SECTION 22 1005 - PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe, Pipe Fittings, Pipe Hangers and Supports, Valves, and Miscellaneous connections for piping systems.

1. Waste/Sanitary Sewer & Vent.
   a. Contractor shall provide complete Sanitary drainage and vent piping system as shown on plumbing drawings and specified herein including but not limited to all: piping, pipe fittings, pipe supports, pipe anchors, drains, and equipment/fixture connections including final coordination and connection to Site Sanitary system.
2. Pumped/Forced Waste and Rainwater
   a. Contractor shall provide complete Forced Main piping systems as shown on plumbing drawings and specified herein including but not limited to all: piping, pipe fittings, pipe supports, pipe anchors, drains, including final coordination and connection to Water/Sanitary or Storm piping system as indicated on drawings.
3. Domestic Potable Water.
   a. Contractor shall provide complete Domestic Cold, Hot, and Hot Water Return, & Tempered water piping systems as shown on plumbing drawings and specified herein including but not limited to all: equipment, piping, valves, fittings, supports, anchors, insulation, connections to equipment/fixtures and plumbing specialties including final coordination and connection to Site Water supply.
4. Rainwater/Storm Water & Emergency Rainwater.
   a. Contractor shall provide complete Rainwater/Storm water piping system as shown on plumbing drawings and specified herein including but not limited to all: piping, pipe fittings, pipe supports, pipe anchors, drains, and insulation including final connection to Site Storm water system.
5. Condensate Drain Piping
   a. Contractor shall provide complete condensate drainage piping system as shown on plumbing drawings and specified herein including but not limited to all: piping, pipe fittings, pipe supports, pipe anchors, drains, and insulation t including final connection to Site Storm water system or discharge point as noted on the drawings.

1.2 RELATED REQUIREMENTS

A. Section 07 8413 - Penetration Fireproofing

B. Section 08 3100 - Access Doors and Panels.

C. Section 09 9000 - Painting and Coating.

D. Section 22 0100 - General Provisions

E. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.

F. Section 22 0553 - Identification for Plumbing Piping and Equipment.

G. Section 22 0719 - Plumbing Piping Insulation.

H. Section 22 1006 - Plumbing Piping Specialties

1.3 REFERENCE STANDARDS

A. Work and products provided in conformance to referenced standards listed below shall be in conformance with the latest editions of the referenced standards where the standards have a revision more current than the edition noted below.

1. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).
2. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).
3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).
4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).
5. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2008 (ANSI/ASME B31.9).
6. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.
7. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2006.
8. ASTM B 32 - Standard Specification for Solder Metal; 2004.
9. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2003.
10. ASTM B 306 - Standard Specification for Copper Drainage Tube (DWV); 2002.
11. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2003a.
12. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2006.
13. ASTM D 2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2006.
14. ASTM D 2513 - Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings; 2007b.
15. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2004.
16. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2008.
17. ASTM D 2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2004.
18. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2003.

19. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2002).
20. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2006.
21. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association; 2005 (ANSI/AWWA C105/A21.5).
22. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; 2009 (ANSI/AWWA C151/A21.51).
23. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).
24. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2005.
25. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2004.
26. IBC - ICC - International Building Code
27. IPC - ICC - International Plumbing Code
28. IFGC - ICC - International Fuel Gas Code
29. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
30. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
31. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2008.
32. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
33. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1996.

1.4 SUBMITTALS

A. In addition to the requirements of Division 01 specifications, plumbing product submittals shall be in accordance with the following:

1. Piping & Pipe fitting Product Data: Provide manufacturer's data on pipe materials and pipe fittings specified herein. Submittals shall clearly indicate exact materials to be provided and applications where the submitted product is to be installed and associated specification section. Manufacturer data shall indicate, material of construction, applicable standards and listings, design pressure and ratings, etc.

2. Hangers & Supports, Valve, & Misc. Product Data: Provide manufacturer's data for Hangers & supports, valve, & miscellaneous piping products specified herein. Clearly indicate exact models/model number, options, and accessories to be provided for each product. Submittals shall clearly indicate applications where the submitted product is to be used. Manufacturer data shall indicate, material of construction, applicable standards and listings, design pressure and ratings, etc.
3. Project Record Documents: Record actual locations of valves. Provide valve schedule as required in Section 22 0553 "Identification for Plumbing Piping and Equipment".
4. Maintenance Data: Submit maintenance data and spare parts lists for each type of valve. Include this data in Maintenance Manual.
5. Maintenance Materials: Furnish the following for Owners use in maintenance of project.
    a. See Section 01 6000 - Product Requirements, for additional provisions.
    b. Valve Repacking Kits: One for each type and size of valve.

B. Review of submittals which do not clearly indicate the information noted below may be delayed or Rejected due to lack of clarity or information. Generic catalog sheets with no indication of options, accessories, or model to be provided will be Rejected without further review. P.C. is responsible to review plumbing product submittals provided by suppliers and coordinate and verify all submittal information prior to submission to Architect/Engineer.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of Pennsylvania, UCC standards.

1. Maintain one copy on project site.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Piping

1. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
2. Welder Qualifications: Certified in accordance with ASME (BPV IX) or ANSI B3l.l as applicable.
3. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.
4. Manufacturers: Firms regularly engaged in the manufacture of piping products of types and sizes required, and which have been in satisfactory use for not less than five years in similar service.
5. Welding: Certify welding procedures, welders and operators in accordance with ANSI B3l.l, paragraph 527.5 for shop and job site welding of piping work.
6. All grooved joint couplings, fittings, valves, and specialties shall be the products manufactured by Victaulic Co. or America. Grooving tools shall be of the same manufacturer as the grooved components.
7. Cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.

D. Valves: Manufacturer's name and pressure rating marked on valve body.

1. Manufacturers: Firms regularly engaged in the manufacture of valves, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
2. Marking of Valves: Comply with MSS SP-25.
3. Valve Dimensions; For face-to-face and end-to-end dimensions of flanged or welding-end valve bodies, comply with ANSI B16.10. Grooved end valves shall comply with manufacturer's published dimensional data, with grooved ends complying with ANSI/AWWA C606.
4. Valve Types: Provide valves of same type by same manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Perform Work and inspections/testing in accordance with State of Pennsylvania UCC building codes including but not limited to IPC, IFGC, IBC, and IFC (Latest editions).

B. Conform to International Plumbing Code and all requirements of the local authority having jurisdiction/local Water Authority for installation of backflow prevention devices, service valving, and metering.

C. Submit product data for backflow prevention devices, service valving, and meters to the Municipal Water Authority prior to submission to Architect/Engineer. Obtain approval for devices and installation details and submit written approval with product data submittal to Architect/Engineer.

D. When a meter pit is required, provide certificate of compliance from the local water authority having jurisdiction indicating approval of water meter pit construction plans prior to order/installation of water meter pit and all associated piping.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Provide factory applied plastic end caps on each length of pipe and tube. Maintain end caps through shipping, storage and handling as required to prevent pipe end damage and eliminate dirt and moisture from outside of pipe and tube..

E. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate well above grade and enclose with durable waterproof wrapping.

F. Protect steel flanges and fittings from moisture and dirt by inside storage and enclosure or packaging with durable, waterproof wrapping.

1.8 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

1.9 EXTRA MATERIALS

A. See Section 01 6000 - Project Requirements, for additional provisions.

B. Provide two repacking kits for each size valve.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Except as otherwise indicated, provide factory fabricated products of the size, joint type, or class (thickness) indicated for each service. Where size, joint type, or class (thickness) is not indicated, provide products as determined by the installer for installation requirements and comply with the standards of the International Plumbing Code, International Fuel Gas Code, NFPA, Cast Iron Soil Pipe Institute (CISPI),and EPA as appropriate for each service.

B. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 WASTE/SANITARY SEWER & VENT PIPING, BELOW SLAB/GRADE AND BURIED WITHIN 5 FEET OF BUILDING

A. PVC Pipe: Schedule 40 ASTM D 2665 or ASTM D 3034. (No foam core permitted) - PVC Piping option for Sanitary Sewer and Waste piping systems shall not be permitted in areas with high temperature drainage discharge, these areas include but are not limited to: Kitchens, Boiler/Mechanical Rooms, etc. In areas with high temperature drainage discharge, Cast Iron Pipe shall be used in lieu of PVC piping. This cast iron pipe shall extend beyond the affected room/space to a minimum of 10ft. beyond the most downstream high temperature drain connection.

1. Manufacturers:
   a. Charlotte Pipe and Foundry
2. Fittings: PVC (DWV Pattern).
3. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.3 WASTE & VENT PIPING, ABOVE SLAB/GRADE

A. Cast Iron Pipe: CISPI 301, hubless.

1. Manufacturers:
   a. Charlotte Pipe and Foundry
   b. Tyler Pipe
2. Fittings: Cast iron.
3. Joints: Heavy Duty Couplings: ASTM C 1540/ASTM C 564/FM 1680 Class 1, neoprene gaskets and smooth 304 stainless steel clamp-and-shield assemblies with .010in minimum thickness corrugated shield, four clamps for sizes 1-1/2"-4", six clamps for sizes 5"-10", and worm gear drive clamps torqued to 80 inch pounds.

2.4 PUMPED WASTE/RAINWATER PIPING, ABOVE SLAB/GRADE

A. Steel Pipe: ASTM A 53/A 53M Schedule 40, galvanized, using one of the following joint types:

1. Flanged Joints: ASME B16.1 cast iron fittings.
2. Threaded Joints: ASME B16.3 malleable iron fittings.

2.5 DOMESTIC POTABLE AND NON-POTABLE WATER PIPING, ABOVE SLAB

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), Drawn (H).

1. Fittings: Provide fittings from one of the options below. All fittings/components within the domestic potable water piping shall meet the Lead Free requirements of the Safe Drinking Water Act (Sec. 1417) amended 1-4-2011 (weighted average lead content = 0.25%) and other equivalent state regulations
   a. Soldered Fittings (all pipe sizes): ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   b. Copper Press Fittings (all pipe sizes): Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements. fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. Copper press fittings shall be manufactured by Viega and installed utilizing Rigid Tool Company as "Pro Press System" or equal system as approved by Engineer. Complete installation shall comply with manufacturers recommendations.
2. Joints: Provide pipe joints from one of the options below.
   a. Solder Joints(All Sizes): ASTM B32, alloy Sn95 solder.
   b. Press Fit Joints(All Sizes): ProPress (as specified above)
3. Unions (Pipe Sizes 2" and Under):
   a. Copper tube and pipe: Class 150 bronze unions with soldered joints.
4. Flanges (Pipe Size Over 1 Inch):
   a. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

2.6 DOMESTIC POTABLE AND NON-POTABLE WATER SERVICE PIPING BURIED BELOW SLAB/GRADE

A. Copper Tube (2 in. and smaller): ASTM B 88 (ASTM B 88M), Type K (A).

1. Fittings: No fittings permitted below grade
2. Joints: Flared

B. Ductile Iron Pipe (3 in. and Larger): AWWA C151/A21.51 cement/mortar lined in accordance with AWWA C104/A21.4

1. Fittings: AWWA C110/A21.10 standard thickness.
2. Joints: AWWA C111/A21.11rubber gasket.
3. Mechanically Restrained Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

2.7 DOMESTIC POTABLE AND NON-POTABLE WATER PIPING, BELOW SLAB

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type K (A).

1. Fittings: No fittings or joints permitted below grade
2. Joints: No fittings or joints permitted below grade

2.8 STORM PIPING, BELOW SLAB AND BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A 74 service weight. (Provide extra heavy weight where required by local Authority Having Jurisdiction).

1. Manufacturers:
   a. Charlotte Pipe and Foundry
   b. Tyler Pipe
2. Fittings: Cast iron.
3. Joint Seals: Hub-and-spigot, CISPI HSN compression type with ASTM C 564 neoprene gaskets conforming to ASTM C 1563, or lead and oakum.

B. PVC Pipe: ASTM D 2665 or ASTM D 3034. (No Foam Core Permitted)

1. Manufacturers:
   a. Charlotte Pipe and Foundry
   b. Spears
   c. Cresline
2. Fittings: PVC (DWV pattern).
3. Joints: Solvent welded, with ASTM D 2564 solvent cement.
4. Transition: Use appropriate transition joints as required for connection to dissimilar piping materials. Transition from PVC below grade piping to cast iron pipe above grade shall occur 6" -12" above slab.

2.9 FLANGES, UNIONS, AND COUPLINGS

A. Unions (Pipe Sizes 2" and Under):

1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges (Pipe Size Over 1 Inch):

1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Unions/Connections: Provide standard products recommended by manufacturer for use in service indicated which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.

1. Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier
2. Manufacturer: Subject to compliance with requirements, provide dielectric unions of one of the following:
   a. Atlas Products Co.
   b. Capital Mfg. Co., Div. of Harsco Corp.
   c. Eclipse, Inc.
   d. Epco Sales, Inc.
   e. PSI Industries.
   f. Stockham Valves and Fittings.

2.10 MISCELLANEOUS PIPING FABRICATION MATERIALS:

A. Forged Branch Connection Fittings: Except as otherwise indicated, provide the type as determined by the installer to comply with installation requirements.

B. Pipe Nipples: Fabricate from same pipe as used for connected pipe; except do not use less than schedule 80 pipe where length remaining unthreaded is less than 1 1/2", and where pipe size is less than 1 1/4", and do not thread nipples full length (no close nipples.)

C. Copper Tube Unions: Provide standard products recommended by the manufacturer for use in the service indicated.

D. Welding Materials: Except as otherwise indicated, provide welding materials as determined by the installer to comply with installation requirements. Comply with Section 2-C, ASME Boiler Code for welding materials.

E. Soldering Materials: Except as otherwise indicated, provide lead free soldering materials as determined by the installer to comply with installation requirements.

F. Tin-Antimony Solder: ASTM B32, Grade 95YA.

G. Gaskets for Flanged Joints: ANSI B16.21 full faced for cast iron flanges; raised face for steel flanges, unless otherwise indicated.

H. Gaskets for Grooved Joints: Pressure responsive, ASTM D-2000. Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be molded and produced by the coupling manufacturer.

2.11 PIPE HANGERS AND SUPPORTS

A. HORIZONTAL PIPING HANGERS AND SUPPORTS:

1. General: Except as otherwise indicated, provide factory fabricated horizontal piping hangers and supports of the MSS type and size indicated, bolts (if any) and washers; comply with MSS SP-58 and the manufacturer's published product information. Where the MSS type or size is not indicated, provide proper selection determined by installer for installation requirements, and comply with MSS SP-69 and the manufacturer's published product information: size hangers and supports properly for piping including insulation, for insulated piping systems..
   a. Adjustable Clevis Hangers: MSS-SP-69 Type 1, fabricated from steel. (Insulated or Non-insulated - Stationary piping systems)
   b. Adjustable Swivel Band Hangers: MSS-SP-69 Type 10 fabricated from steel. (Non-insulated - Stationary piping systems)
   c. Adjustable Roller Hangers: MSS-SP-69 Type 43, including axle roller and clevis.(Insulated or Non-insulated - Non-Stationary piping systems)
   d. Steel Brackets: Welded structural steel shapes complying with one of the following:
      1) Light Duty: MSS Type 31.
      2) Medium Duty: MSS Type 32.
      3) Heavy Duty: MSS Type 33.

B. VERTICAL PIPING CLAMPS:

1. General: Except as otherwise indicated, provide factory fabricated vertical piping clamps of the MSS type and size indicated; comply with MSS SP-58 and the manufacturer's published product information. Where the MSS type or size is not indicated, provide proper selection as determined by the installer for installation requirements, and comply with MSS SP-69 and the manufacturer's published product information. Size clamps properly for piping, including insulation (if any).
   a. Two Bolt Riser Clamp: MSS-SP-69 Type 8.
   b. Four Bolt Riser Clamp: MSS-SP-69 Type 42, including pipe spacers at inner bolt holes.

C. HANGER ROD ATTACHMENTS:

1. General: Except as otherwise indicated, provide factory fabricated hanger rod attachments of the MSS type and size indicated; comply with MSS SP-58 and the manufacturer's published product information. Where MSS type or size is not indicated, provide proper selection as determined by installer for installation requirements, and comply with MSS AP-69 and the manufacturer's published product information. Size attachments properly for piping, including insulation (if any).
   a. Turnbuckles: MSS-SP-69 Type 13.
   b. Weldless Eye Nut: MSS-SP-69 Type 17.
   c. Malleable Eye Socket: MSS-SP-69 Type 16.
   d. Clevises: MSS-SP-69 Type 14.

D. BUILDING ATTACHMENTS:

1. General: Except as otherwise indicated, provide factory fabricated building attachments of the MSS type and load rating indicated; comply with MSS SP-58 and the manufacturer's published product information. Where the MSS type or load rating is not indicated, provide proper selection determined by installer for installation requirements, and comply with MSS SP-69 and the manufacturer's published information. Size units properly for piping loading.
   a. Concrete Inserts: MSS-SP-69 Type l8, steel.
   b. Top Beam C-Clamps: MSS-SP-69 Type l9.
   c. C-Clamps: MSS-SP-69 Type 23, steel
   d. Top I-Beam Clamp: MSS-SP-69 Type 25.
   e. Side Beam Clamp: MSS-SP-69 Type 20.
   f. Beam Clamp/Eye Nut: MSS-SP-69 Type 28.
   g. Wide Flange Beam Clamp/Eye Nut: MSS-SP-69 Type 29.
   h. Beam Clamp/Extension Piece: MSS-SP-69 Type 30.

E. SADDLES AND SHIELDS:

1. General: Except as otherwise indicated, provide factory fabricated saddles and shields of the MSS type and size indicated; comply with MSS SP-58 and the manufacturer's published product information. Where the MSS type or size is not indicated, provide proper selection determined by installer for installation requirements, and comply with MSS SP-69 and the manufacturer's published product information. Size saddles and shields properly for insulation and vapor barriers (if any).
   a. Protection Saddles: MSS-SP-69 Type 39.
   b. Protection Shields: MSS-SP-69 Type 40.
   c. Wood Insulation Saddle: Provide products manufactured by Elcen Metal Products Company.

F. RESTRAINTS

1. General: Provide No-Hub Cast Iron Joint restraints as required by local Plumbing Codes, CISPI Designation 310-11, and the 2006 CISPI Installation Handbook. 24 ga. CRS, galvanized straps, stainless steel bands and worm gear drive clamps.

a. HoldRite Series #117

G. MISCELLANEOUS HANGER AND SUPPORT MATERIALS:

1. Metal Framing: Provide products complying with NEMA STD ML 1. Contractor shall provide all miscellaneous steel required for support of work within his contract.
2. Steel Plates, Shapes and Bars: Provide products complying with ASTM A 36.
3. Cement Grout: Portland cement (ASTM C l50, Type I or Type III,) and cleaned uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of l.0 part cement to 3.0 parts sand, by volume, with only the minimum amount of water required for placement and hydration.
4. Heavy Duty Steel Trapezes: Fabricate from steel shapes selected for the loads required, weld steel in accordance with AWS Standards.
5. Pipe Guides: Provide factory fabricated guides of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base with a two sections guiding spider bolted tightly to the pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of the length recommended by the manufacturer to allow indicated travel.

2.12 VALVES:

A. General: Provide factory fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections.

B. All valves and specialties within the domestic potable water piping shall meet the Lead Free requirements of the Safe Drinking Water Act (Sec. 1417) amended 1-4-2011 (weighted average lead content = 0.25%), NSF/ANSI-61-8 Commercial Hot 180°F (including Annex F and G) and NSF/ANSI-372, and other equivalent state regulations.

C. All shutoff valves 4" and smaller within the domestic potable water piping shall be full port ball valve type unless noted otherwise.

D. BALL VALVES:

1. Acceptable Manufacturers: Subject to compliance with requirements, provide valves of one of the following:
   a. Conbraco Industries, Inc.
   b. Milwaukee Valve Co., Inc.
   c. NIBCO, Inc.
2. General: Valves shall be rated 600 PSI non-shock CWP, valve ends shall have full depth ANSI threads or extended solder connections.
3. Comply with the following standards: MSS SP-110

4. Domestic Water Service: Valves shall be rated 600 PSI non-shock CWP and will have 2-pc. lead-free * dezincification-resistant bronze body, end piece, stainless steel stem and ball, PTFE seats, full port, separate pack nut with adjustable stem packing, anti-blowout stems and have the capability of accepting extended operating handles. Valve ends shall have full depth ANSI threads or extended solder connections. Valves shall be 3rd party certified to NSF/ANSI-61-8Commercial Hot 180°F (including Annex F and G) and NSF/ANSI-372. Valves for use in insulated piping systems shall be equipped with 2" extended handles of non-thermal conductive material. A protective sleeve shall allow operation of the valve without disturbing the installation and providing a vapor seal. Product shall be NIBCO NIB-SEAL or approved equal.
    a. Basis of Design(threaded ends): NIBCO T585HP-66-LF (1/2" to 3")
    b. Basis of Design(Soldered): NIBCO S585HP-66-LF (1/2" to 3")
    c. Basis of Design(PressFit): NIBCO PC-585HP-66-LF (1/2" to 3")

E. SWING CHECK VALVES:

1. Acceptable Manufacturers: Subject to compliance with requirements, provide valves of one of the following:
    a. Conbraco Industries, Inc.
    b. Milwaukee Valve Co., Inc.
    c. NIBCO, Inc.
2. Comply with MSS SP-71 and MSS SP-SO for design, workmanship, material and testing.
3. For Domestic Water Service: Valves shall be Y-pattern swing-type rated 200 PSI non-shock CWP. Body, bonnet, and disc hanger are to be of lead-free dezincification-resistant material and PTFE seat disc. Valve ends may be threaded or solder-type. Valves shall be 3rd party certified to NSF/ANSI-61-8 Commercial Hot 180°F (including Annex F and G) and NSF/ANSI-372.
    a. Basis of Design: NIBCO ® T413-Y-LF (threaded); S413-Y-LF (solder)

F. VALVE FEATURES:

1. General: Provide valves with features indicated and where not otherwise indicated, provide proper valve features as determined by installer for installation requirements. Comply with ANSI B31.1
2. Flanged: Valve flanges complying with ANSI B16,1 (cast iron), ANSI B16.5 (steel), or ANSI P16.24 (bronze).
3. Threaded; Valve ends complying with ANSI P2.1.
4. Grooved; Valve ends complying with ANSI/AWWA C606.
5. Solder Joint: Valve ends complying with ANSI P16.18.
6. Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from bronze materials, of standard alloy recognized in the valve manufacturing industry that resists dezincification and meets the Lead free requirements
7. Non-Metallic Discs: Non-metallic material selected for service indicated in accordance with the manufacturer's published literature.
8. Renewable Seat: Design seat of valve with removable disc, and assemble valve so disc can be replaced when worn,

9. Extended Stem: Increase stem length by 2" minimum, co accommodate insulation applied over valve.
10. Check Valve: Check valve designed with hinged disc which seals against seat machined in bridgewall of valve body and manufactured for automatic closure by flow reversal.

2.13 LOW PRESSURE Y-TYPE STRAINERS:

A. Manufacturer: Subject to compliance with requirements, provide low pressure Y-Type strainers of one of the following:

1. Armstrong Machine Works.
2. Hoffman Specialty, ITT Fluid Handling Div.
3. Metraflex Co.
4. Crane Co., Valve Div.
5. Milwaukee Valve Co., Inc.
6. NIBCO, Inc-

B. General: Comply with FCI 73-1. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens, with 3/64" perforations @ 233 per sq. in.

C. All valves and specialties within the domestic potable water piping shall meet the Lead Free requirements of the Safe Drinking Water Act (Sec. 1417) amended 1-4-2011 (weighted average lead content = 0.25%) and other equivalent state regulations

1. Threaded Ends: 2" and Smaller: Lead Free Bronze body rated for 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen, with centered blowdown fitted with threaded ball valve and pipe plug.
2. Threaded Ends: Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen, with centered blowdown fitted with threaded ball valve and pipe plug.
3. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with threaded ball valve and pipe plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. PIPING INSTALLATION:

1. General: Install pipe, tube and fittings in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with a minimum of joints and couplings, but with adequate and accessible unions for disassembly and maintenance/ replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connection, within 1/16" misalignment tolerance.
2. Install all piping in accordance with International Plumbing Code (IPC), International Fuel Gas Code(IFGC), and ANSI B31 Code for Pressure Piping requirements as applicable to each system.
3. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in the shortest route which does not obstruct usable space or block access for servicing the building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanently enclosed elements of the building; limit clearance to 0.5" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1.0" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal piping from view by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
4. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical equipment spaces and enclosures including elevator machine rooms.
5. Piping System Joints: Provide joints of the type indicated in each piping system.
6. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Read threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound/tape on male threads at each joint and tighten joint to leave not more than 3 threads exposed.
7. Solder copper tube and fittings joints in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in a manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
8. Weld pipe joints in accordance with ANSI B31.

9. Flanged Joints: Match flanged within piping systems, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.
10. Insulating Unions: Comply with manufacturer's instructions for installing unions. Install unions in a manner which will prevent galvanic action and stop corrosion when joining ferrous and non-ferrous piping.
11. Grooved Joints: Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to grooved. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer's representative shall periodically visit the job site and review and installation. Contractor shall remove and replace any joints deemed improperly installed.
12. Unless noted otherwise on the Plumbing drawings all Sanitary/Waste, Kitchen Sanitary/Kitchen Waste, Rainwater, Emergency Rainwater, and Storm piping shall be installed at a minimum continuous 2% slope (1/4" per foot).
13. Unless noted otherwise on the Plumbing drawings all Vent, Condensate Drainage, and Radon Remediation piping shall be installed at a minimum continuous 1% slope (1/8" per foot).
14. Provide penetration firestopping for all work of Div. 22 in accordance with Div. 07 specifications.

B. PIPING INSPECTION:

1. General: Clean exterior surfaces of installed piping systems of superfluous materials and prepare for application of specified coatings if any. Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.
2. Disinfect water service piping in accordance with IPC or as required otherwise by local AHJ. Perform bacteriological and chemical contaminant testing in accordance with IPCand submit test results to Engineer and local AHJ.

C. PIPING TESTS:

1. General: Provide temporary equipment for testing, including pumps and gages. Test piping system before insulation is installed wherever feasible and remove control devices before testing.
2. Test each natural section of each piping system independently, but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for the indicated pressure and time.
3. Test piping installations and backflow preventers in accordance with IPC Section 312. Coordinate testing with local AHJ.
4. Repair piping systems sections which fail the required piping tests by disassembly and reinstallation, using new materials to the extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics or other temporary repair methods.

D. PIPING DISINFECTION

1. Disinfect potable water supply piping in accordance with IPC Section 610 or as required otherwise by local AHJ. Perform bacteriological and chemical contaminant testing in accordance with IPCand submit test results to Engineer and local AHJ.

E. HANGERS AND SUPPORTS:

1. Proceed with the installation of hangers, supports and anchors only after the required building structural work has been completed in areas where work is to be installed. Correct inadequacies including (but not limited to) the proper placement of inserts, anchors and other building attachments.

F. BUILDING ATTACHMENTS INSTALLATION:

1. Install building attachments at the required locations within concrete or onto structural steel for proper piping support. Space attachments within the maximum piping span length indicated in MSS SP-69 and IPC. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through the openings at the top of inserts. Prior to placing concrete, install nut in insert and screw threaded rod thru nut until rod is firmly against top of the insert body.

G. HANGERS AND SUPPORTS INSTALLATION:

1. General: Install hangers, supports, clamps and attachments to support piping properly from the building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with the maximum spacing complying with MSS SP-69. Where piping of various sizes is to be supported together with trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire of perforated metal to support piping, and do not support piping from other piping.
2. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of the same type and style as installed for adjacent similar piping.
3. Provide additional steel as required to span structural members for intermediate support of piping required between structural framing members. ALL piping shall be supported from structural framing members only. Coordinate all work with other trades.
    a. Do not fasten or anchor work to concrete floor deck except where individually approved by Structural Engineer and Architect.
    b. Do not fasten or anchor any work directly to metal roof deck.
    c. Prevent electrolysis in support of copper tubing by the use of hangers and supports which are copper plated, or by other recognized industry methods.

d. Provisions for movement:
    1) Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate the action of expansion joints, expansion loops, expansion bends and similar units.
    2) Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
    3) Pipe Slopes: Install hangers and supports to provide the indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B3l are not exceeded.

H. PIPE GUIDE INSTALLATION:

1. Install pipe guides complying with the manufacturer's published product literature. Where not otherwise indicated, install pipe guides on each side of expansion loops.

I. PIPING ANCHORS INSTALLATION:

1. Install anchors at the proper location to prevent stresses from exceeding those permitted by ANSI B3l, and to prevent the transfer of loading and stresses to connection equipment.
    a. Fabricate and install anchor by welding steel shapes, plates and bars to the piping and to the structure. Comply with ANSI B3l and with AWS standards.
    b. Anchor Spacings: Where not otherwise indicated, install anchors at the ends of principal pipe runs, at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

J. ADJUSTMENT OF HANGERS AND SUPPORTS:

1. Adjust hangers and supports and place grout as required under floor mounted supports to bring piping to proper levels and elevations.

K. VALVE INSTALLATION:

1. General: Except as otherwise indicated, comply with the following requirements:
    a. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
    b. Install valves with stems pointed up, in the vertical position, where possible, but in no case with stems pointed downward from a horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
    c. Insulation: Where insulation is indicated, install extended stem valves, arranged in the proper manner co receive insulation.

d. Applications Subject to Shock; Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.
e. Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless the bronze and steel are separated by a dielectric insulator. Install bronze valves in steam and condensate service and in other services where corrosion is indicated or can be expected to occur.
f. OS&Y Valve Stem: Select and install gate valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.
g. Non-Metallic Disc: Limit the selection and installation of valves with non-metallic discs to locations indicated and where foreign material in the piping system can be expected to prevent tight shut off of metal seated valves.
h. Renewable Seats: Select and install valves with renewable seats, except where frequent usage of the valves is indicated.

L. STRAINER INSTALLATION

1. Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.
2. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:
   a. Pumps.
   b. Temperature control valves.
   c. Pressure reducing valves.
   d. Temperature or pressure regulating valves.

M. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

N. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

O. Install piping to maintain headroom, conserve space, and not interfere with use of space.

P. Group piping whenever practical at common elevations.

Q. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 0516.

R. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 0719.

S. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 3100.

T. Establish elevations of buried piping outside the building to ensure not less than four ft of cover.

U. Install vent piping penetrating roofed areas to maintain integrity of roof assembly. Coordinate all requirements with roof installer. Install vent piping penetrations in existing roof assemblies in accordance with all requirements of the roof manufacturer to maintain existing roof warranty.

V. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

W. Provide support for utility meters in accordance with requirements of utility companies.

X. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 9000.

Y. Install bell and spigot pipe with bell end upstream.

Z. Install valves with stems upright or horizontal, not inverted.

AA. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

AB. Install water piping to ASME B31.9 and IPC requirements.

AC. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.

AD. Sleeve pipes passing through partitions, walls and floors.

3.4 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Provide spring loaded check valves on discharge of water pumps.

E. Provide plug valves in natural gas systems for shut-off service in piping systems larger than 2".

F. Provide ball valves with lever handles in natural gas systems for equipment shutoff valves.

G. Provide flow controls in water recirculating systems where indicated. Balance recirculation system to achieve timely delivery of hot water to all plumbing fixtures in accordance with IECC and local Health Department requirements.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with IPC, AWWA, or other method as directed by Local A.H.J. Where sanitizing procedure is not specified by local codes follow the procedure below.

1. Prior to starting work, verify system is complete, flushed and clean.
2. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
3. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
4. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
5. Maintain disinfectant in system for 24 hours.
6. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
7. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
8. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

END OF SECTION