SECTION 23 21 13

HYDRONIC PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Heating water piping, above ground.
2. Chilled water piping, above grade.
3. Equipment drains and over flows.
4. Unions and flanges.
5. Pipe hangers and supports.
6. Valves.
7. Bedding and cover materials.
8. Equipment vent piping

B. Related Sections:

1. Division 07 - Firestopping: Product requirements for firestopping for placement by this section.
2. Division 08 - Access Doors and Frames: Product requirements for access doors for placement by this section.
3. Division 09 - Painting and Coating: Product requirements Painting for placement by this section.
4. Division 23 - Hangers and Supports for HVAC and Plumbing Piping and Equipment: Product requirements for pipe hangers and supports, sleeves, for placement by this section.
5. Division 23 - Vibration and Seismic Controls for HVAC and Plumbing Piping and Equipment: Product requirements for Vibration Isolation for placement by this section.
6. Division 23 - Identification for HVAC and Plumbing Piping and Equipment: Product requirements for pipe identification for placement by this section.
7. Division 23 - HVAC and Plumbing Insulation: Product requirements for Piping Insulation for placement by this section.
8. Division 23 - Hydronic and Plumbing Piping Specialties: Product and execution requirements for piping specialties used in heating and cooling piping systems.
9. Division 31 - Soils for Earthwork: Soils for backfill in trenches.
10. Division 31 - Aggregates for Earthwork: Aggregate for backfill in trenches.
11. Division 31 - Excavation: Product and execution requirements for excavation and backfill required by this section.
12. Division 31 - Trenching: Execution requirements for trenching required by this section.
13. Division 31 - Fill: Execution requirements for backfilling required by this section.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B16.3 - Malleable Iron Threaded Fittings.
2. ASME B16.4 - Gray Iron Threaded Fittings.
3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
5. ASME B31.1 - Power Piping.
6. ASME B31.9 - Building Services Piping.
7. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

B. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
3. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
4. ASTM A536 - Standard Specification for Ductile Iron Castings.
5. ASTM B32 - Standard Specification for Solder Metal.
6. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
7. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
8. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
9. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
10. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
11. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
12. ASTM D2310 - Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
13. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
14. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
15. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
16. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
17. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
18. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
19. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
20. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
21. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
22. ASTM D3309 - Standard Specification for Polybutylene (PB) Plastic Hot- and Cold-Water Distribution Systems.
23. ASTM F437 - Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
24. ASTM F439 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
25. ASTM F441/F441M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
26. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
27. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
28. ASTM F845 - Standard Specification for Plastic Insert Fittings for Polybutylene (PB) Tubing.
29. ASTM F876 - Standard Specification for Cross-linked Polyethylene (PEX) Tubing.
30. ASTM F877 - Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot-and Cold-Water Distribution Systems.
31. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

C. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
2. AWS D1.1 - Structural Welding Code - Steel.

D. American Water Works Association:

1. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
2. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

E. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 67 - Butterfly Valves.
3. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
4. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
5. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
6. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
7. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
8. MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.
9. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
10. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.03 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.

B. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Provide pipe hangers and supports in accordance with ASME B31.1, ASME B31.9, ASTM F708, MSS SP 58, MSS SP 69, and MSS SP 89.

D. Use gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Use globe, ball or butterfly valves for throttling, bypass, or manual flow control services.

F. Use spring loaded check valves on discharge of hot water, chilled water or condenser water pumps.

G. Use plug valves for throttling service. Use non-lubricated plug valves only when shut-off or isolating valves are also provided.

H. Use only butterfly valves in chilled and condenser water systems for throttling and isolation service.

I. Use lug end butterfly valves to isolate equipment.

J. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

K. Flexible Connectors: Use at or near pumps, compressors and motor driven equipment where piping configuration does not absorb vibration.

1.04 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate schematic layout of all piping system, including equipment, critical dimensions, and sizes.

C. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
3. Hangers and Supports: Submit manufacturers catalog information including load capacity.

D. Test Reports: Indicate results of piping system pressure test.

E. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

G. Welders' Certificate: Include welders' certification of compliance with ASME Section IX., AWS D1.1.

1.05 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of valves equipment and accessories.

C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.1 or ASME B31.9 code as applicable for installation of piping systems and ASME Section IX for welding materials and procedures.

B. Perform Work in accordance with applicable authority for welding hanger and support attachments to building structure.

C. Maintain one copy of each document on site.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.

1.08 PRE-INSTALLATION MEETINGS

A. Division 01 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Product storage and handling requirements.

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

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

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Division 01 - Product Requirements.

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

1.11 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.12 COORDINATION

A. Division 01 - Administrative Requirements: Requirements for coordination.

B. Coordinate trenching, excavating, bedding and backfilling of buried piping systems.

1.13 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for valves excluding packing.

1.14 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish two packing kits for each size and valve type.

PART 2 PRODUCTS

2.01 HEATING WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53, Schedule 40, 0.375 inch wall for sizes 12 inch and larger, black.

1. Fittings: ASME B16.3, malleable iron or ASTM A234, forged steel welding type.
2. Joints: Threaded for pipe 2 inches and smaller; welded for pipe 2-1/2 inches and larger.

B. Copper Tubing: ASTM B88, Type L, hard drawn, for 2 inch and smaller.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

2.02 CHILLED WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53, Schedule 40, 0.375 inch wall for sizes 12 inch and larger, black.

1. Fittings: ASME B16.3, malleable iron or ASTM A234, forged steel welding type.
2. Joints: Threaded for pipe 2 inches and smaller; welded for pipe 2-1/2 inches and larger.

B. Steel Pipe: ASTM A53 Schedule 40, black, cut grooved ends.

1. Fittings: ASTM A395 and ASTM A536 ductile iron, or ASTM A234 carbon steel, grooved ends. (Allowed only in the chiller room, mechanical rooms on the roof and fan rooms.)
2. Joints: Grooved mechanical couplings meeting ASTM F1476.

a. Housing Clamps: ASTM A395 and ASTM A536 ductile iron, hot dipped galvanized compatible with steel piping sizes, rigid or flexible type.
b. Gasket: Elastomer composition for operating temperature range from -30 degrees F to 180 degrees F.
c. Accessories: Stainless steel bolts, nuts, and washers.

C. Copper Tubing: ASTM B88, Type L, hard drawn, for 2 inch and smaller.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
2. Joints: Solder, lead free. Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

2.03 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53 Schedule 40, galvanized.

1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
2. Joints: Threaded for pipe 2 inches and smaller; flanged for pipe 2-1/2 inches and larger.

B. Copper Tubing: ASTM B88, Type L, hard drawn.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

2.04 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.
2. Copper Piping: Class 150, bronze unions with brazed joints.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
2. Copper Piping: Class 150, slip-on bronze flanges.
3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.05 GATE VALVES

A. Gate Valves 2 inch and Smaller: MSS SP-80; Class 150, body and union bonnet of ASTM B62 cast bronze; with threaded or solder ends, solid disc, copper silicon alloy stem, brass packing gland, "Teflon" impregnated

packing, and malleable iron hand wheel. Do not use solder end valves for hot water heating or steam piping applications.

Manufacturer	Threaded NRS	Threaded RS	Solder NRS	Solder RS
Crane	X	431UB	X	X
Grinnell	3050	3060	X	X
Hammond	IB637	IB629	X	IB68
Jenkins	X	47U	X	X
Lunkenheimer	3153	3151	3154	3155
Milwaukee	X	1151	X	1169
Powell	2712	2714	X	1842
Stockham	B-130	B-120	X	B-124
Nibco	T-136	T-134	X	S-134

1. X - means not available

B. Gate Valves, 2-1/2 inch and Larger: MSS-SP-70; Class 150 iron body, bronze mounted, with body and bonnet conforming to ASTM A126 Class B; with flanged ends, "Teflon" impregnated packing, and two piece backing gland assembly.

Manufacturers	OS&Y	NRS
Crane	465-1/2	461
Grinnell	6020A	6060A
Hammond	IR1140	IR1138
Jenkins	651A	326
Lunkenheimer	1430	1428
Milwaukee	F-2885	F-2882
Stockham	G-623	G-212
Powell	1793	1787
Nibco	F-6170	F-619

2.06 GLOBE VALVES

A. Globe Valves, 2 inch and Smaller: MSS SP-80; Class 150; body and screwed bonnet of ASTM B62 cast bronze; with threaded or solder ends, brass or replaceable composition disc, copper silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron hand wheel. Provide Class 150 valves meeting the above where system pressure requires, and for all heating hot water and low-pressure steam with threaded ends. Steam valves shall be rated for 150 PSI saturated steam.

Manufacturer	Threaded	Solder	Threaded
Crane	1	1310	17TF
Grinnell	3210	3210SJ	3240
Hammond	IV440	IB423	IB413T
Jenkins	746X	1200	106-A-2
Lunkenheimer	2140	2146	407
Milwaukee	502X	1502	590
Powell	6502712	1823	150
Stockham	B-16	B-14T	B-22

B. Globe Valves, 2-1/2 inch and Larger: MSS SP-85; Class 150 iron body with bolted bonnet conforming to ASTM A126, Class B; with outside screw and yoke, bronze mounted, flanged ends, and "teflon" impregnated packing, and two piece backing gland assembly. Steam valves shall be rated for 150 PSI saturated steam.

Manufacturer	Straight Body	Angle Body
Crane	351	353
Grinnell	6200A	X
Hammond	IR116	IR118

Manufacturer	Straight Body	Angle Body
Jenkins	613	X
Lunkenheimer	1123	1124
Milwaukee	F2981	F2986
Powell	241	243
Stockham	G-512	G-515

1. X - means not available.

2.07 BALL VALVES

A. Ball Valves, 2-1/2 inch and Smaller: Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; two-piece construction; with bronze body conforming to ASTM B62, full port, chrome plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl covered steel handle.

Manufacturer	Threaded Ends	Solder Ends
Conbraco (Apollo)	70-100	70-200
Crane	9302	9322
Grinnell	3500	3500 SJ
Jamesbury	351	X
Jenkins	900T	902T
Lunkenheimer	708HST	X
Metravlex	IT	IS
Powell	4210T	X
Stockham	S-216 BR-R-T	S-216 BR-R-S
Watts	B-6000	B-6001
Nibco	T-585-70	S-585-70

1. X - means not available.

B. Ball Valves 1-1/4 inch to 2-1/2 inch: Rated for 150 PSI saturated steam pressure, 600 PSI WOG pressure; 3 piece construction; with bronze body conforming to ASTM B62, conventional port, chrome plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blow out proof stem, and vinyl covered steel handle. Provide threaded ends for chilled water and heating hot water service.

Manufacturer	Threaded Ends	Solder Ends
Grinnell	3800	3800SF
Nibco	T-595-Y	S-595-Y

2.08 BUTTERFLY VALVES

A. Butterfly Valves, 2-1/2 inch and Larger: MSS SP-67; rated at 200 psi, ductile iron body conforming to ASTM A536, Class B. Provide valves with field replaceable EPDM sleeve, nickel aluminum bronze disc, stainless steel stem, and EPDM O-ring stem seals. Provide lever operators with locks for sizes 2 – 6 inch and gear operators with position indicator for sizes 8 – 24 inch. Provide lug type. Drill and tap valves on dead end service or requiring additional body strength.

1. The following are model numbers for lug type with aluminum bronze disc:

Manufacturer	Lever	Gear
Center Line	Series LT	Series LT
Crane	44	44
Conbraco (Apollo)	6L-14X-01	6L-14X-02
Grinnell	LD-8289-7	LD-8282-7
Keystone	129	129
Mueller	56INK-6	INK-6
Powell	5011-BA-1	5011-BA1
Stockham	LG-712-BS3E	LG-722-BS3E

Manufacturer	Lever	Gear
Watts	BF-03-121-11	BF-03-121-12

2.09 CHECK VALVES

A. Swing Check Valves, 2 inch and Smaller: MSS SP-80; Class 125, cast bronze body and cap conforming to ASTM B62; with horizontal swing, Y-pattern and bronze disc; and having threaded or soldered ends. Provide valves capable of being reground while the valve remains in the line. Provide Class 150 (150 PSI saturated steam) valves meeting the above specifications, with threaded end connections, where system pressure requires and for all heating hot water, steam

Manufacturer	Class 125 Threaded Ends	Class 125 Solder Ends	Class 50 Threaded Ends
Crane	37	1342	137
Grinnell	3300	3300SJ	3320
Hammond	IB940	IB941	IB946
Jenkins	92-A	1222	92-A
Lunkenheimer	2144	2145	230-70
Milwaukee	509	1509	510
Powell	587	1825	596
Stockham	B-319	B-309	B-321

B. Swing Check Valves, 2-1/2 inch and Larger: MSS SP-71; Class 125 (Class 175 FM approved for fire protection piping systems), cast iron body and bolted cap conforming to ASTM A126, Class B; horizontal wing, and bronze disc or cast iron disc with bronze disc ring; and flanged ends. Provide valves capable of being refitted while the valve remains in the line. Steam valves shall be rated for 150 PSI saturated steam.

Manufacturer	Class 125	Class 175
Crane	373	X
Grinnell	6300A	X
Hammond	IR1124	X
Jenkins	X	729
Kennedy	X	Fig 126
Lunkenheimer	179 IBBM	X
Milwaukee	F2974	X
Powell	559	X
Stockham	G-931	G-940

1. X - means not available.

C. Lift Check Valves, 2 inch and Smaller: Class 125; cast bronze body and cap conforming to ASTM B62; horizontal or angle pattern, lift type valve with stainless steel spring, bronze disc holder with renewable "Teflon" disc, and threaded ends. Provide valves capable of being refitted and ground while the valve remains in the line. Steam valves shall be rated for 150 PSI saturated steam.

Manufacturer	Horizontal	Angle
Hammond	X	IB954
Jenkins	655-A	X
Lunkenheimer	233	X
Mueller	303-BP	X

1. X - means not available.

D. Globe (Flanged) Style Silent Check Valves: 2 inch and larger Class 250, cast iron body; with replaceable bronze seat, and non-slam design lapped and balanced twin bronze flappers and stainless steel trim and torsion spring. Provide valves designed to open and close at approximately 1 foot differential pressure.

Check Valves	
Grinnell	502 ½ - 580
Mueller	109 MAP

2.10 BACKFLOW PREVENTERS

A. Reduced pressure principle assembly consisting of shut off valves on inlet and outlet and strainer on inlet. Assemblies shall include test cocks and pressure differential relief valve located between 2 positive seating check valves and comply with requirements of ASSE Standard 1013. Assemblies shall have approval of the Health Department having jurisdiction.

Backflow Preventers
Cla-Val Co.
Febco
Hersey Products, Inc.
Watts Regulator Co.
Zurn Industries Inc., Wilkins Regulators Div.

2.11 Y-TYPE STRAINERS

A. Provide strainers full line size of connecting piping, with ends matching piping system materials. Screens shall be Type 304 stainless steel, with 3/64 inch perforations at 233 per square inch.

1. All strainers shall be furnished with a 3/4 inch ball valve with a hose adapter for blowing down.
2. Provide strainers with 125 PSI working pressure rating for low-pressure applications, and 250 PSI pressure rating for high pressure application.
3. Threaded Ends 2 inch and Smaller: Cast iron body, screwed screen retainer with centered blow down fitted with pipe plug.
4. Threaded Ends 2-1/2 inch and Larger: Cast iron body, bolted screen retainer with off center blow down fitted with pipe plug.
5. Flanged Ends 2 inch and Larger: Cast iron body, bolted screen retainer with off-center blow down fitted with pipe plug.
6. Butt Welded Ends 2-1/2 inch and Larger for Low Pressure Application: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blow down fitted with pipe plug.
7. Butt Welded Ends 2-1/2 inch and Larger for High Pressure Application: Schedule 80 cast carbon steel body, bolted screen retainer with off center blow down fitted with pipe plug.

2.12 PIPE HANGERS AND SUPPORTS

A. Refer to Division 23 Hangers and Supports for HVAC and Plumbing Piping and Equipment.

2.13 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type A1, A2, A3 or A4 as specified in Division 31.

B. Cover: Fill Type A1, A2, A3 or A4, as specified in Division 31.

C. Soil Backfill from Above Pipe to Finish Grade: Soil Type S1 or S2, as specified in Division 31. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

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

3.02 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.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

E. After completion, fill, clean, and treat systems.

3.03 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Install in accordance with ASME B31.9, ASTM F708 and MSS SP 89.

B. Support horizontal piping as scheduled.

C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

D. Place hangers within 12 inches of each horizontal elbow.

E. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

F. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

G. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.

H. Provide copper plated hangers and supports for copper piping or sheet lead packing between hanger or support and piping.

I. Prime coat exposed steel hangers and supports. Refer to Division 09. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

K. Install pipe hangers and supports in accordance with Division 23.

3.04 VALVE ENDS SELECTION

A. Select valves with the following ends or types of pipe/tube connections:

1. Copper Tube Size, 2 inch and Smaller: Solder ends, except provide threaded ends for heating hot water and low-pressure steam service.
2. Steel Pipe Sizes, 2 inch and Smaller: Threaded end.
3. Steel Pipe Sizes, 2-1/2 inch and Larger: Flanged end.

3.05 VALVE INSTALLATIONS

A. General Application: Refer to piping system specification sections for specific valve applications and arrangements. Use gate, ball, and butterfly valves for shut-off duty; globe and ball for throttling duty.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

D. Install three-valve bypass around each pressure reducing valve using throttling type valves.

E. Install valves in horizontal piping with stem movement.

F. Install valves in a position to allow full stem movement.

G. Installation of Check Valves: Install for proper direction of flow as follows:

1. Swing Check Valves: Horizontal position with hinge pin level.
2. Lift Check Valve: With stem upright and plumb.

3.06 SOLDER CONNECTIONS

A. Cut tube square and to exact lengths.

B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in same manner.

C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

D. Open gate and glove valves to full open position.

E. Remove the cap and disc holder of swing check valves having composition discs.

F. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of flux.

G. Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

H. Use 95-5 tin/antimony solder for all solder joints unless indicated otherwise.

3.07 THREADED CONNECTIONS

A. Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.

B. Align threads at point of assembly.

C. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.08 FLANGED CONNECTIONS

A. Align flanged surfaces parallel.

B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

3.09 FIELD QUALITY CONTROL

A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.10 ADJUSTING AND CLEANING

A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.

3.11 VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES

A. Valves, 2 inch and Smaller:

Service	Gate	Globe	Ball	Check
Chilled Water	125	125	150	125
Domestic Hot and Cold Water, Heating Hot Water	150	150	150	150
Steam	150	150	150	150
Steam Condensate	150	150	150	150

B. Valves, 2-1/2 inch and Larger:

Service	Gate	Globe	Ball	Check
Chilled Water	125	125	200	125
Domestic Hot and Cold Water	125	125	200	125
Heating Hot Water	150	150	200	125
Steam	150	150	N/A	150
Steam Condensate	125	125	N/A	125

C. Valve Service:

1. Heating Hot Water Piping
2. Chilled Water Piping
3. Equipment Drains and Overflows

END OF SECTION