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process HEATING

Steam Team Know-How

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A step-by-step guide to proper sizing and installation of safety valves equips you with the tools you need to specify these safety devices with confidence.



To properly select and install safety valves, the steam team members must understand and follow ASME code as well as insurance company or local jurisdiction regulations.

One of the most critical automatic safety devices in a steam system is the safety valve. The safety valve provides a protective measure for personnel, equipment and property from potentially dangerous levels of temperature and forces caused by excessive steam pressure in a system.

Safety valves are required by code and for insurance purposes. Therefore, it is important to have good, up-to-date records of all safety valves in the steam system. With today's readily available technology, a database should be developed containing all the relative information for all safety devices in a facility. The safety valve database should be reviewed on a periodic basis, depending on plant standards, insurance company recommendations and local, state or federal government requirements.

The American Society of Mechanical Engineers (ASME) governs the code that establishes the

requirements for safety valves. Through its committees, ASME has published and continually updates the boiler and pressure vessel codes for safety valves. It is the responsibility of plant personnel, primarily the steam team, to know which codes apply to the various parts of the steam system.



This safety valve is installed incorrectly, compromising system safety. The safety valve must be mounted vertically with the valve's spindle in the vertical position.

Sizing Guidelines

The two major considerations for safety valves are proper sizing and correct installation. The following tips address safety valve sizing.

- It is suggested that the setpoint selected for the safety valve provide a differential of at least 20 percent between operating and set steam pressures.
- When considering installation of a safety valve downstream of a steam pressure control valve, the total capacity of the safety valve at the setpoint must exceed the steam control valve's maximum flow capacity (the largest orifice available from that manufacturer) if the steam valve were to fail to open. The inlet steam pressure to the valve must be calculated at the maximum safety valve setting of the steam supply source, not the nominal operating pressure.
- It is important not to oversize a safety valve. Bigger is not better in this case because a larger-than-required valve could cause chatter, leakage and premature failure.
- Many times, a single safety valve is not possible due to high capacity, physical limitations or economic considerations. An acceptable alternative is to employ multiple safety valves on the same system. The valves should be of the same setpoint and the capacities must be equal to or greater than the rating of the equipment. Additionally, the vent pipe must be sized to account for the venting capacity of all of the safety valves fully opening at the same time.
- The set pressure of the safety valve should be set at or below the maximum allowable working pressure (MAWP) of the component with the lowest setpoint in the system. This includes steam boilers, pressure vessels and equipment, and piping systems. In other words, if two components on the same system are rated at different pressures, the safety device protecting both of these devices must be set at the lower of the two ratings.

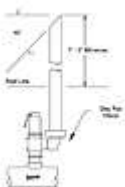


Proper safety valve installation includes a drip pan elbow and drain lines off the safety valve and drip pan elbow.

Installation

Once sizing has been properly determined, proper installation is the next crucial step to ensure safety. There are several points to consider when installing the safety valve.

- The steam system must be clean and free of any dirt or sediment before commissioning the steam system with a safety valve.
- The safety valve must be mounted vertically with the valve's spindle in the vertical position.
- The inlet steam piping to the safety valve must be equal to or larger than the safety valve inlet connection.
- There should be no intervening shutoff valves located between the safety valve inlet and the steam component that could permit the safety valve to be isolated from the system.
- Drains or vent openings on the safety valve should not be plugged or capped. They are on the safety valve for a reason.
- Safety valves are set, sealed and certified to prevent tampering. If the wire seal is broken, the valve is unsafe and should not be used. Contact the supplier immediately.
- For multiple safety valve installations using a single connection, the internal cross-sectional area of the inlet shall be equal to the combined inlet areas of all the safety valves.
- All safety valves should use a drip pan elbow on the outlet. The drip pan elbow changes the outlet of the safety device from horizontal to vertical. Installation of the drip pan elbow has its own guidelines, which should be researched and addressed to meet the needs of each application.
- Never attach the vent discharge piping directly to the safety valve. This would place undue stress and weight on the valve body. Also, the safety valve vent pipe may not touch the drip pan elbow.
- The drains on the drip pan elbows are to direct condensed vapor and rain safely away to the drain. Do not plug these openings.
- Steam will not escape from the drip pan elbow if the vent line is sized correctly.



For a roof-line termination, the vent should be no less than 7' above the roof line. The top of the vent line should be cut at a 45° angle to dissipate the discharge thrust of the steam, prevent capping of the pipe and to visually signify that it is a safety valve vent line.

Vent Piping

There also are some important considerations when it comes to the vent piping of the safety valve and the steam system.

- The diameter of the vent pipe must be equal to or greater than the safety valve outlet.
- The vent line should be sized so that backpressure is not placed on the drip pan elbow.
- The length of the vent pipe should be minimized where possible.
- The discharge outlet of the vent pipe should be piped to the closest location where free discharge of the safety device will not pose a safety hazard to personnel. For a roof-line termination, the vent should be no less than 7' above roof line. The top of the vent line should be cut at a 45° angle to dissipate the discharge thrust of the steam, prevent capping of the pipe and to visually signify that it is a safety valve vent line.

The proper selection, installation and use of safety valves require a complete understanding of ASME code and any additional requirements adopted by insurance companies or the local jurisdictional authority.

Links

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