

SECTION 15185
STEAM AND CONDENSATE PIPING

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

- A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to work specified in this Section.
- B. Requirements of Section 15050, "Basic Mechanical Materials and Methods," apply to this Section.

1.02 SUMMARY

- A. This Section includes low pressure steam and condensate piping and specialties for building heating systems. Materials and equipment specified in this Section include:
 - 1. Pipes, fittings, and specialties
 - 2. Special duty valves
- B. Related Work Specified in Other Sections:
 - 1. Division 7 Section "Firestopping and Joint Sealer" for materials and methods for sealing pipe penetrations through basement walls and fire/smoke barriers.

1.03 DEFINITIONS

- A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).
- B. Low Pressure Steam Systems operate at 15 psig (100 kPa above atmospheric) and under.

1.04 SUBMITTALS

- A. Product data, including rated capacities where applicable, furnished options and accessories, and installation instructions.
- B. Maintenance data, including data for steam and condensate specialties and special duty valves. Refer to Division 1 and Division 15 Section "Basic Mechanical Materials and Methods" for detailed requirements.
- C. Welders' certificates certifying that welders meet the quality requirements specified in Quality Assurance below.
- D. Certification of compliance with specified ASTM, ASME, and ANSI manufacturing requirements for pipe, fittings, and specialties.
- E. Test reports indicating and interpreting test results relative to compliance with requirements specified in Part 3 of this Section.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: comply with the provisions of the following:
 - 1. ASME B 31.9 "Building Services Piping: for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.
 - 2. ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualification" for qualifications for welding processes and operators.
 - 3. Massachusetts State Building Code.

1.06 COORDINATION

- A. Coordinate layout and installation of piping with steam and condensate equipment and with other installations.
- B. Coordinate installation of pipe sleeves for penetrations in exterior walls and floor assemblies. Coordinate with Division 7 Section "Firestopping" for fire and smoke wall and floor assemblies.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Steam Traps: Subject to compliance with requirements, provide products from one of the following:
 - 1. Barnes-Jones.
 - 2. Armstrong.
 - 3. Spirax Sarco.
- B. Air Vents: Subject to compliance with requirements, provide products from one of the following:
 - 1. Armstrong Machine Works.
 - 2. Hoffman Specialty ITT; Fluid Handling Div.
 - 3. Spirax Sarco.
- C. Strainers: Subject to compliance with requirements, provide products from one of the following:
 - 1. Armstrong Machine Works.
 - 2. Hoffman Specialty ITT; Fluid Handling Div.
 - 3. Metraflex Co.
 - 4. Spirax Sarco.
 - 5. Watts Regulator Co.

2.02 PIPE MATERIALS

- A. General: Refer to Part 3, Article "PIPE APPLICATION" for identification of systems where the following pipe and fitting materials are used.

- B. Steel Pipe 2-Inch and smaller: ASTM A 53, Grade A, Schedule 40 and 80 for application as specified in Part 3, seamless, black steel pipe, with plain ends.
- C. Steel Pipe 2-1/2-Inch and larger: ASTM A 53, Type E, Grade A, Schedule 40 and 80 for application as specified in Part 3, seamless, black steel pipe, with plain ends.
- D. Steel Pipe Nipples: ASTM A 733, made of ASTM A53 Schedule 40 and 80, carbon steel, seamless for 2-inch and smaller, and electric-resistance welded for 2-1/2 inch and larger.

2.03 FITTINGS:

- A. Steel Fittings: ASTM A 234, Schedule 40 and 80.
- B. Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets of the following material group, end connection and facing:
 1. Material Group: 1.1.
 2. End Connections: Butt Welding.
 3. Facings: Raised face.
- C. Unions: ANSI B16.39, malleable-iron, Class 150 hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends. Threads shall conform to ANSI B1.20.1.

2.04 GENERAL DUTY VALVES

- A. General duty valves (i.e., gate, globe, check, ball, and butterfly valves) are specified in Division 15 Section "Valves." Special duty valves are specified in this Article by their generic name; refer to Part 3, Article "VALVE APPLICATION" for specific uses and applications for each valve specified.

2.05 SPECIAL DUTY VALVES

- A. Float and Thermostatic Traps: ASTM A 126, cast iron body and bolted cap; renewable, stainless steel float mechanism, with renewable, hardened stainless steel head and seat; maximum operating pressure of 125 psig; balanced pressure, thermostatic air vent made of stainless steel or monel bellows, with stainless steel head and seat.
- B. Air Vents: cast iron or brass body, with balanced pressure stainless steel or monel thermostatic bellows, and stainless steel heads and seats.
- C. Y-Pattern Strainers: minimum 250 psig steam working pressure; cast iron body conforming to ASTM A 278, Class 30; threaded connections for 2 inch and smaller, flanged connections for 2-1/2 inch and larger; grade 18-8 stainless steel screen (20 mesh for 2 inch and smaller, and manufacturer recommended perforations for sizes 2-1/2 inch and larger); tapped blow-off plug.

PART 3 - EXECUTION

3.01 PIPE APPLICATIONS

- A. Low pressure steam and condensate: Install steel pipe with threaded joints and Class 125 cast iron fittings for 2 inch and smaller; and with welded joints, wrought-steel welding fittings, and

Class 150 wrought-steel flanges, for 2-1/2 inch and larger. Low pressure steam pipe shall be schedule 40. Condensate return pipe shall be schedule 80.

3.02 STEAM TRAP APPLICATIONS

- A. Float and Thermostatic Traps: Install steam traps at steam main and riser drip legs, humidifiers, boiler, heat exchangers, and elsewhere as indicated on the drawings.

3.03 PIPING INSTALLATIONS

- A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout takes into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.
- B. Use fittings for all changes in direction and all branch connections.
- C. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- D. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.
- E. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- F. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1 inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- G. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- H. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4 inch ball valve, and short 3/4 inch threaded nipple and cap.
- I. Fire Rated Partition Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, the fire rated integrity shall be maintained by the Contractor for Division 7, "Firestopping".
- J. Install steam supply piping at a uniform grade of 1/4 inch in ten feet downward in the direction of flow.
- K. Install condensate return piping at a uniform grade of 1/2 inch in ten feet downward in the direction of flow.
- L. Install branch connections to supply mains with top take-offs from the main. Where the length of a branch takeoff is less than 10 feet, pitch branch line down toward main, 1/2 inch per 10 feet.
- M. Make reductions in pipe sizes using eccentric reducer fitting installed with the level side down.

- N. Install unions or flanges, adjacent to each valve, at final connections to each piece of equipment, and elsewhere as indicated
- O. Install strainers on the supply side of each control valve, pressure regulating valve, solenoid valve, traps, and elsewhere as indicated. Install 3/4 inch NPS nipple and ball valve in blow down connection of strainers 2 inch and larger. Use same size nipple and valve as blow-off connection of strainer.
- P. Anchor piping to ensure proper direction of expansion and contraction. Install expansion loops and joints as indicated on the Drawings.
- Q. Install drip legs at low points and natural drainage points in the system, such as at the ends on mains, bottoms of risers, and ahead of pressure regulators, control valves, isolation valves, pipe bends, and expansion joints.
 - 1. On straight runs with no natural drainage points, install drip legs at intervals not exceeding 200 feet where pipe is pitched down in the direction of the steam flow and a maximum of 150 feet where the pipe is pitched up in the direction of steam flow.
 - 2. Size drip legs at vertical risers full size and extend beyond the rise. Size drip legs at other locations same diameter as the main, for steam mains under six inches. In steam mains 6 inches and larger, provide drip legs 2 pipe sizes smaller than the main, but not less than 4 inches.
 - 3. Provide eighteen inch long drip legs.
 - 4. Equip drip legs, dirt pockets, and strainer blowdowns with gate valves to allow removal of dirt and scale.
 - 5. Install steam traps close to drip legs.

3.04 STEAM TRAP INSTALLATIONS

- A. Install steam traps in accessible locations as close as possible to connected equipment. Maximum allowable distance from equipment is 4 feet.
 - 1. Unless otherwise indicated, install gate valve, strainer, and union upstream from the trap; install union, check valve, and gate valve downstream from trap.

3.05 VALVE APPLICATIONS

- A. General Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated the following requirements apply:
 - 1. Shut-off duty: use gate and ball valves
 - 2. Throttling duty: use globe and ball valves.
 - 3. Install shut-off duty valves at each branch connection to supply mains, at inlet connection to steam traps, and elsewhere as indicated.
 - 4. Vacuum breakers: Class 150 bronze swing check with composition seat.

5. Install throttling duty valves at supply connection to each piece of equipment, and elsewhere as indicated.
- B. Install angle pattern globe valves on the supply side of each terminal unit. If unit has an enclosure, install the valve within the enclosure.
- C. Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage.
- D. Install swing check valves as required to control flow direction, and to serve as "vacuum breakers".

3.06 TERMINAL EQUIPMENT CONNECTIONS

- A. Piping size for supply and return shall be same size as equipment connections.
- B. Install traps and control valves in accessible locations as close as possible to the equipment.
- C. Install bypass piping with globe valve around control valve. Where multiple, parallel control valves are installed, only one bypass is required.

3.07 FIELD QUALITY CONTROL

- A. Prepare steam and condensate piping in accordance with ASME B 31.9 and as follows:
 1. Leave joints, including welds, uninsulated and exposed for examination during the test.
 2. Provide temporary restraints for expansion joints which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.
 3. Flush system with clean water. Clean strainers.
 4. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.
 5. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.
- B. Test steam and condensate piping as follows:
 1. Use ambient temperature water as the testing medium, except where there is risk of damage due to freezing. Another liquid may be used if it is safe for workmen and compatible with piping system components.
 2. Use traps installed at high points in the system to release trapped air while filling system. Use drip legs installed at low points for complete removal of the that liquid.

3. Examine system to see that equipment and parts that cannot withstand test pressures are properly isolated. Examine test equipment to ensure that it is tight and that low pressure filling lines are disconnected.
4. Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test. Check to verify that stress due to pressure at the bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength, or 1.7 times the "SE" value in Appendix A of ASME B31.9.
5. After the hydrostatic test pressure has been applied for at least 10 minutes, examine the system for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

3.08 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect finish. Remove burrs, dirt and construction debris, and repair damaged finishes including chips, scratches and abrasions.
- B. Flush the system with clean water. Remove, clean, and replace strainer screens.

END OF SECTION 15185