

## Safety and Pressure Relief Valves

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Boilers and pressurized vessels are equipped with a safety or pressure relief valve to help protect against overpressure. These valves are designed to help prevent the system from exceeding the maximum allowable working pressure, which could result in damage or even catastrophic failure. Proper installation, inspection, testing and maintenance of these valves can reduce the risk of property damage and personal injury.

### Safety and Relief Valve Designs

Relief valves and safety valves both function to minimize the risk of over-pressurization of pressure containing devices and systems. While their function is similar, their designs, operation and intended application differs.

A Safety Valve is a device that automatically relieves pressure in the system to which it is attached and is typically used for gas or vapor service. A safety valve is characterized by a fully opening pop action. This type of valve will fully open at a set pressure and remain fully open until the system pressure is reduced below a preset pressure, at which time the valve will then fully close. This fully open or fully closed operation prevents the valve from repeatedly opening and closing rapidly (referred to as chattering), thereby reducing the risk of valve damage.

A Relief Valve is also a device that automatically relieves pressure. A relief valve is characterized by a gradual opening with an increase in pressure and is primarily used for liquid service. This type of valve will gradually open at the set pressure and gradually close until the pressure drops below the opening pressure. Because liquids are highly incompressible, the relatively rapid pressure drop in a liquid system minimizes the risk of valve chatter and subsequent damage.

A Pressure-Temperature Relief Valve is a type of relief value used for domestic hot water heaters. As a relief valve, it functions as described above but it also is designed to open when the temperature of the liquid exceeds a preset temperature, usually 210 degrees Fahrenheit (100 degrees Celsius). The temperature functionality of this type of device is to help prevent vaporization (the creation of steam) within a domestic potable water system.

### Installation Considerations

Both safety and relief valves are required to have a nameplate or tag affixed to the valve. The Information on this nameplate includes the valve capacity, set pressure, manufacturer, design/model, year assembled and/or tested, and any code approval markings. The nameplate information should be rated to the equipment specifications to verify that the valve is at a sufficient capacity and set pressure to properly protect your equipment.

The inlet and outlet piping for safety and relief valves must be at least equal to the valve inlet/outlet size. Restricting the inlet or outlet will reduce the capacity of the valve and may prevent it from providing the intended over-pressure protection. Outlet piping should be directed to a safe place for discharge. Missing discharge piping may result in property damage or personal injury when the valve opens. Any piping should be properly supported independently of the valve. Inlet and outlet piping should be kept free of any additional valves or obstructions

### Inspections and Testing for Proper Performance

Safety and relief valves both require periodic inspection and testing to help ensure they can function properly. Periodic inspection and testing can be used to detect adverse conditions such as: leaking, debris and residue build-up, corrosion, misalignment of the stem, weakening of the spring, or other physical damage. Documenting safety and relief valve inspection and testing, is a good engineering practice and is required by many jurisdictional authorities that regulate boilers and pressure retaining equipment.

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Safety and relief valve testing should be conducted only by those properly trained to test the valves, since testing can present hazards. When a valve is lifted, high pressure steam or high temperature fluid can be released. Personnel should take proper safety measures to protect themselves from these hazards..

A number of publications on the safe operation, inspection, and testing of safety and relief valves are available for reference, including the Boiler and Pressure Vessel Codes of the American Society of Mechanical Engineers (ASME) and the National Board Inspection Code (NBIC).

The NBIC makes the following recommendations regarding the frequency of safety and relief valve testing:

- High pressure steam boilers operating above 15 psi and less than 400 psi - Manually check every 6 months and pressure test annually.
- High pressure steam boilers operating above 400 psi - Pressure test every 3 years or as determined by operating experience as verified by testing history.
- Low pressure steam boilers operating at 15 psi or less - manually check quarterly and pressure test annually.
- Hot water heating boilers operating below 160 psi and/or 250 degrees Fahrenheit (121 degrees Celsius) - manually check quarterly and pressure test annually.
- High temperature hot water boilers operating above 160 psi and/or 250 degrees Fahrenheit (121 degrees Celsius) - pressure test annually. For safety reasons, removal and testing on a test bench is recommended.
- Potable water heaters - Manually check every 2 months. A defective temperature and pressure relief valve should be replaced with a new valve versus rebuilding the defective valve, due to the relatively low cost to purchase a new valve.

Any safety or relief valve found not able to operate freely during a manual check, or within the manufacturer's specified range during a pressure test, is considered non-functional and should be repaired or replaced. If the nameplate is illegible, missing or if the safety seals are tampered with, the valve should be tested and re-certified or replaced. Only an organization with a Valve Repair stamp issued by the National Board of Boiler and Pressure Vessel Inspectors can make repairs or adjustments to safety or relief valves. This includes reattaching a nameplate.

Additional Resource: [National Board of Boiler and Pressure Vessel Inspectors](#)



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