

SECTION 232200 - STEAM AND CONDENSATE SPECIALTIES

1.0 Steam Traps:

- A. All high pressure (100 PSI or higher) steam traps shall be minimum 3/4" inverted bucket traps. Construction shall be steel, with stainless steel internal parts, rated for a 300 PSI operating pressure. This trap requirement is also applicable to all underground steam piping and all steam pressure reducing stations. Spirax Sarco model B or Series 200 or equal.
- B. Traps for "constant pressure" steam services below 100 PSI, and inside a building, shall be thermodynamic traps with swivel connectors. These traps shall be supplied with a threaded or socket weld pipeline connector which, once installed, remains permanently inline. Trap shall be attached to the connector by two bolts to enable simple and rapid installation and replacement. The connector is designed to allow installation on pipe work that is vertical, horizontal, or any angle in between. When specified, the connector shall be available with an integral "Y" pattern strainer and optional blow-down valve. The blow-down valve shall be wrench operated to keep operator clear of the blow-downstream. The traps should be capable of working with up to 80% back pressure and have an operating pressure range of 3.5 to 450 psig. Trap to be provided with optional insulating cover to reduce excessive heat loss resulting from low ambient temperatures, wind, rain, etc. when specified. Spirax Sarco models UTD52L, UTD52H, UTD30L, UTD30H or equal.
- C. Traps for "variable pressure", (i.e. downstream of a modulating control valve), process steam services below 100 PSI, and inside a building, shall be float and thermostatic traps. These traps shall be Ductile iron and cover pressures to 200 psig operating pressures. Traps shall be repairable without disturbing the connecting piping. All internals including float, main valve head and seat, and thermostatic air vent shall be stainless steel. Air vent shall be of a precision welded twin diaphragm design which is completely encased in a protective capsule, and is self-adjusting over its entire operating range. Air vent capsule shall be a stainless steel balance pressure thermostatic air vent capable of withstanding 45 F (25°C) of superheat steam and resisting water hammer without sustaining damage. Internals of the trap shall be completely serviceable without disturbing the piping. Spirax Sarco Models FT, FTI, FTB, or IFT.
- D. Steam main drip traps shall be sized with a 2 times safety factor at full differential pressure. In most cases, they will be 3/4" size with low capacity orifice or smaller unless otherwise shown on the drawings and they shall be located every 200 feet or less. Traps for equipment drainage are sized with safety factors that reflect the HVAC industry. A summary of these typical recommendations are as follows:
 - E. HVAC INDUSTRY:
 - 1. Non-modulating control systems have traps selected with a 2 times factor at full pressure differential.
 - 2. Modulating control systems with less than 30 psig inlet pressure have traps selected for full load at 1/2 psi pressure differential, provide 18 to 24" drip leg for condensate to drain freely to gravity return at 0 psi.
 - 3. Modulating control systems with greater than 30 psig inlet pressure have traps selected with a 3 times factor at full pressure differential for all preheat coils, and a 2 times factor for others.

4. Modulating control systems have removal module packages selected for full operating range (0 to 100% capacity) with elevated condensate returns and/or return pressures greater than 0 psi.
 - F. Do not install traps in areas which may be subjected to freezing temperatures under normal conditions.
- 2.0 Pressure reducing valves shall be of the pilot operation type. Consideration shall be given to the operating range (Lbs./Hr. flow) of the system and the use of parallel valves to prevent erosion of the valve and seat. Valve body shall be cast steel with ANSI flanges. Provide valves with stainless steel seat rings, trim and stem. Valves shall be Spence Model E or Sarco Model P. Refer to Section 230700 for insulation requirements at PRVs.
- 3.0 Safety valves shall be constructed of the following materials and shall be sized to pass the maximum capacity that the associated PRV can pass:
 - A. Carbon steel body
 - B. Trim - stainless steel
 - C. Springs - stainless steel
- 4.0 Strainers - same as that listed in Section 236100 "Hydronic Specialties" except that screens shall have 1/32" openings through 4" size and 3/64" openings above 4" size.
- 5.0 Flash Tanks - ASME rated tanks size to assure dryness of the steam released and to avoid carry-over of water by the steam.
- 6.0 Waste Heat Recovery – Steam is provided to University projects by a local supplier (Veolia Philadelphia). Steam condensate is not returned to the provider. Steam condensate shall be piped from each use point to a central collection point before being discharged to a drain. Uses for the waste heat (including flash tank steam) shall be considered on a project by project basis. The A/E should attempt to be innovative and aware of potential applications for waste heat recovery (such as domestic water preheating) that may be associated with the building or project.
- 7.0 Condensate Coolers - All steam condensate systems shall be fitted with an inline condensate cooler properly sized to achieve a maximum discharge temperature of 140°F at peak condensate flow. Cooler shall be provided with self-actuating temperature regulating valve, check valve, vent line to exterior, isolation valve, relief valve, strainer, leaving condensate thermometer, and wall or floor support, as required. Colton Industries, Armstrong, ITT or equal. Coordinate routing of drainage piping to properly sized and contained floor drain.
- 8.0 Thermometers and Pressure Gauges – same as that listed in Section 236100 "Hydronic Specialties, with the following differences:
 - The range for thermometers in steam service shall be 50 to 400 degrees F.
 - Provide pigtail siphon and needle valves on all gauges.
- 9.0 Electric Steam Condensate Pumps and Receiver Sets – Provide packaged electrically-powered automatic duplex steam condensate return pumps and receiver sets in one factory-assembled package, pre-piped, pre-wired and factory tested. The receiver shall be a floor-mounted, rated for 250° F, horizontal, atmospheric close grained cast iron tank provided with insulation clips.

Receiver shall include inlet, vent to exterior, drain and level gauge glass connections. The pumps shall be horizontal, centrifugal pumps. The pumps shall be of low NPSH design to meet the receiver height and saturated condensate condition. SPIRAX SARCO MODEL VCS, VES.

- 10.0 Safety Relief Valves - Steam safety relief valves shall be set to open at 85 percent of the maximum working pressure of the equipment or vessel being protected. Valves shall be sized to relieve at a rate equal to the maximum boiler output, or the maximum possible flowrate from fully-open pressure-reducing valve or control valve upstream. Valves shall be bonnet type with enclosed spring and open operating lever. Valves shall be ASME code stamped. Valve body shall be carbon steel, cast iron or bronze, with internals of brass or stainless steel. Valves shall be threaded for pipe smaller than 1 inch in size and flanged for pipe 1 inch and larger. Terminate piping from each safety valve discharge to the outside. At the base of each discharge stack, provide safety relief valve discharge (drip pan) elbow with drain piping arranged to discharge over the nearest floor drain in the room.
- 11.0 Noise Attenuation at steam stations - Shall be accomplished through proper design selection, then through acoustic blankets, plates, diffusers or suppressors as scheduled. Where indicated, noise attenuation equipment shall be attached directly to the downstream connection of the pressure reducing valve to reduce noise output by approximately 15 to 30 dBA when measured by a sound level meter meeting ANSI standards. Noise diffuser shall be manufactured of rolled and welded steel components that have been welded in accordance with ASME Section IX weld procedures. Pressure drop through the diffuser shall not exceed 1% of line pressure upstream of the pressure reducing valve. Spirax Sarco Model D or equal.
- 12.0 Steam Powered Condensate Pumps - The pump shall be pressure powered type (Ductile Iron) or (Steel) pump operated by steam, which does not require any electrical energy and is sized to meet the actual maximum capacity of the system being drained. Body construction of ductile iron A395 or steel as required, with lift type check (Bronze) or Stainless Steel Disc Check valves for pumping liquids of specific gravity of 0.65 and above. The pump shall contain a float operated snap-acting mechanism with no external seals or packing and stainless steel trim, and hardened stainless steel mechanism bearing components. Pump to be provided with inlet and outlet check valves attached at factory for ease of field installation. When required, pump shall be equipped with a cycle counter to monitor the volume of liquids being pumped, sight glass to monitor operation and insulation cover. SPIRAX SARCO MODEL PPC OR PPF or equal.
- 13.0 Moisture Separators - Shall be of the high efficiency internal baffle type having a pressure drop that does not exceed an equivalent length of pipe. The body shall be provided with a screwed bottom drain to provide for the installation of a trap to discharge any accumulated liquid. Flow shall be diverted by an internal baffling arrangement and connections shall be on the same horizontal plane.

Ductile Iron Separators.

Construction of Separator shall allow inspection/removal of the internal baffle plate if desired. Body to be made of ductile iron with screwed connections. Design shall be rated to 232 psig at 248°F and 160 psig at 572°F with no maintenance required for separator. SPIRAX SARCO MODEL S1.

Cast Iron Separators.

Construction of Separator shall have a fixed baffle arrangement with connection for balancing line in air system or air venting in steam systems. Body to be made of cast iron with screwed or flanged connections. Design shall be rated to 232 psig at 248°F and 188 psig at 428°F with no maintenance required for separator. SPIRAX SARCO MODEL S2 (SCREWED CONNECTIONS) or SPIRAX SARCO MODEL S3 (FLANGED CONNECTIONS.)

Steel Separators.

Cast Steel Separators. Construction of Separator shall have an internal baffle with a tapping at top of body for connection of a balancing line for air systems or air venting in steam systems. Body to be of cast steel construction with body designed to ANSI Class 300 and connection options of: Socket Welded, Threaded, or Flanged. Efficiency shall be better than 99% in the removal of moisture particles, greater than and equal to 10 microns in size, up to rated maximum allowable capacity. Design shall be rated to 285 psig at 100°F and 95 psig at 750°F for ANSI 150 flanged units, 740 psig at 100°F and 505 psig at 750°F for all other connections. SPIRAX SARCO MODEL S5.

- 14.0 Vacuum breakers shall be used on all modulating or on/off steam run heat exchangers and coils. Vacuum breakers shall be installed in the condensate drain pipe exchanger equipment and the assembly, or in the shell of the heat exchanger. Bodies shall be brass or stainless steel with stainless steel internals. SPIRAX SARCO MODEL VB14 OR VB21.
- 15.0 Incoming steam services to buildings or projects, as determined by the University, shall be submetered and reported to the University Operations Control Center (OCC). Steam used for temporary heating during construction shall be metered.