PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes piping, and hydronic specialties for High Temperature Hot Water piping, blowdown drain piping, and vent piping.

B. Related Sections include the following:

1. Division 15 Section "Basic Mechanical Materials and Methods" for general piping materials and installation requirements and for labeling and identifying hydronic piping.
2. Division 15 Section "Hangers and Supports" for pipe supports, product descriptions, and installation requirements. Hanger and support spacing is specified in this Section.
3. Division 15 Section "Valves" for gate and globe valves.
4. Division 15 Section "Meters and Gages" for thermometers, flow meters, and pressure gages.

1.3 SUBMITTALS

A. Product Data:

B. Shop Drawings: Detail fabrication of pipe anchors, hangers, special pipe support assemblies, alignment guides, expansion loops, and their attachment to the building structure. Detail location of anchors, alignment guides, and expansion loops.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.
D. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Failed test results and corrective action taken to achieve requirements.

E. Maintenance Data: For hydronic specialties and special-duty valves to include in maintenance manuals specified in Division 1.

F. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.4 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to the ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."


1.5 COORDINATION

A. Coordinate layout and installation of hydronic piping and suspension system components with other construction.

B. Coordinate piping installation with roof curbs, equipment supports, and roof penetrations. Roof specialties are specified in Division 7 Sections.

C. Coordinate pipe fitting pressure classes with products specified in related Sections.

D. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base. Concrete, reinforcement, and formwork requirements are specified in Division 3 Sections.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All pipe and fittings used on this project shall be manufactured in the United States.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pipe:
   a. Laclede.
   b. LTV.
   c. Sawhill Tubular.
   d. U.S. Steel.
   e. Wheatland.

2. Welded Fittings:
   a. Bonney Forge.
   b. Hackney.
   c. Ladish.
   d. Tubetums.
   e. Weldbend.
   f. Wheeling.

3. Gaskets:
   a. Flexitallic.
   b. Lamons

2.2 PIPING MATERIALS

A. General: Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe, NPS 2 and Smaller: ASTM A 53 or A106, Type S (seamless), Grade B, Schedule 80, black steel, plain ends.

B. Steel Pipe, NPS 2-1/2 through NPS 12: ASTM A 53 or A106, Type S (seamless), Grade B, Schedule 40, black steel, plain ends.

C. Joints: Butt-welded for pipe 2-1/2” and larger; socket welded for pipes 2” and smaller.
D. Wrought-Steel Fittings: ASME B16.9; ASTM A234, Grade B wall thickness to match adjoining pipe. All elbows shall be long radius.

E. Socket Welded Fittings: Forged steel; ASME B16.11; 3000 psig class.

F. Forged Steel Threaded Fittings: ASME B16.11, 3000 psig class.

G. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, ASTM A105; class 300, weld-neck type, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

2. End Connections: Weld neck, butt welding type.
3. Facings: Raised face.
4. Bolts: High-strength, ASTM 193, Grade B7;
5. Nuts: ASTM 194, Grade 2H.

H. Welding Materials: Comply with Section II, Part C, of the ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.

I. Gaskets: Spiral wound stainless steel designed for service conditions.

2.4 VALVES

A. Gate, globe, check, and triple offset rotary valves are specified in Division 15 Section "Valves."

B. Refer to Part 3 "Valve Applications" Article for applications of each valve.

2.5 HYDRONIC SPECIALTIES

A. Manual Air Vent: Manual air vents shall consist of an air collection chamber, ½” vent piping including two (2) ½” forged steel globe valves as indicated. Where not shown otherwise, provide air collection chamber fabricated from 6 inch diameter pipe with a pipe cap on one end and a 6”x3” eccentric reducer at the other end.
PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. High Temperature Hot Water, NPS 2 and Smaller: Schedule 80 seamless steel pipe with socket welded joints using forged steel fittings.

B. High Temperature Hot Water, NPS 2-1/2 and Larger: Schedule 40 seamless steel pipe with butt welded joints except at equipment connections with flanged joints. Fittings shall be schedule 80 wrought-steel welding fittings and class 300 wrought-steel flanges where indicated.

C. Drain and Vent Lines:
   1. High Temperature Hot Water: Schedule 80 seamless steel pipe with socket welded joints using forged steel fittings.

3.2 VALVE APPLICATIONS

A. Valve Applications: Unless otherwise indicated, use the following valve types:
   1. Shutoff Duty: Gate valves.

B. Install shutoff duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, unless only one piece of equipment is connected in the branch line. Install throttling duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated.

3.3 PIPING INSTALLATIONS

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.

B. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

C. Install drains, consisting of a sock-o-let fitting, NPS 3/4 forged steel globe valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

D. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

E. Reduce pipe sizes using eccentric reducer fitting installed with level side down.
F. Unless otherwise indicated, install branch connections to mains using tee or lateral fittings in main pipe, with the takeoff coming out the bottom of the main pipe. For up-feed risers, install the takeoff coming out the top of the main pipe.

G. Install strainers on supply side of each control valve, and elsewhere as indicated. Install NPS 3/4 nipple and forged steel globe valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

H. Anchor piping for proper direction of expansion and contraction.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 15 Section "Hangers and Supports." Comply with requirements below for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable roller hangers and spring hangers for individual horizontal piping.
2. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
3. Spring hangers to support vertical runs.

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.

3.5 PIPE JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joint construction requirements for threaded, welded, and flanged joints in steel piping.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
3.7 CHEMICAL TREATMENT

A. Chemicals required for chemical treatment will be provided by the owner.

B. Fill system and coordinate with owner to perform initial chemical treatment.

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.1 and as follows:
   1. Leave joints, including welds, uninsulated and exposed for examination during test.
   2. Flush system with clean water. Clean strainers.
   3. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blind flanges on generator safety valve connections and unit connections if required.
   4. Upon completion of testing, remove blind flanges and install safety valves. Valves are factory set at 420 PSIG and 430 PSIG.

B. Perform the following tests on hydronic piping:
   1. Use ambient temperature water as a testing medium.
   2. While filling system, use vents installed at high points of system to release trapped air. Use drains installed at low points for complete draining of liquid.
   3. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure does not exceed either 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A of ASME B31.1, "Power Piping."
   4. After hydrostatic test pressure has been applied for at least 2 hours, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
   5. Prepare written report of testing.

3.9 ADJUSTING

A. Perform these adjustments before operating the system:
   1. Open valves to fully open position.
   2. Check air vents at high points of system and determine if all are installed and bleed air completely.
3.10 CLEANING

A. Flush hydronic piping systems with clean water. Remove and clean or replace strainer screens.