SECTION 232113

HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and pipe fittings for:
   1. Heating water piping system.
   2. Chilled water piping system.
   3. Equipment drains and overflows.

B. Valves:
   1. Gate valves.
   2. Ball valves.
   3. Plug valves.
   4. Butterfly valves.
   5. Check valves.

1.2 RELATED SECTIONS

A. Division 08 - Access Doors.

B. Division 09 - Painting.

C. Section 23 05 16 - Piping Expansion Compensation.

D. Section 23 05 48 - Vibration Isolation.

E. Section 23 05 53 - Mechanical Identification.

F. Section 23 07 00 - Piping Insulation.

G. Section 23 2 116 - Hydronic Specialties.

H. Section 23 25 00 - Chemical Water Treatment: Pipe cleaning.

I. Section 26 06 05 - Equipment Wiring Systems: Electrical characteristics and wiring connections.

1.3 REFERENCES

A. ASME - Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.

B. ASME B16.3 - Malleable Iron Threaded Fittings Class 50 and 300.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

E. ASME B31.5 - Refrigeration Piping.

F. ASME B31.9 - Building Services Piping.

G. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

H. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

I. ASTM B32 - Solder Metal.

J. ASTM B88 - Seamless Copper Water Tube.

K. ASTM D1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

L. ASTM D2310 - Machine-Made Reinforced Thermosetting Resin Pipe.

M. ASTM D2466 - Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

N. ASTM D2467 - Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

O. ASTM D2683 - Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

P. ASTM D2855 - Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

Q. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

R. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

S. AWS A5.8 - Brazing Filler Metal.

T. AWS D1.1 - Structural Welding Code.

U. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

V. AWWA C110 - Ductile - Iron and Grey -Iron Fittings 3 in. through 48 in., for Water and Other Liquids.

W. AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

X. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds, or Sand-Lined Molds, for Water or Other Liquids.

Y. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacture.

Z. MSS SP69 - Pipe Hangers and Supports - Selection and Application.

AA. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.4 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Use grooved mechanical couplings and fasteners in accessible locations.

C. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment, or other apparatus.

D. Provide pipe hangers and support in accordance with ASTM B31.9, MSS SP69 unless indicated otherwise.

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

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

G. Use spring loaded check valves on discharge of condenser water pumps.

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

I. Use butterfly valves in heating and chilled water systems interchangeably with gate and globe valves.

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

K. Use lug end butterfly valves to isolate equipment.

L. 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.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Submit under the provisions of Division 01.

B. Record actual locations of valves.

C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with a minimum of three (3) years' documented experience.

B. Installer: Company specializing in performing the work of this section with a minimum of three (3) years' documented experience.

C. Welders: Certify in accordance with ASME SEC 9. AWS D1.1.

1.7 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME SEC 9 and applicable state labor regulations.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 23 05 00.

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

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

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

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

1.9 ENVIRONMENTAL REQUIREMENTS

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

PART 2 PRODUCTS

2.1 HEATING WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53, Schedule 40, black.
   1. Fittings: ASTM B16.3, malleable iron, or ASTM A234, forged steel welding type fittings.
   2. Joints: Threaded, or AWS D1.1, welded.

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.

2.2 CHILLED WATER PIPING, BURIED

A. Steel Pipe: ASTM A53, Schedule 40, black with AWWA C105 polyethylene jacket, or double layer, half-lapped 10 mil polyethylene tape.
   1. Fittings: ASTM A234, forged steel welding type with double layer, half-lapped 10 mil polyethylene tape.
   2. Joints: AWS D1.1, welded.
   3. Casing: Polyurethane insulation with high density polyethylene jacket and heat shrink sleeves.

B. Copper Tubing: ASTM B88, Type K, annealed.
   1. Fittings: ASME B16.22, 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.
   3. Casing: Polyurethane insulation with high density polyethylene jacket and heat shrink sleeves.

C. Ductile Iron Pipe: AWWA C151.
   1. Fittings: AWWA C110, ductile iron, standard thickness.
   2. Joints: AWWA C111, rubber gasket with 3/4-inch diameter rods.

D. FRP Pipe: ASTM D2310, fiberglass reinforced thermosetting resin plastic.
   1. Fittings: Fiberglass reinforced epoxy.
   2. Joints: Hub-and-spigot with rubber gasket.

2.3 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53, Schedule 40, black.
   1. Fittings: ASTM B16.3, malleable iron, or ASTM A234, forged steel welding type.

2. Joints: Threaded or AWS D1.1 welded.

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.

2.4 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53, Schedule 40 galvanized.
1. Fittings: Galvanized cast iron, or ASTM B16.3 malleable iron.
2. Joints: Threaded or grooved mechanical couplings.

B. Copper Tubing: ASTM B88, Type M, 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.

2.5 PIPE HANGERS AND SUPPORTS

A. Reference Section 23 05 29.

2.6 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches and Under:
1. Ferrous Piping: 150-psig malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 Inches:
1. Ferrous Piping: 150-psig forged steel, slip-on.
2. Copper Piping: Bronze.
3. Gaskets: 1/16-inch-thick preformed neoprene.

C. Grooved and Shouldered Pipe End Couplings:
1. Housing Clamps: Malleable iron [galvanized] to engage and lock, designed to permit some angular deflection, contraction, and expansion.
2. Sealing Gasket: C-shape elastomer composition for operating temperature range from -30 degrees F to 230 degrees F.
3. Accessories: Steel bolts, nuts, and washers.

2.7 GATE VALVES

A. Screwed - Up to and Including 2 Inches:
1. Manufacturers:
a) Nibco Model T134.
b) Milwaukee Model 1151.
c) Hammond Model IB629.
d) Kitz Model 42.
2. Bronze body, bronze trim, union bonnet, rising stem, handwheel, inside screw, solid wedge disc, threaded ends.

B. Soldered - Up to and Including 2 Inches:
1. Manufacturers:
a) Nibco Model S-134.
b) Milwaukee Model 1169.
c) Hammond Model IB648.

d) Kitz Model 43.

2. Bronze body, bronze trim, union bonnet, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

C. Flanged - Over 2 Inches:

1. Manufacturers:
   a) Nibco Model F-6170.
   b) Milwaukee Model F2885.
   c) Hammond Model IR1140.
   d) Kitz Model 72.
2. Iron body, bronze trim, bolted bonnet, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends.

2.8 BALL VALVES

A. Screwed Ends - Up to and Including 2 Inches:

1. Manufacturers:
   a) Nibco Model T585-70.
   b) Milwaukee Model BA300.
   c) Hammond Model 8300.
   d) Kitz Model 68.
2. Bronze two-piece full port body, chrome plated brass ball, Teflon seats and stuffing box ring, lever handle, threaded ends.

B. Soldered Ends - Up to and Including 2 Inches:

1. Manufacturers:
   a) Nibco Model S-585-70.
   b) Milwaukee Model BA-150.
   c) Hammond Model 8311.
   d) Kitz Model 69.
2. Bronze two-piece full port body, chrome plated brass ball, Teflon seats and stuffing box ring, lever handle, solder ends.

C. Flanged - Over 2 Inches:

1. Manufacturers:
   a) Nibco Model F-510.
   b) Milwaukee Model F90CC.
   c) Stockham Model 941TRE.
   d) Kitz Model K150.
2. Cast steel body, chrome plated steel ball, Teflon seat and stuffing box seals, lever handle.

2.9 BUTTERFLY VALVES

A. Manufacturers:

1. Nibco Model WD2000.
2. Milwaukee 'C' Series.
3. Hammond Model 6100.
4. Kitz Model 81.

B. Ductile iron body with EPDM seat, wafer ends, extended neck, aluminum bronze disc.

C. Operator: 10 position lever handle for valves through 4-inch size. Gear operator for valves five inches and above.

2.10 SWING CHECK VALVES

A. Threaded - Up to and Including 2 Inches:
   1. Manufacturers:
      a) Nibco Model T413.
      b) Milwaukee Model 544.
      c) Hammond Model IB940.
      d) Kitz Model 04.
   2. Bronze body, bronze trim, bronze rotating swing check with composite disc, threaded ends.

B. Soldered - Up to and Including 2 Inches:
   1. Manufacturers:
      a) Nibco Model S413.
      b) Milwaukee Model 1509.
      c) Hammond Model IB-912.
      d) Kitz Model 14.
   2. Bronze body, bronze trim, bronze rotating swing check with composite disc, solder ends.

C. Flanged - Over 2 Inches:
   1. Manufacturers:
      a) Nibco Model F-918B.
      b) Milwaukee Model F-2974.
      c) Hammond Model IR1140.
      d) Kitz Model 78.
   2. Iron body, bronze trim, bronze on bronze faced rotating swing disc, renewable disc and seat, flanged ends.

PART 3 EXECUTION

3.1 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. Refer to Section 23 25 00.

3.2 INSTALLATION

A. Install in accordance with the manufacturer's instructions.

B. Install heating water, chilled water, and engine exhaust piping to ASME B31.9.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls, and floors.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.

H. Inserts:
   1. Reference Section 23 05 29.

I. Pipe Hangers and Supports:
   1. Reference Section 23 05 29.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 00.

K. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Division 08.

L. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain the top of pipe level.

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

N. Prepare unfinished pipe, fittings, supports, and accessories, ready for the finished painting. Refer to Division 09.

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

END OF SECTION