

SECTION 232213 - STEAM AND CONDENSATE PIPING

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 the following for LP steam and condensate piping, valves, fittings, and accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of the following:

1. Pressure-reducing and safety valve.
2. Steam trap.
3. Air vent and vacuum breaker.

- B. Operation and Maintenance Data

1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code - Steel."
- B. Pipe Welding: Qualify processes and operators according to the following:
 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp flash tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, plain ends, Type, Grade, and Schedule as indicated in Part 3 piping applications articles.
- B. Steel Pipe: ASTM A106 / A106M - 10 Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
- C. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125, 150, and 300 as indicated in Part 3 piping applications articles.
- D. Malleable-Iron Threaded Fittings: ASME B16.3; Classes 150 and 300 as indicated in Part 3 piping applications articles.
- E. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 piping applications articles.
- F. Cast-Iron Threaded Flanges and Flanged Fittings: ASME B16.1, Classes 125 and 250 as indicated in Part 3 piping applications articles; raised ground face, and bolt holes spot faced.
- G. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- H. Wrought-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- I. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, black steel of same Type, Grade, and Schedule as pipe in which installed.

2.2 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

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

2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.

2.4 STEAM VALVES

- A. Refer to Part 3 "Valve Applications" Article for applications of each valve.
- B. Gate Valves:
 - 1. Threaded Ends 2" and Smaller, Low Pressure Steam and condensate: Class 150, bronze body, union bonnet, rising stem, solid wedge: Hammond IB629, Nibco T-134, Stockham B120, Milwaukee 1151 or approved equal.
 - 2. Threaded Ends 2" and Smaller, High Pressure Steam and condensate: Class 300, bronze body, union bonnet, rising stem, solid stainless wedge and stainless seat: Hammond IB654, Nibco T-174SS, Stockham B145, Milwaukee 1184 or approved equal.
 - 3. Flanged Ends 2-1/2" and Larger, Low Pressure Steam and condensate: Class 125, iron body, bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge: Hammond IR1140, Nibco F617-0, Stockham G623, Milwaukee F2885 or approved equal.
 - 4. Comply with the following standards:
 - a. Cast Iron Valves: MSS SP – 70
 - b. Bronze Valves: MSS SP - 80
- C. Swing check valves:
 - 1. Construct pressure containing parts of Valves as follows:
 - a. Bronze Valves: 125 or 150 psi: ANSI/ASTM B 62
 - b. Iron Body Valves: ANSI/ASTM A-126, Grade B
 - 2. Comply with the following standards for design, workmanship, material and testing:
 - a. Bronze Valves: MSS SP - 80
 - b. Cast Iron Valves: MSS SP – 71
 - 3. Construct valves of pressure casting free of any impregnating materials. Construct disc and hanger as one piece. Support hanger pins by removable side plug.
 - 4. Threaded Ends 2" and Smaller, Low Pressure Steam: Class 150, bronze body, screwed cap, Teflon disc: Hammond IB946, Stockham B316, Milwaukee 510T or approved equal.

2.5 STRAINERS

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B cast iron, with bolted cover and bottom drain connection.
2. End Connections: Threaded ends.
3. Strainer Screen: Stainless-steel, 20 mesh strainer, and perforated stainless-steel basket with 50 percent free area.
4. Tapped blowoff plug.
5. CWP Rating: 250-psig working steam pressure.

2.6 STEAM TRAPS

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

1. Armstrong International, Inc.
2. Barnes & Jones, Inc.
3. Dunham-Bush, Inc.
4. Hoffman Specialty; Division of ITT Industries.
5. Spirax Sarco, Inc.

B. Thermostatic Traps:

1. Body: Bronze angle-pattern body with integral union tailpiece and screw-in cap.
2. Trap Type: Balanced-pressure.
3. Bellows: Stainless steel or monel.
4. Head and Seat: Replaceable, hardened stainless steel.
5. Pressure Class: 125.

C. Thermodynamic Traps:

1. Body: Stainless steel with screw-in cap.
2. End Connections: Threaded.
3. Disc and Seat: Stainless steel.
4. Maximum Operating Pressure: 600 psig.

D. Float and Thermostatic Traps:

1. Body and Bolted Cap: ASTM A 126, cast iron.
2. End Connections: Threaded.
3. Float Mechanism: Replaceable, stainless steel.
4. Head and Seat: Hardened stainless steel.
5. Trap Type: Balanced pressure.
6. Thermostatic Bellows: Stainless steel or monel.
7. Thermostatic air vent capable of withstanding 45 deg F of superheat and resisting water hammer without sustaining damage.
8. Vacuum Breaker: Thermostatic with phosphor bronze bellows, and stainless steel cage, valve, and seat.
9. Maximum Operating Pressure: 125 psig.

2.7 THERMOSTATIC AIR VENTS AND VACUUM BREAKERS

A. Thermostatic Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong International, Inc.
 - b. Barnes & Jones, Inc.
 - c. Dunham-Bush, Inc.
 - d. Hoffman Specialty; Division of ITT Industries.
 - e. Spirax Sarco, Inc.
 - f. Sterling.
2. Body: Cast iron, bronze or stainless steel.
3. End Connections: Threaded.
4. Float, Valve, and Seat: Stainless steel.
5. Thermostatic Element: Phosphor bronze bellows in a stainless-steel cage.
6. Pressure Rating: 125 psig.
7. Maximum Temperature Rating: 350 deg F.

B. Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong International, Inc.
 - b. Dunham-Bush, Inc.
 - c. Hoffman Specialty; Division of ITT Industries.
 - d. Johnson Corporation (The).
 - e. Spirax Sarco, Inc.
2. Body: Cast iron, bronze, or stainless steel.
3. End Connections: Threaded.
4. Sealing Ball, Retainer, Spring, and Screen: Stainless steel.
5. O-ring Seal: EPR.
6. Pressure Rating: 125 psig.
7. Maximum Temperature Rating: 350 deg F.

PART 3 - EXECUTION

3.1 LP STEAM PIPING APPLICATIONS

- A. Steam Piping: Schedule 40 steel pipe, with threaded joints using Class 125 cast-iron fittings.
- B. Condensate Piping: Schedule 80 steel pipe, with threaded joints using Class 125 malleable-iron fittings.

3.2 ANCILLARY PIPING APPLICATIONS

A. Air-Vent Piping:

1. Inlet: Same as service where installed.
2. Outlet: Type K annealed-temper copper tubing with soldered or flared joints.

B. Vacuum-Breaker Piping: Outlet, same as service where installed.

3.3 VALVE APPLICATIONS

- #### A. Install shutoff duty valves at branch connections to steam supply mains, at steam supply connections to equipment, and at the outlet of steam traps.

3.4 PIPING INSTALLATION

- #### A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Use indicated piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- #### B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- #### C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- #### D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- #### E. Install piping to permit valve servicing.
- #### F. Install piping free of sags and bends.
- #### G. Install fittings for changes in direction and branch connections.
- #### H. Install piping to allow application of insulation.
- #### I. Select system components with pressure rating equal to or greater than system operating pressure.
- #### J. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- #### K. Install drains, consisting of a tee fitting, NPS 3/4 full port-ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- #### L. Install steam supply piping at a minimum uniform grade of 1/4" per 10 feet downward in direction of steam flow.

- M. Install condensate return piping at a minimum uniform grade of ¼" per 10 feet downward in direction of condensate flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side down.
- O. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- P. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- Q. Install strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install NPS 3/4 nipple and full port ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.
- R. Identify piping as specified in Division 23 Section "Mechanical Identification."
- S. Install drip legs at low points and natural drainage points such as ends of mains, bottoms of risers, and ahead of pressure regulators, and control valves.
 - 1. On straight runs with no natural drainage points, install drip legs at intervals not exceeding 300 feet.

3.5 STEAM-TRAP INSTALLATION

- A. Install steam traps in accessible locations as close as possible to connected equipment.
- B. Install full-port ball valve, strainer, and union upstream from trap; install union, check valve, and full-port ball valve downstream from trap unless otherwise indicated.

3.6 HANGERS AND SUPPORTS

- A. Install hangers and supports according to Division 23 Section "Hangers and Supports." Comply with requirements below for maximum spacing.
- B. Install the following pipe attachments: Adjustable steel clevis hangers.

3.7 PIPE JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

3.8 FIELD QUALITY CONTROL

- A. Prepare steam and condensate piping according to ASME B31.9, "Building Services Piping," and as follows:
1. Leave joints, including welds, uninsulated and exposed for examination during test.
 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 3. Flush system with clean water. Clean strainers.
 4. 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 blinds in flanged joints to isolate equipment.
- B. Perform the following tests on steam and condensate piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 2. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the working 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 at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength.
 3. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
- C. Prepare written report of testing.

END OF SECTION 232213