



DESIGN REQUIREMENTS

STEAM AND CONDENSATE PIPING SPECIALTIES

GENERAL INFORMATION

- 1.1 This section applies to steam and condensate piping specialties including traps, vents, vacuum breakers and PRV's.

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- 2.1 The designer shall not rely on lift after the steam trap when a steam trap serves a device such as a coil or heat exchanger controlled by a modulating valve. Lift may only be considered when the trap will always have full line pressure.
- 2.2 Steam mains shall have isolation valves space no further than 200' apart. Steam isolation valves larger than 6" shall be equipped with warm-up valves.
- 2.3 Select steam safety valves for full relief of capacity of equipment served, in accordance with ASME Boiler and Pressure Vessel Code.
- 2.4 The design documents shall include a flow diagram of the system indicating all major components of the system, isolation and control valves, unions/flanges, pipe sizes, pressure and/or temperature relief devices, direction of flow, etc.
- 2.5 Under all conditions, and unless otherwise shown or directed, branches from any steam main shall be taken from the top of the pipe. A shutoff valve shall be installed at ALL branch connections to the steam mains and risers.
- 2.6 Minimum steam pipe size shall be 1".
- 2.7 Minimum steam riser size shall be 1¼".
- 2.8 Minimum condensate return pipe size shall be 1".
- 2.9 Minimum condensate return riser size shall be 1¼".
- 2.10 In all systems operating at temperatures above 100°F., all runouts to risers and equipment shall have 18" minimum spring piece offsets or 3 elbow swings to absorb expansion.



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- 2.11 Equipment condensate connections shall at a minimum provide a 12 inch vertical cooling leg including a 6 inch, full size dirt pocket below the tee feeding the trap for the equipment.
- 2.12 Condensate drip traps above 15 psig shall not discharge directly into condensate return mains or condensate pump receivers, but shall be designed to discharge into a flash tank, and to drip through a low pressure Float & Thermostatic (F&T) trap to a condensate return main or receiver.
- 2.13 Piping carrying steam or condensate shall not be installed or designed for installation over electrical switchgear, motor control centers, transformers, nor in elevator shafts and elevator equipment rooms.
- 2.14 Steam Specialties
 - a. Steam Traps
 - 1. Balanced Pressure Thermostatic Traps:
 - 2. Not preferred for use on Campus.
 - 3. Float and Thermostatic Traps
 - 4. To be used on variable pressure systems, including Air Handlers and other HVAC equipment.
 - 5. Inverted Bucket Traps:
 - 6. To be used on constant pressure systems.
 - 7. Install isolation valve, strainer (leg vertical), and union upstream from the trap; install union, test tee with test valve, check valve, and isolation valve downstream from trap.
 - b. Air Separators / Vents
 - 1. Automatic type:
 - 2. Install on HVAC coils and shell and tube systems.
 - c. Vacuum Breakers
 - 1. Install vacuum breakers on all closed vessels, steam heating coils and shell and tube heat exchangers.

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d. Pressure Regulating Valves

1. Install pressure reducing valves as required to regulate system pressure in a location readily accessible for maintenance and inspection. Install in strict accordance with the manufacturer's recommended piping practices for straight pipe upstream and downstream of the valve. Provide a bypass around each reducing valve, with a globe valve equal in size to the area of the reducing valve seat ring. Install isolation valves and unions around each reducing valve to facilitate removal and repair of reducing valves. Unions may be omitted for reducing valves with flanged connections. Install strainers upstream for each reducing valve.
2. For main building steam supply, install safety shutoff valve upstream from each reducing valve, set at 5 psig higher than the reduced pressure, ensure sensing lines are connected downstream of the reducing valve set. Ensure pressure reducing station includes Safety Shut-Off (SSO) valve arrangement on flow diagrams.
3. Install pressure gauges on both sides of each reducing valve, on the system side of the shut-off valves. On two stage reducing stations, install a drip trap and pressure gauge upstream from the second stage reducing valve.

e. Safety Shutoff Valves

1. Provide non-vented type safety shutoff valves at each pressure reducing valve.

f. Safety Relief Valves

1. Install relief valves in accordance with and where required by ASME B31.1 – "Power Piping." Pipe discharge to atmosphere outside the building, without valves, and terminate vent pipe with screened air gap. Install a drip pan elbow fitting adjacent to the safety valve pipe drain connection to the nearest floor drain without valves.

g. Pipe Line Strainer

1. Strainers shall be installed upstream of all pressure control valves / regulators in the steam system.

CONSTRUCTION REQUIREMENTS

- 3.1 Connection to equipment shall be made to permit ready disconnection of equipment with minimum disturbance to adjoining pipe. Screwed or flanged unions shall be used at all equipment connections.

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- 3.2 Unions or flanges shall be provided at valves, traps, strainers, apparatus, pumps, heat exchangers, tanks, machines and equipment to permit easy dismantling of piping and apparatus.
- 3.3 Under all conditions, and unless otherwise shown or directed, branches from any steam main shall be taken from the top of the pipe. A shutoff valve shall be installed at ALL branch connections to the steam mains and risers.
- 3.4 All valve stems shall stand upright or at an angle above the center line of the pipe and not handle down.
- 3.5 All piping, including valves, traps, vents and accessories, shall be installed so as to be easily accessible for maintenance, removal, replacement and cleaning.
- 3.6 In all systems operating at temperatures above 100°F., all runouts to risers and equipment shall have 18" minimum spring piece offsets or 3 elbow swings to absorb expansion.
- 3.7 All piping, after erection, shall be thoroughly blown and washed out. During construction, all lines shall be properly capped or plugged to prevent the entrance of dirt, sand or foreign matter.
- 3.8 Provide a drain and drain valve with hose connection and drip cap for all equipment containing water. If this equipment is within a mechanical equipment room, provide a gate valve piped to a floor drain.
- 3.9 Pitch steam piping downward in the direction of flow $\frac{1}{4}$ inch in 10 feet (1 inch in 40 feet) minimum. Pitch all steam return lines downward in the direction of condensate flow $\frac{1}{2}$ inch per 10 feet (1 inch in 20 feet) minimum. Where length of branch lines are less than 8 feet, pitch branch lines toward mains $\frac{1}{2}$ inch per foot minimum.
- 3.10 Equipment condensate connections shall at a minimum provide a 12 inch vertical cooling leg including a 6 inch, full size dirt pocket below the tee feeding the trap for the equipment.
- 3.11 Provide an end of main drip at each rise in the steam main. Provide condensate drips at the bottom of all steam risers, downfed runouts to equipment, radiators, etc. at end of mains and low points, and ahead of all pressure regulators, control valves, isolation valves, and expansion joints.
- 3.12 Provide line size shut-off valves in steam supply piping ahead of all control valves.
- 3.13 Pipe relief and safety valves to roof vent pipes, or other approved open locations, to dispose of discharge without injury to equipment, personnel or premises.



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- 3.14 Eccentric reducers shall be used to prevent trapping of condensate water in bottom of line.
- 3.15 All high pressure steam blowoff discharge lines shall have valves with lock shields and capped nipples, except for boiler blowdown valves.
- 3.16 All valves shall be packed at the completion of the work prior to final inspection.
- 3.17 Condensate drip traps above 15 psig shall not discharge directly into condensate return mains or condensate pump receivers, but shall be designed to discharge into a flash tank, and to drip through a low pressure Float & Thermostatic (F&T) trap to a condensate return main or receiver.
- 3.18 Make piping connections to coils and equipment with offsets provided with screwed or flanged unions so arranged that the equipment can be serviced or removed without dismantling the piping. Do not screw unions directly to coil header piping connections.

REFERENCE

- 4.1 The applicable CSI Specification Section is 23 22 16.