# 232213 STEAM AND CONDENSATE PIPING

## Part 1 – GENERAL

1.1 Description

A. This section details the guidelines and expectations for the design and installation of steam and condensate piping on Johns Hopkins University Homewood Campus. Project conditions and requirements vary, thus precluding the absolute adherence to the items identified herein in all cases. However, unless there is adequate written justification and approval from the JHFRE Engineering and Energy Department, it is expected that these guidelines will govern the design and specifications.

1.2 Submittals

A. Piping layouts shall be designed to provide organized distribution systems which permit isolation of distinct sections without disruption of the entire building. Provide isolation valves at every major branch and at all unit connections. Provide steam traps with strainer blowdown and drain valves at the lowest point of the piping system.

B. Expansion loops, offsets, pipe guides and anchors shall be shown on the contract documents. Expansion loops shall be used unless compensation devices are reviewed and accepted by the JHFRE Engineering and Energy Department.

1.3 Quality Assurance

A. Contractor shall subject piping to pressure that is not less than 1.5 times design pressure (which means that all system joints, pumps, valves or other component rated pressures shall not be exceeded). Air test shall be at pressure for a minimum of 2 hours before visibly examining joints and connections for leakage.

B. Expansion joints shall be provided as a last resort and shall not be installed above the ceiling within a critical space.

C. Pipe anchors shall be designed for each location and sized to handle all forces with conservative safety factors. All anchors, guide loops and joints shall be readily accessible for maintenance and inspection.

D. Float and thermostatic traps shall be used for low pressure steam (<15psi).

E. Thermodynamic traps shall be used for medium and high-pressure steam (>15psi).

F. Provide consideration for future extensions to building systems.

## Part 2 – PRODUCTS

2.1 Steam condensate piping shall be schedule 80 seamless, ASTM A106, Grade B, carbon steel.

A. Joints 2” and smaller shall be screwed. All threaded steam and condensate fittings shall be ASME/ANSI B16.3, Class 300, malleable iron.

B. Joints 2-1/2” and larger shall be welded.

2.2 Steam supply piping shall be schedule 80 seamless, ASTM A106, Grade B, carbon steel.

A. Joints 2” and smaller shall be screwed. All threaded steam and condensate fittings shall be ASME/ANSI B16.3, Class 300, malleable iron.

B. Joints 2-1/2” and larger shall be welded.

2.3 For underground piping installations, specify corrosion resistant pre-insulated piping to eliminate the need for cathodic protection. Pre-insulated piping systems consist of a carrier pipe that is factory insulated and wrapped in a non-ferrous (FRP, PVC, or HDPE) jacket. Leak detection shall be provided within the outer jacket to identify the relative location of leaks along the entire length of buried pipe.

## Part 3 – EXECUTION

3.1 All new piping must be treated, cleaned and have ends deburred prior to connection to commons systems on the university utility distribution. Once completed, flush total system with clean water. Strainers shall be cleaned before and after flushing.

3.2 All piping take offs shall be from the sides or top of the main piping. Avoid taking off on the bottom of pipes to avoid debris from being supplied via the take-off.

3.3 All steam traps and strainers shall be installed with isolation, check valves, and drains for cleaning, maintenance and correct use.

3.4 Mechanical joints of any kind will not be acceptable. Provide electrolysis control between dissimilar materials through the use of dielectric nipples and a non-dielectric union. Dielectric unions are not acceptable.

3.5 Coils shall be piped with strainers, flow meters, balancing valves and isolation valves as individual components.

3.6 Provide temperature and pressure gauges on the supply and return of all new equipment.

3.7 All multiple stacked coils shall be piped in a reverse return configuration.

3.8 Provide piping identification and directional flow arrows at intervals not greater than 20’.

3.9 Steam velocities shall not exceed 10,000 feet/minute.

3.10 All effort shall be taken to drain steam condensate by gravity. Steam piping shall slope 1” in 40’ and condensate shall slope 1” in 30’ in direction of flow.

A. Condensate piping shall be gravity drained from the trap to the condensate receiver for all low pressure-steam applications.

B. Traps on steam coils shall be at least 14” below the coil’s discharge. Where the hydraulic head is not achievable a condensate pump shall be utilized. Under no circumstances shall condensate be lifted after a steam modulating device.

3.11 Drip legs shall be provided in all steam mains to accommodate condensate drainage at all locations. Drip connections shall be provided at the base of each low point in mains and just before all equipment connections (includes laboratory process equipment). Steam instrumentation sensors require a 20’ long sensing line from header to sensor to protect it from extensive heat.

3.12 High-pressure drip lines on steam distribution mains shall be routed to a flash tank and not connected to pumped condensate return lines.

A. Flash tanks shall be provided for high-pressure and medium-pressure condensate and before connection to the condensate receiver. The flash tank shall be factory fabricated and ASME stamped and approved. A contractor shop-fabricated tank is not acceptable. Flash tanks shall be vented directly to the outside with a relief valve of the proper size. Flash steam is waste energy and can be recovered either by installing a heat exchanger (vent condenser) to provide preheat for domestic hot water application or by connecting the steam vent to an active low pressure steam main through an appropriate pressure regulating valve. A check valve must be installed to prevent backflow if the flash tank pressure should drop. A back pressure valve shall be installed to control the maximum pressure in the tank and relief valve to protect the system.