

Proper Piping Practices for Steam Systems

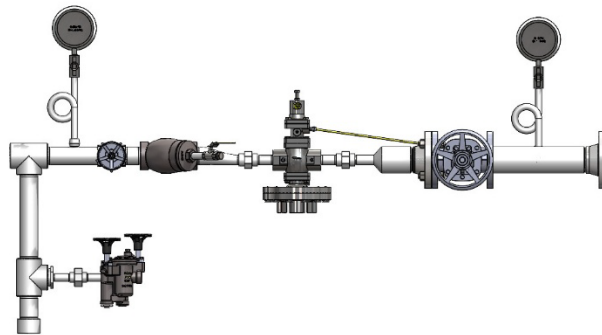
Proper steam distribution piping practices are crucial to ensure that steam arrives at its destination in its intended condition. Incomplete installations may reduce initial capital costs but may result in long-term complications and may lead to catastrophic results. Safety issues can also be avoided with correct design and installation practices. To achieve optimal performance – to maximize steam quality and heat transfer - it is essential to implement proper condensate and non-condensable gas removal practices. The following are recommended best practices for piping for steam distribution:

- Steam distribution piping should be sized for steam velocities of 4,000 to 12,000 ft/min (67 – 200 ft/s) - lower end for steam heating and higher end for process applications. The steam distribution piping should be sized to prevent an excessive pressure drop.
- It is preferred that piping have a negative slope in the direction of the flow of steam. In cases where condensate must flow counter to the direction of steam flow, pipe diameter should increase and intervals between steam trap stations should decrease.
- Drip legs are installed in main steam distribution pipes to ensure effective condensate removal. This supports steam dryness and reduces the possibility of water hammer.
- Drip legs should be sized in accordance with ASHRAE recommendations. Drip legs should be the same diameter as the steam main, up to a size of 4” for the steam main. Where the steam main is over 4” diameter, the drip leg should be a minimum of 4” diameter, but never less than half of the pipe diameter. For additional information on drip leg, access [FCI Tech Sheet #ST 104](#), *Small Drip Legs Cause Big Problems – Correct Sizing Eliminates Water Hammer, Pipe Erosion, and Long Start-up Times*.
- Drip legs should be spaced every 150–300 feet along a straight length of steam distribution mains. On steam piping which has a *positive* slope in the direction of flow, the drip legs should be spaced closer together, as close as 50 feet apart. Drip legs should also be located prior to important valves and steam pipe components, such as control valves and regulators, to prevent premature damage to these components. Additionally, drip legs should be placed at low points, at changes of direction, where piping elevation increases, at the end of a line, and upstream of any valve that can close.

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- The full depth of a drip leg should be 1-1/2 times the drip leg diameter, with a minimum of 10” for manual start-up and a minimum of 28” for automated start-up.
- Sufficient space in the bottom of the drip leg should be provided for accumulation of corrosion materials, etc. Typically, this space is the bottom 6” of the drip leg, which is where the steam trap set is piped. A steam trap set should be placed horizontally on the side of the drip leg where condensate will be collected and removed. For more information on steam trap set design, access [FCI Tech Sheet #ST 104](#).
- Eccentric pipe reducers should be utilized when reducing pipe diameters. It is recommended that concentric pipe reducers are not used as these allow condensate build-up. For details, review the diagram in [FCI Tech Sheet #ST 104](#).
- A Y-strainer should be fitted on its side (in the horizontal plane) in steam pipes to eliminate condensate build-up internally. In condensate lines, fitting Y-strainers with the wye downwards (in the vertical plane), is acceptable.



For steam service, it is recommended that Y strainers be mounted sideways in horizontal lines to reduce condensate accumulation.

Strainer Installation Example

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- Steam branches should be plumbed out of the top of steam mains to ensure the driest possible steam flow into the branch piping.



Steam Branches

- Steam trap discharge piping should always be piped into the top of the condensate-return header – never into the side or bottom.

The steam piping best practice recommendations in this tech sheet, in addition to FCI Tech Sheet #ST 104 and other FCI educational documents, are provided to make steam piping simple, relatively easy to implement and maintain, while improving safety during system start-up and operation.

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