276M-15, Type 321.

#### End Connections:

##### 80 mm and Larger: Shop fabricated flanged ends to match mating flanges.

##### 65 mm and Smaller: Screwed ends with one union end.

#### Minimum Burst Pressure: 4,140 kPa at 21 degrees C for 300 mm and smaller.

#### Length: Provide hose live-length equal to lengths shown on the Drawings.

#### Manufacturers:

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

##### Approved Equivalent.

## Flexible Expansion Joints

### Design:

#### Ball and socket type for earth settlement compensation.

#### Joints shall be double ball assemblies rated for a minimum deflection of 15 degrees and not less than 100 mm offset from centreline of connecting piping.

#### Assembly shall accommodate up to 100 mm of expansion in length.

#### Ductile iron conforming to the requirements of AWWA C153/A21.53-11.

#### Rated for 2,415 kPa.

#### Components shall be lined and coated by the manufacturer with fusion-bonded epoxy on all surfaces not bearing gaskets.

#### End Connections: Flanged or mechanical joint as shown on the Drawings and as required by connecting pipe and fittings.

#### Joint connecting to mechanical joint shall be thrust restrained.

#### Bonding:

##### Manufacturer shall factory install thermite welded joint bonds for assembled expansion joint.

##### Provide 600 mm bond wires for field bonds to adjacent metallic piping.

##### Bond wires shall be No. 2 AWG with two 600 mm-long THHN insulated No. 12 AWG wire pigtails.

### Manufacturer and Product:

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

#### Approved Equivalent.

## Seal Water Hose

### Product as specified for water hose (subsection 2.10.4), except 10 mm [A: 3/8 inch] with male NPT ends, in two 30.48 cm lengths. [B: 610 mm, 2 foot lengths.]

## Service Saddles

### Double-Strap Iron:

#### Pressure Rating: Capable of withstanding 1,035 kPa internal pressure without leakage or over stressing.

#### Run Diameter: Compatible with outside diameter of pipe on which saddle is installed.

#### Taps: Iron pipe threads.

#### Materials:

##### Body: Malleable or ductile iron.

##### Straps: Galvanized steel.

##### Hex Nuts and Washers: Steel.

##### Seal: Rubber.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Nylon-Coated Iron:

#### Pressure Rating: Capable of withstanding 1,035 kPa internal pressure without leakage or over stressing.

#### Run Diameter: Compatible with outside diameter of pipe on which saddle is installed.

#### Materials:

##### Body: Nylon-coated iron.

##### Seal: Buna N.

##### Clamps and Nuts: Stainless steel.

#### Manufacturers:

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

##### Approved Equivalent.

## Pipe Sleeves

### Steel Pipe Sleeve:

#### Minimum Thickness: 4.7 mm. (3/16 inch.)

#### Seep Ring:

##### Center steel flange for water stoppage on sleeves in exterior or water-bearing walls, 4.7 mm (3/16 inch) minimum thickness.

##### Outside Diameter: Unless shown otherwise on the Drawings, 80 mm (3 inches) greater than the outside diameter of the pipe sleeve.

##### Continuously fillet weld on each side all around.

#### Factory Finish:

##### Galvanizing:

###### Hot-dip applied, meeting the requirements of ASTM A153/A153M-11.

###### Electroplated zinc or cadmium plating is unacceptable.

##### Shop Lining and Coating: Factory prepare, prime, and finish coat in accordance with Section 09900 – Painting and Protective Coatings.

### Molded Polyethylene Pipe Sleeve:

#### Molded HDPE with integral water stop ring not less than 80 mm (3 inches) larger than sleeve.

#### Provided with end caps for support during concrete placement.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Insulated and Encased Pipe Sleeve:

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Modular Mechanical Seal:

#### Type: Interconnected synthetic rubber links shaped and sized to continuously fill annular space between pipe and wall sleeve opening.

#### Fabrication:

##### Assemble interconnected rubber links in accordance with ASTM A276-13a, Type 316 stainless steel bolts and nuts.

##### Pressure plates shall be reinforced nylon polymer.

#### Size: According to manufacturer’s instructions for size of pipes shown to provide a watertight seal between pipe and wall sleeve opening [and to withstand a hydrostatic head of (12 metres of water)].

#### Manufacturer:

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

##### Approved Equivalent.

## Slab, Floor, Wall and Roof Penetrations

### Ductile Iron Wall Pipe:

#### Diameter and Ends: Same as connecting ductile iron pipe.

#### Thickness: Equal to or greater than remainder of pipe in line.

#### Fittings: In accordance with applicable Pipe Data Sheet.

#### Thrust Collars:

##### Rated for thrust load developed at 1,725 kPa.

##### Safety Factor: 2, minimum.

##### Material and Construction: Ductile iron or cast iron, cast integral with wall pipe wherever possible, or thrust rated, welded attachment to wall pipe.

#### Manufacturers:

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

##### Approved Equivalent

### Steel or Stainless Steel Wall Pipe:

#### Same material and thickness as for connecting pipe, except that it must have a minimum thickness of 6.3 mm (0.25 inch).

#### Lining: Same as for connecting pipe.

#### Thrust Collar:

##### Outside Diameter: Unless otherwise shown on the Drawings, 80 mm (3 inches) greater than outside diameter of wall pipe.

##### Continuously fillet welded on each side all around.

## Miscellaneous Specialties

### Strainers, Water Service, 50 mm (2 Inches) and Smaller:

#### Type: Bronze body, Y pattern, 1,380 kPa non-shock rated, with screwed gasketed bronze cap.

#### Screen: Heavy-gauge Type 304 stainless steel or Monel, 20 mesh.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Strainers, Water Service, 65 mm and Larger:

#### Type: Cast iron or ductile iron body, Y pattern, 1,200 kPa non-shock rated, with flanged gasketed iron cap.

#### Screen: Heavy-gauge Type 316 stainless steel, 1.1 mm (0.045 inch) perforations.

#### Manufacturers and Products:

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

##### Approved Equivalent.

### Strainers, Plastic Piping Systems, 100 mm and Smaller:

#### Type: Y pattern PVC body, 1,035 kPa non-shock rated, with screwed PVC cap and Viton seals

#### End Connections: Screwed or solvent weld, 50 mm and smaller. Class 150 ANSI flanged, 65 mm and larger.

#### Screen: Heavy-gauge PVC, 0.8 mm (1/32 inch) mesh, minimum 2:1 screen area to pipe size ratio.

#### Manufacturer:

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

##### Approved Equivalent.

### Basket Strainer:

#### Service Conditions:

##### Material Handled: [A: Plant final effluent (No. 3 water)] [ ].

##### Temperature of Material Handled: [ ] degrees C, minimum to [ ] degrees C, maximum.

##### Specific Gravity of Material Handled: [ ].

##### pH Range of Material Handled: [ ].

##### Range of Total Suspended Solids: [ ] mg/L.

#### Strainer Capacity: [ ] Litres/sec, maximum pressure drop shall not exceed [ ] kPa at [ ] Litres/sec.

#### Screen: Capable of removing material larger than 250 microns [0.01 inch (250 microns)] [ ] in diameter.

#### Strainer: Single chamber design of [cast iron] [fabricated steel] [stainless steel] construction with a [bolted] [quick opening] cover.

#### Process Connections: [25] mm flanges faced and drilled Class [125 ASME B16.1-2015.] [150 ASME B16.5-2013.]

#### Strainer: Double chamber design of [fabricated steel] [stainless steel] construction.

#### Permit one basket strainer to be removed for cleaning while other basket is in operation.

#### Inlet and Outlet Valves: [Three-way globe type] [Lever operated swing type valve disc] with neoprene disc seals.

#### Baskets: [Type 304 stainless steel.] [Type 316 stainless steel.] [Monel.]

#### Wearing parts shall be replaceable without removing strainer from line.

#### Factory Finishing:

##### Prepare, prime, and finish coat in accordance with Section 09900 – Painting and Protective Coatings.

##### [Furnish manufacturer’s standard [baked] enamel finish, color as selected.] [Match color as specified in pipe schedule.]

#### Manufacturer:

##### Consultant to provide three acceptable products,

##### Approved Equivalent.

#### Water Hose:

#### Furnish [ ] 15 m (50 feet) lengths of 25 mm (1 inch) and [     ] 15 m (50 feet) lengths of 40 mm (1.5 inch) rubber hose. EPDM black cover and EPDM tube, reinforced with two textile braids. Provide each length with brass male and female NST hose thread couplings to fit hose nozzle and hose valve.

#### Rated minimum working pressure of 1,380 kPa (200 psi.)

#### Manufacturers:

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

##### Approved Equivalent.

### Hose Nozzles:

#### Furnish [ ] 25 mm (1 inch) and [ ] 40 mm (1.5 inch) cast brass, satin finish, nozzles with adjustable fog, straight-stream, and shut-off feature and rubber bumper. Provide nozzles with a female NST hose thread.

#### Manufacturers:

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

##### Approved Equivalent.

### Pump Seal Water Sight Flow Indicators:

#### Bronze body, 10 mm (3/8 inch) horizontal, ball action with tempered glass.

#### Rated 860 kPa (125 psi) with NPT screwed ends.

#### Operate with a minimum flow of 0.94 Litres/ min. (0.25 gpm.)

#### Manufacturers and Products:

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

##### Approved Equivalent.

# EXECUTION

## General

### Provide accessibility to all piping specialties for control and maintenance.

## Piping Flexibility Provisions

### General:

#### Thrust restraint shall be provided as specified in Section 15200 - Process Piping and Fittings.

#### Install flexible couplings to facilitate piping installation, in accordance with the approved shop drawings.

### Flexible Joints at Concrete Backfill or Encasement: Install within 450 mm or one-half pipe diameter, whichever is less, from the termination of any concrete backfill or concrete encasement.

### Flexible Joints at Concrete Structures:

#### Install 450 mm or less from face of structures; joint may be flush with face.

#### [Install a second flexible joint, whether or not shown on the Drawings.]

##### [Pipe Diameter 450 mm and Smaller: Within 450 mm of first joint.]

##### [Pipe Diameter Larger than 450 mm: Within one pipe diameter of first joint.]

### [Flexible expansion joints shall be provided to compensate for earth settlement at buried piping connections to structure wall pipes. Wrap complete joint assembly in a double layer of polyethylene encasement, as specified in Section 15200 - Process Piping and Fittings.] *[Consultant to modify as required.]*

## Piping Transition

### Applications:

#### Provide complete closure assembly where pipes meet other pipes or structures.

#### Pressure Pipeline Closures: Plain end pieces with double flexible couplings, unless shown otherwise on the Drawings.

#### Restrained Joint Pipe Closures: Install with thrust tie-rod assemblies as shown [or in accordance with NFPA 24 (2013)].

#### Gravity Pipe Closures: As specified for pressure pipelines, or concrete closures.

#### Concrete Closures: Use to make connections between dissimilar pipe where standard rubber gasketed joints or flexible couplings are impractical, as approved by the Consultant.

#### Elastomer sleeves bonded to pipe ends are not acceptable.

### Installation:

#### Flexible Transition Couplings: Install in accordance with coupling manufacturer’s instructions to connect dissimilar pipe and pipes with a small difference in outside diameter.

#### Concrete Closures:

##### Locate away from structures so there are a minimum of two flexible joints between closure and pipe entering structure.

##### Clean pipe surface before placing closure collars.

##### Wet non-metallic pipe thoroughly prior to pouring collars.

##### Prevent concrete from entering pipe.

##### Extend collar a minimum of 300 mm on each side of the joint with a minimum thickness of 150 mm around the outside diameter of the pipe.

##### Make entire collar in one placement.

##### After concrete has reached initial set, cure by covering with well-moistened earth.

## Piping Expansion

### Piping Installation: Allow for thermal expansion due to differences between installation and operating temperatures.

### Expansion Joints:

#### Grooved Joint and Flanged Piping Systems: Elastomer bellows expansion joint.

#### Nonmetallic Pipe: Teflon bellows expansion joint.

#### Screwed and Soldered Piping Systems: Copper or galvanized and black steel pipe expansion compensator, as applicable.

#### Air and Water Service above 49 degrees Celsius (120 degrees F): Metal bellows expansion joint.

#### Pipe Run Offset: Flexible metal hose.

### Anchors [and Anchor Walls]: Install as specified in Section 15201 - Piping Support Systems, to withstand expansion joint thrust loads and to direct and control thermal expansion.

## Service Saddles

### Ferrous Metal Piping (except stainless steel): Double-strap iron.

### Plastic Piping: Nylon-coated iron.

## Couplings

### General:

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

#### Before coupling, clean pipe holdback area of oil, scale, rust, and dirt.

#### [Remove pipe coating if necessary to present a smooth surface.] [Do not remove pipe coating. If damaged, repair before joint is made.]

#### Application:

##### Metallic Piping Systems: Flexible couplings, transition couplings, and flanged coupling adapters.

##### Concrete Encased Couplings: Flexible coupling.

## Flexible Pipe Connections to Equipment

### Install to prevent piping from being supported by equipment, for vibration isolation, and where shown on the Drawings.

### Product Applications (unless shown otherwise on the Drawings):

#### Non-metallic Piping: Teflon bellows connector.

#### Copper Piping: Flexible metal hose connector.

#### Compressor and Blower Discharge: Metal bellows connector.

#### All Other Piping: Elastomer bellows connector.

### Limit Bolts and Control Rods: Tighten snug prior to applying pressure to the system.

## Pipe Sleeves

### Application:

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

#### Above Grade in Nonsubmerged Areas: Hot-dip galvanized after fabrication.

#### Below Grade or in Submerged or Damp Environments: Shop-lined and coated.

#### Alternatively, Molded Polyethylene Pipe Sleeve may be applied, as specified in the Contract Documents.

### Installation:

#### Support non-insulating type securely in formwork to prevent contact with reinforcing steel and tie-wires.

#### Caulk joint with the specified sealant in non-submerged applications and seal below grade and submerged applications with wall penetration seal.

## Slab, Floor, Wall and Roof Penetrations

### Applications:

#### Watertight and Below Ground Penetrations:

##### Wall pipes with thrust collars.

##### Provide taps for stud bolts in flanges to be set flush with wall face.

#### Non-watertight Penetrations: Pipe sleeves with seep ring.

#### Existing Walls: Rotary drilled holes.

#### Fire-Rated or Smoke-Rated Walls, Floors or Ceilings: Insulated and encased pipe sleeves.

### Wall Pipe Installation:

#### Isolate embedded metallic piping from concrete reinforcement using coated pipe penetrations as specified in Section 09900 – Painting.

#### Support wall pipes securely by formwork to prevent contact with reinforcing steel and tie-wires.

## Miscellaneous Specialties

### Basket Strainers:

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

#### Field Quality Control:

##### Conduct test on each basket strainer.

##### [Test valves shall be tested for proper seating, travel, and operation.]

#### Manufacturer’s Services: Provide manufacturer’s representative at the Site in accordance with Section 01640 - Manufacturers’ Services, and Section 01810 – Equipment Testing and Facility Commissioning for installation assistance, inspection and certification of proper installation, equipment testing, startup assistance, and training of [the Region’s] personnel for the specified component, subsystem, equipment, or system.

**END OF SECTION**