PRESSURE RELIEF DEVICES

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1.0 SCOPE

This data sheet provides loss prevention recommendations for the design, installation, and inspection, testing and maintenance (ITM) of overpressure protection for pressure vessel systems supporting a process, which operate at pressures equal to or greater than 15 psig (1 barg). These systems include, but are not limited to, boilers and/or unfired pressure vessels in steam, hot water and/or air systems.

For the design basis, installation, and ITM of emergency overpressure protection for non-reactive process pressure vessel systems, and ITM of reactive process pressure vessel systems, refer to Operating Standard 7-49, *Emergency Venting of Vessels.*

For the design basis for reactive process pressure vessel systems (chemical reactors), see FM Property Loss Prevention Data Sheet 7-46, *Chemical Reactors and Reactions.*

For ignitable storage vessels operating at pressures less than 15 psig (1 barg), see FM Property Loss Prevention Data Sheet 7-88, *Outdoor Ignitable Liquid Storage Tanks.*

1.1 Hazard

Pressure relief devices that perform a safety function mitigate a transient event by maintaining the equipment within its allowable pressure limits. The hazard of a malfunctioning or isolated device could cause a significant explosion or implosion event.

For additional information, see FM's Understanding the Hazard (UTH) titled Boiler and Pressure Vessel Overpressure (P0191). Other relevant UTHs are Operator Training (P0195) and Lack of Equipment Contingency Planning (P0179).

1.2 Changes

October 2025. Interim revision. The following changes are included:

A. Clarified the scope of the document.

B. Improved guidance on select inspection, testing and maintenance (ITM) methodologies.

C. Updated loss history.

2.0 LOSS PREVENTION RECOMMENDATIONS

2.1 Introduction

The range of applications for which the pressure relief devices covered by this data sheet may apply is broad. As a result, the recommendations are also typically broad. For more information, see the data sheet(s) applicable to the specific system of the pressure relief device.

2.1.1 FM Approved Products

Use FM Approved equipment, building materials and assemblies, and miscellaneous equipment whenever applicable and available. Select and install FM Approved products and services in accordance with the *Approval Guide* listing. For a list of FM Approved products and services, refer to the *Approval Guide*, an online resource of FM Approvals.

2.2 Equipment and Processes

2.2.1 General

2.2.1.1 Design and construction of the overpressure protection system shall meet the minimum requirements of the governing code for the geographical area where it is installed.

This data sheet references the ASME Boiler and Pressure Vessel Code because it is the default code accepted by FM. However, this data sheet does not mandate that ASME code be applied. Each location should follow regional and/or industry-specific codes and regulations.

2.2.2 Prohibited Designs of Primary Protection Pressure Relief Devices

The following valves were found to be unreliable, prone to tampering and are not commonly used today:

- Dead weight valve
- Weighted lever valve

These valves have largely been replaced by spring-type relief valves. Refer to Appendix A for their definitions.

2.2.3 Design

2.2.3.1 For design and construction of acceptable direct-acting spring-loaded safety, safety relief, relief, and pilot operated relief valves:

FM endorses application of the ASME Boiler and Pressure Vessel Code. When there is no comparable boiler and pressure vessel code for a country or jurisdiction, provide overpressure protection meeting the intent of the ASME Boiler and Pressure Vessel Code.

2.2.3.2 Select overpressure protection device construction materials appropriate for the fluid(s) in the system to be protected and the installation environment.

2.2.3.3 For vessels not designed for full vacuum, provide a properly sized vent or vacuum breaker to prevent implosion or collapse.

2.2.3.4 Specify the differential between the expected maximum operating pressure and the set pressure of the overpressure protection device as recommended by the device manufacturer or if more conservative, the enforced code of the sites geographical area. For steam power boilers, the National Board Inspection Code recommends the following pressure differentials between the pressure relief valve set pressure and boiler operating pressure:

- 15 psi to 300 psi (103.4 kPa to 2068.4 kPa): 10% but not less than 7 psi (48.3 kPa)
- 300 psi to 1000 psi (2068.4 kPa to 6894.8 kPa): 7% but not less than 30 psi (206.8 kPa)
- 1000 psi to 2000 psi (6894.8 kPa to 13789.5 kPa): 5% but not less than 70 psi (482.6 kPa)
- Over 2000 psi (13789.5 kPa): Per designer’s judgment

2.2.3.5 Provide direct spring-loaded reclosing overpressure protection devices for steam power boilers. These devices are generally known as safety valves and are characterized by a “pop action.” Provide direct spring-loaded reclosing safety relief valves for high-temperature water boilers. Safety and safety relief valves are sealed by the agency certifying the set pressure and capacity of the valve. Use safety and safety relief valves as described in Section I, Rules for the Construction of Power Boilers, ASME Boiler and Pressure Vessel Code. Direct spring-loaded safety and safety relief valves conforming to other recognized codes are also acceptable.

2.2.3.6 Protect all systems (i.e., water, steam and air) from overpressure and excessively high temperature with direct spring-loaded safety, safety relief, or temperature and pressure safety relief valves as appropriate Safety, safety relief, and temperature and pressure safety relief valves are sealed by the agency certifying the set pressure and capacity of the valve. Safety, safety relief, and temperature and pressure safety relief valves acceptable to FM are described in Section IV, Rules for Construction of Heating Boilers, ASME Boiler and Pressure Vessel Code. Direct spring-loaded safety, safety relief, and temperature and pressure safety relief valves conforming to other recognized codes are also acceptable. Valve installation examples are shown in Figures 2.2.3.6-1 through 2.2.3.6-5.

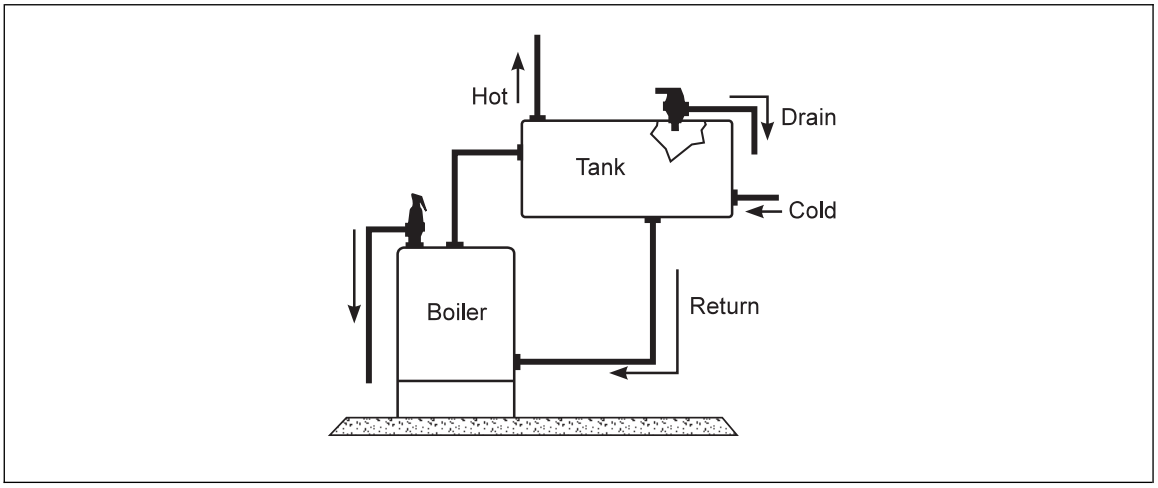

Fig. 2.2.3.6-1. Hot water supply system with both safety relief valve (on boiler) and temperature relief valve (on tank)

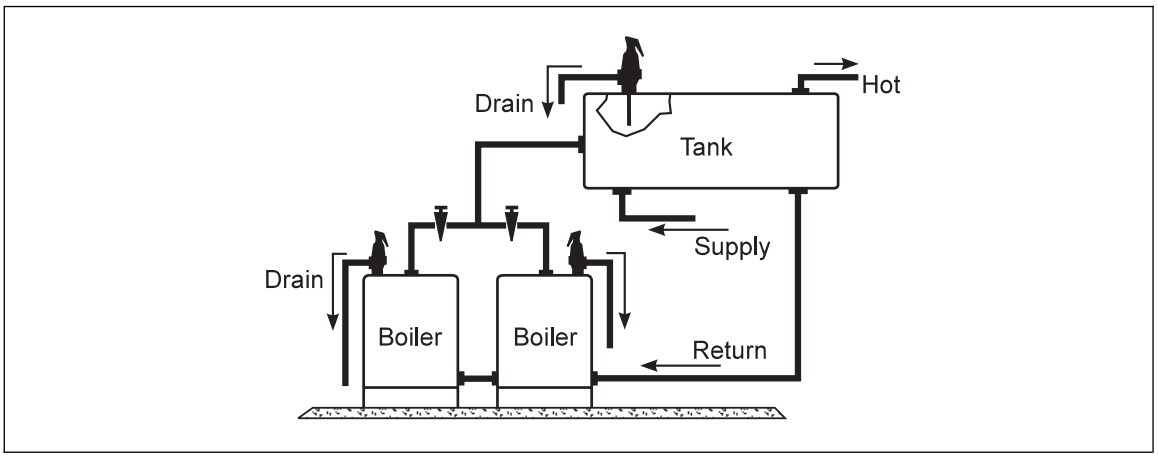

Fig. 2.2.3.6-2. Multi-boiler hot water supply system with a pressure relief valve on each boiler and a pressure-temperature relief valve on tank

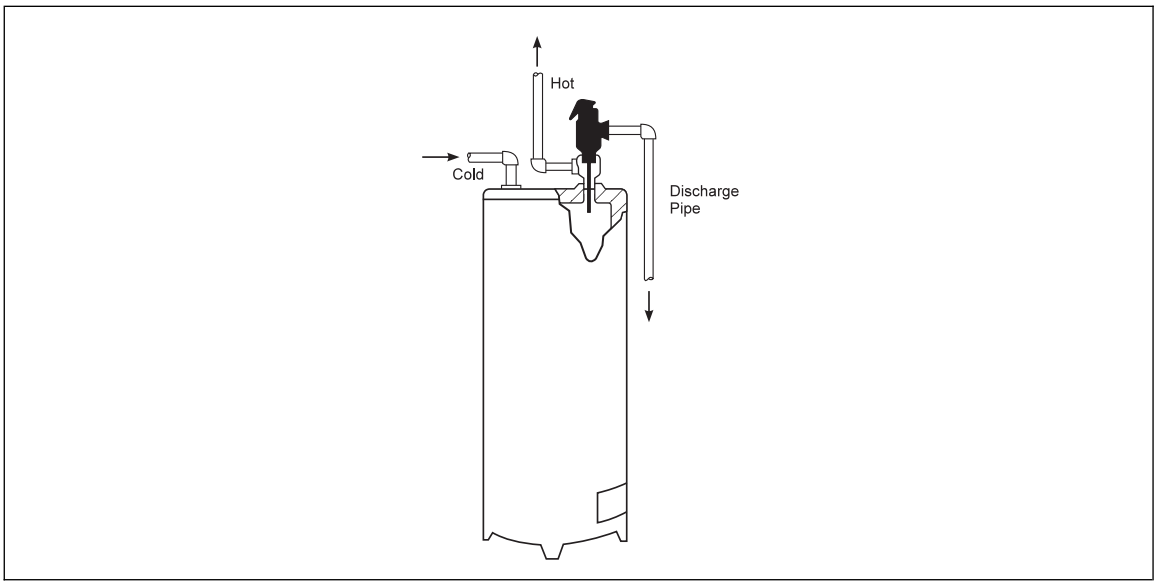

Fig. 2.2.3.6-3. Water heater relief valve protection for storage water heater

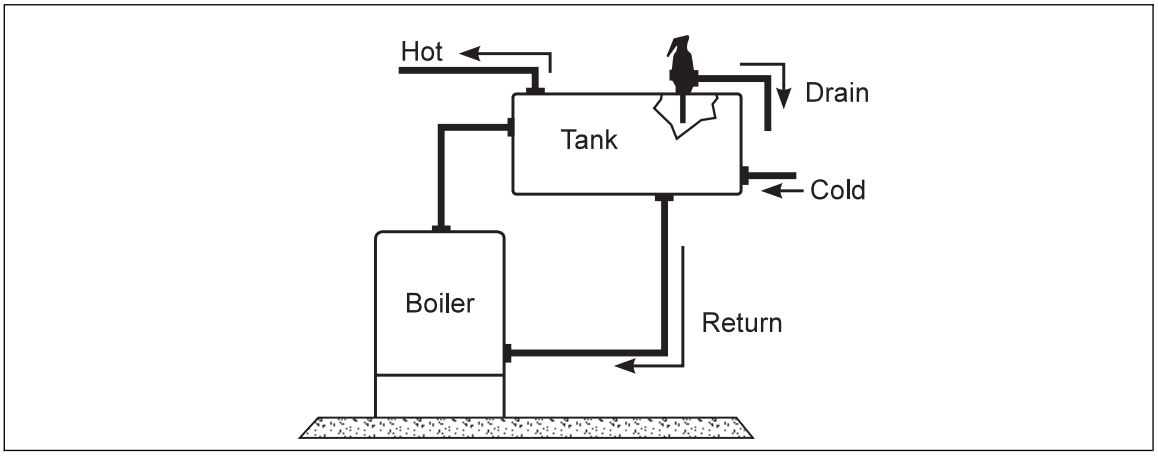

Fig. 2.2.3.6-4. Location of combination pressure- and temperature-actuated relief valve, with no stop valves between boiler and storage tank

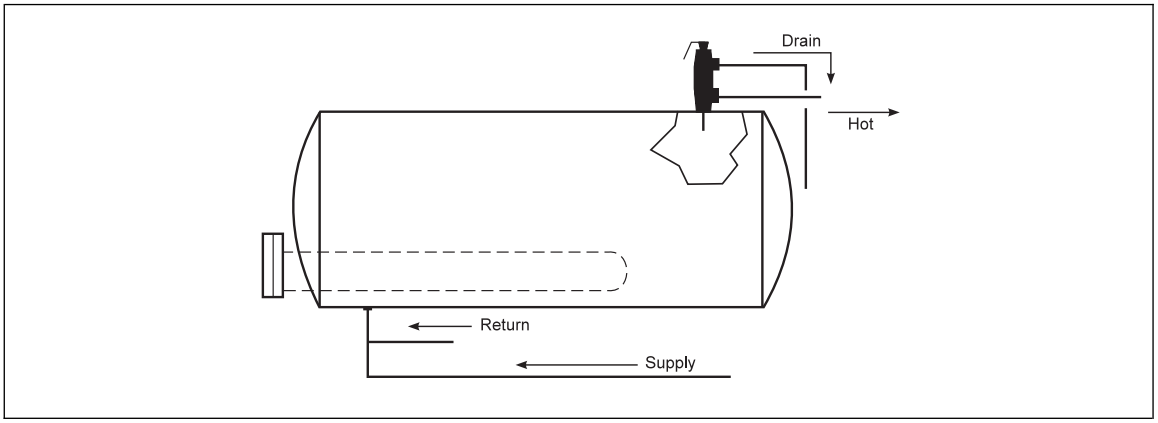

Fig. 2.2.3.6-5. Steam-coil-heated storage tank with pressure-temperature valve, maximum temperature 250°F (127°C) and maximum pressure 160 psi (1102 kPa)

2.2.3.7 Provide overpressure protection for pressure vessels and piping systems. Use direct-acting spring loaded safety, safety relief, relief, or pilot-operated relief valves (reclosing devices) or rupture disks, breaking-pin devices, buckling-pin devices or spring-loaded non-reclosing pressure relief devices as described in Section VIII, Divisions 1, 2, and 3, Rules for Construction of Pressure Vessels, ASME Boiler and Pressure Vessel Code. Safety, safety relief, relief, and pilot-operated relief valves are sealed by the agency certifying the set pressure and capacity of the valve. Similar devices conforming to other recognized codes are also acceptable. Provide vacuum relief protection for vessels not designed for full vacuum if the vessels may be subjected to vacuum.

2.2.3.8 Provide overpressure protection on all reduced-pressure systems. Use direct-acting spring-loaded safety, safety relief, relief, or pilot-operated relief valves (reclosing devices) or rupture disks, breaking-pin devices, buckling-pin devices, or spring-loaded nonreclosing pressure relief devices as described in Section VIII, Divisions 1, 2, and 3, Rules for Construction of Pressure Vessels, ASME Boiler and Pressure Vessel Code. Safety, safety relief, relief, and pilot operated relief valves are sealed by the agency certifying the set pressure and capacity of the valve. Similar devices conforming to other recognized codes are also acceptable.

An example of relief valves on the low-pressure side of a reduced-pressure system is shown in Figure 2.2.3.8-1.

Caution: Pressure reducing valves are frequently provided with a bypass, in some cases larger than the reducing valve inlet (Figure 2.2.3.8-2). When this is the case, the required overpressure relieving capacity is based on the size of the bypass rather than the size of the reducing valve inlet.

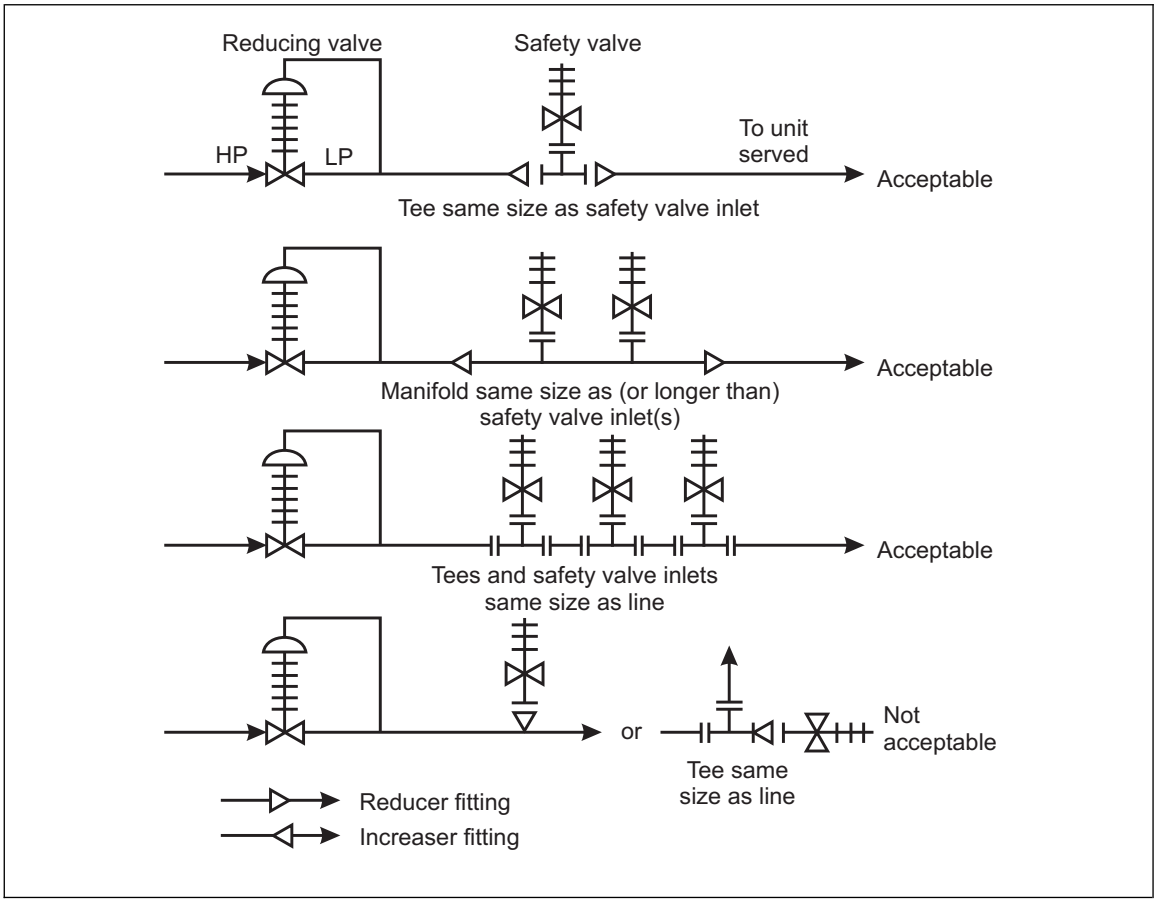

Fig. 2.2.3.8-1. Methods of installing safety valve(s) on low-pressure side of reducing valve. Note: Sum of discharge capacities equals (or exceeds) required capacity as determined by the National Board Inspection Code Part 1 Installation, Supplement 2, "Pressure Relief Valves on the Low-Pressure Side of Steam Pressure Reducing Valves", or the reducing valve rating.

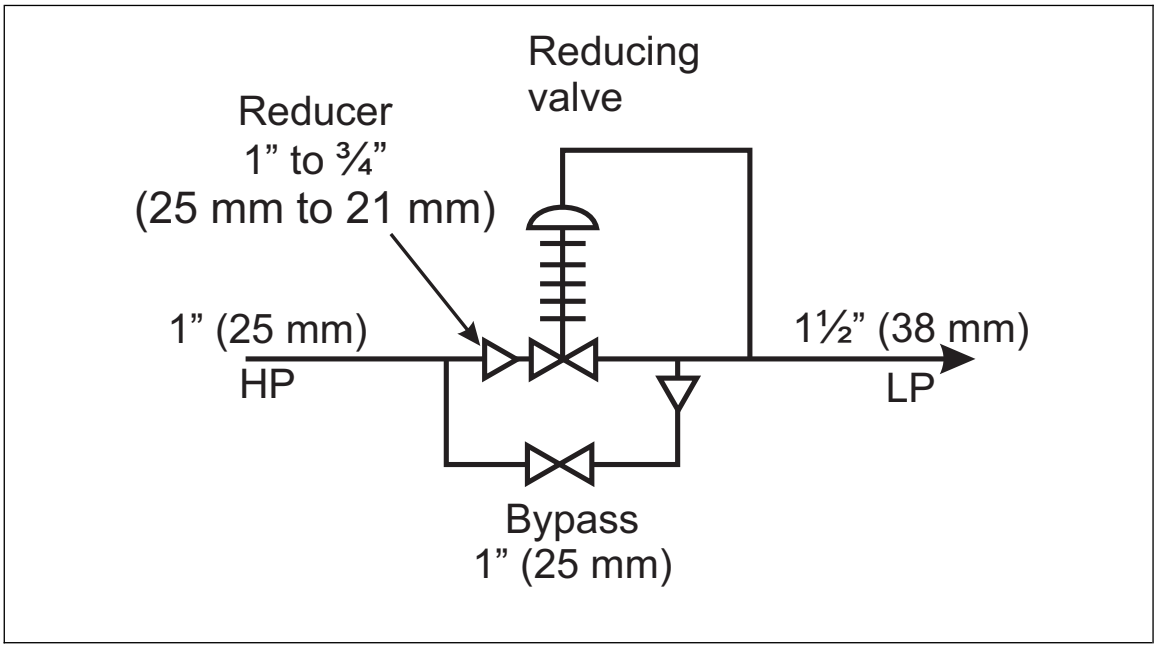

Fig. 2.2.3.8-2. Bypass larger than reducing valve inlet

2.2.3.9 For specific processes, such as vessels containing combustible mixtures, follow the overpressure protection recommendations in the data sheets listed in Section 4.0, References.

2.2.4 Vents and Drains

2.2.4.1 Discharge or vent piping for overpressure protection devices must be of ample size to handle the expected relief flow. Individual lines from each device are preferred.

2.2.4.2 Provide a vent of sufficient size to prevent the buildup of any appreciable pressure within vessels (e.g., process tanks and silos) designed for atmospheric pressure only.

2.2.4.3 Provide boiler blowoff tanks with vapor vent and water drain pipe sizes in accordance with *National Board NB-27, Guide for Blowoff Vessels*, or a similar accepted standard.

2.2.4.4 Provide condensate receivers with properly sized vents that are short, straight (no pockets to accumulate condensation), and of uniform or increasing pipe size (no restrictions between vent and atmosphere).

2.2.4.5 Connect power boiler safety valves to the boiler independently of any other connection, and attach them as closely as possible to the boiler, without any unnecessary intervening pipe or fitting. Always mount power boiler safety valves in a vertical position directly on nozzles having well-rounded approaches providing smooth, unobstructed flow from the drum to the valve. Never install a power boiler safety valve on a fitting that has an inside diameter smaller than the inlet connection to the valve, since this will restrict the flow and cause faulty operation.

2.2.4.6 When unavoidable, use a riser (e.g. intervening pipe or fitting) of the same diameter and pressure rating under the applicable piping standard (e.g., American National Standard) to install a power boiler safety valve. The riser should be as short as possible, and never longer than the face-to-face dimension of the corresponding tee fitting.

2.2.4.7 Ensure overpressure protection device discharge piping is as simple and direct as possible. The inside diameter of the discharge line must never be less than that of the valve outlet. Broken connections with generous clearance like those in Figure 2.2.4.7 are preferred. If fixed piping is necessary, a separate discharge line from each valve is preferable to the manifold type. If a manifold vent arrangement is used, size the manifold for at least the combined areas of all valves connected to it.

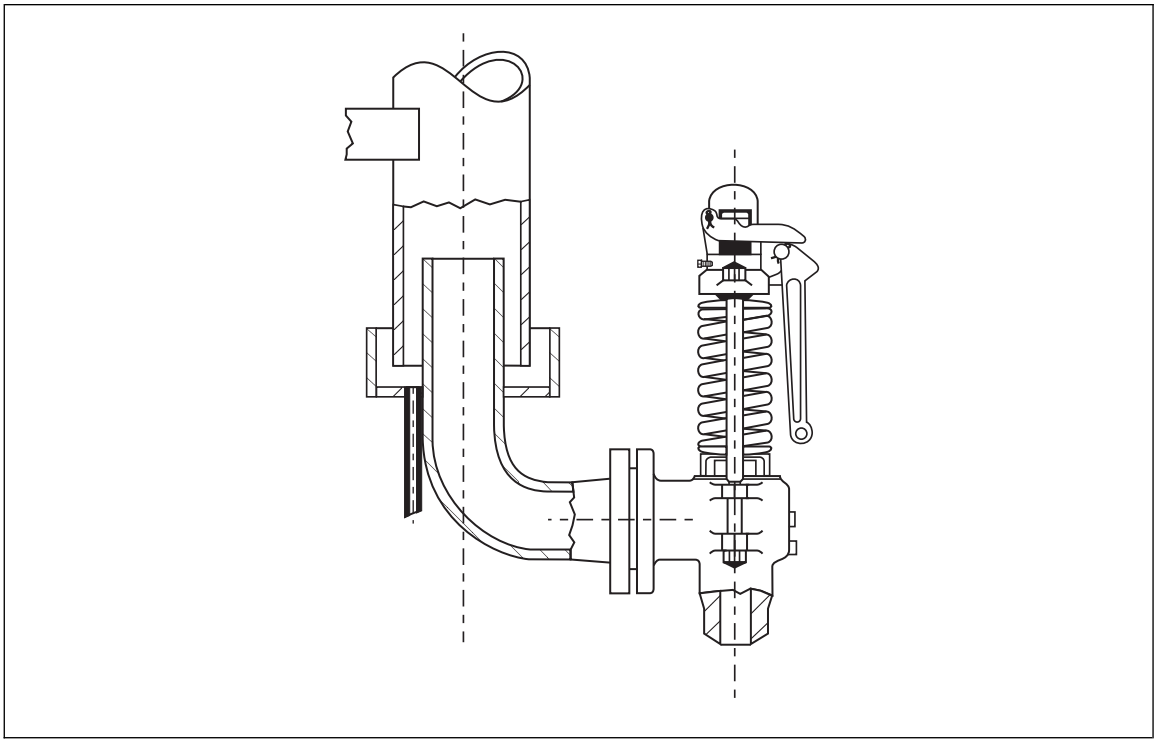

Fig. 2.2.4.7. Discharge pipes of safety valves are kept as short as possible and must be adequately braced

2.2.5 Installation

2.2.5.1 Properly clean connections before installing overpressure protective devices.

2.2.5.2 Remove plugs from drains in reclosing valve bodies and provide drain piping to an appropriate location.

2.3 Operation and Maintenance

2.3.1 Operation

2.3.1.1 Operators

2.3.1.1.1 Establish and implement operator training programs. See Data Sheet 10-8, *Operators*, for guidance on developing these programs. Only personnel properly trained in pressure relief device inspection, testing and maintenance shall be allowed to inspect/adjust them. All settings and repairs must be made by the manufacturer, manufacturer's representative, or firms authorized and certified to perform repairs and reseal the device (e.g., in North America firms holding the VR stamp issued by the National Board).

2.3.1.2 Controls of Pressure Relief Device Isolation Valves

Isolation valves anywhere between the pressure vessel, pressure relief devices and relief piping outlet are not permitted. An exception is when the valves are physically locked open with chains, car seals or other devices that prevent the valve from being switched to any position other than 100% open; AND administrative controls are in place to maintain these valves open.

See Data Sheet 7-49, *Emergency Venting of Vessels*, Section 2.3.4, Isolation Valves, for more detailed guidance on programmatic control of pressure relief device (PRD) isolation valves.

2.3.1.3 System Pressure Control

2.3.1.3.1 Maintain a differential between expected maximum operating pressure and overpressure protection device set pressure as recommended by the device manufacturer or the governing code of the sites georgraphical area.

2.3.1.3.2 Pressure transients that open relief valves should not be a regular occurrence. Assess operator proficiency, procedure adequacy and system design in these cases.

2.3.2 Inspection Testing and Maintenance (ITM)

2.3.2.1 General

The inspection, testing and maintenance (ITM) of the overpressure protection system shall meet the minimum requirements of the governing code for the geographical area where it is installed and be included in the overall asset integrity program of the pressure equipment. See Data Sheet 9-0, *Asset Integrity.* for guidance on developing an asset integrity program.

The pressure relief devices are maintained and operated as required by the code of construction, inspection codes and the local jurisdiction having authority (e.g.,i.e., in North America, the ASME Code, Sections I, IV, VI, VII, and VIII, and XIII, and as required by the National Board Inspection Code [NBIC]).

This data sheet references the inspection standards of the National Board Inspection Code (NBIC), because it is the default inspection code endorsed by FM. However, this data sheet does not mandate that NBIC code be applied to all FM insured locations. Each location should follow their regional and industry-specific codes and regulations.

2.3.2.2 ITM Strategy for Replacement PRDs

2.3.2.2.1 Test all reclosing-type overpressure protection devices at the time of installation to ensure they operate. Reclosing valves are tested and carefully adjusted at the factory, but the valve may have been damaged during shipment or installation.

2.3.2.3 ITM Strategy for Installed PRD's

FM's recommended ITM strategy is the application of the National Board Inspection Code or as mandated by local jurisdictional authority.

In North America, follow the guidance in National Board Inspection Code Part 4, *Pressure Relief Devices.*

In the European Union, follow the guidance in the Pressure Equipment Directive (PED) 2014/68/EU. This standard is adopted by national regulations, and implemented through industry standards (e.g., EN standards) and requirements of the inspection board. Fixed testing intervals for safety valves or pressure relief devices follow the requirements of local jurisdictional authorities.

In the absence of local jurisdictional requirements or as determined by operating experience/documented test history, FM recommends the following (derived from NBIC Part 4):

Table 2.3.2.3. Pressure Relief Device ITM

Service	*Lift Lever Test (LLT)*	*Set Pressure Test (SPT)*	*Other*	*Comments*
Power boilers < 400 psi (2757.9 kPa)	6 month	1 year	-	SPT-annual or prior to planned boiler shutdown
Power boilers ≥ 400 psi (2757.9 kPa)	-	3 year	-	SPT-3 years or prior to planned boiler shutdown
High-temperature hot water boilers	-	1 year	-	SPT-for safety reasons removing the valve from the boiler and bench testing is preferred
Low-pressure steam heating boilers	3 month	1 year	-	SPT-prior to heating season
Organic fluid vaporizers	-	1 year	-	SPT-remove and inspect valve as well.
Hot water heating boilers (Note 1)	3 month	1 year	-	SPT prior to heating season
Water heaters (Note 2)	2 month	-	3 year	Other-remove and inspect temperature probe for damage, buildup or corrosion.
Pressure vessels/piping-steam service	-	1 year	-	-
Pressure vessels/piping- air and clean dry gases	-	3 year	-	-
Pressure vessels/piping-propane and refrigerant	-	5 year	-	-
Pressure relief valves in combination with rupture disks	-	5 year	-	-
All others	TBD	TBD	TBD	-

Note 1.The frequencies specified for testing relief devices on heating boilers are primarily based on the differences between high-pressure boilers that are continuously monitored by a boiler operator and lower pressure boilers with automatic controls that are not continuously monitored. When a boiler experiences an overpressure condition such that the pressure relief valves actuate, the valves should be inspected for seat leakage and other damage as soon as possible; and any deficiencies should be corrected.

Note 2.The temperature probe should be checked for the condition of the coating material and freedom of movement. If the probe pulls out or falls off during inspection, the valve should be repaired or replaced. Due to the relatively low cost of temperature and pressure relief valves for this service, recommend replacement of a defective valve with a new valve if repair or resetting is indicated.

2.3.2.4 Miscellaneous ITM Activities

2.3.2.4.1 Replace rupture disks on a regular basis. The frequency of replacement is governed by the disk manufacturer's recommendation, based on operating conditions such as amplitude and frequency of pressure cycling, operating temperature, and corrosive characteristics of contained material.

2.3.2.4.2 When a combination rupture disk and reclosing relief device is provided, periodically inspect the pressure gauge to monitor the space between the rupture disk and the relief valve seat.

2.3.2.4.3 Periodically check traps on the return lines leading to vented condensate receivers to ensure the lines are in proper working order.

2.3.3 Boiler Acid Cleaning

When acid-cleaning a boiler or pressure vessel, take every precaution to protect internal parts of safety, safety relief, or relief valves from damage. Before the cleaning operation starts:

- Remove the valves, and install temporary blank flanges.
  OR
- Keep the valves in place, and install temporary internal plugs.

Before returning the boiler or pressure vessel to service, ensure that all blanks or plugs have been removed; and that the valves are properly installed and functioning.

2.3.4 Hydrostatic Testing

Follow the device manufacturer's recommendations on removing or applying a gag to the reclosing device to avoid damaging the device when conducting hydrostatic testing of a boiler or pressure vessel. Have a system in place to ensure the relief device is properly restored to operation upon completion of the testing. See Figure 2.3.4 for an example of a gag application.

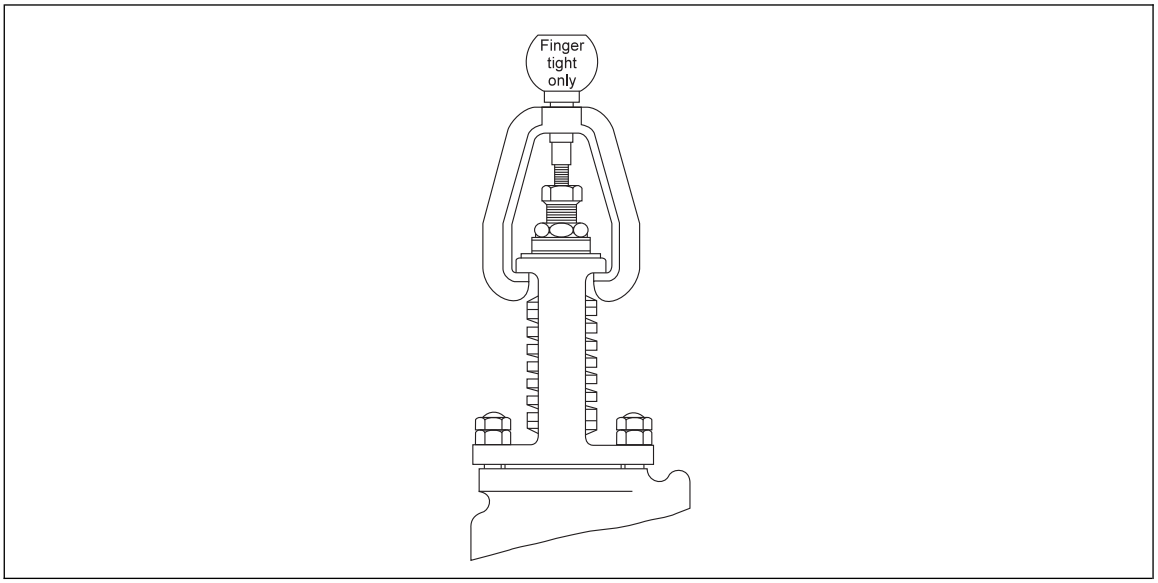

Fig. 2.3.4. Gag screw in position for hydrostatic test

3.0 SUPPORT FOR RECOMMENDATIONS

3.1 Loss History

3.1.1 Loss Data

The following loss review is based on 318 incidents that occurred over a recent 20-year period (2005–2025). It focuses on events involving overpressurization, explosion, implosion, and pressure relief device (PRD) issues within pressure vessel systems supporting a process.

All loss amounts have been indexed to 2025 U.S. dollar values. Only indexed, gross losses exceeding US$1 million are included in the analysis.

Table 3.1.1. PRD Related Losses in Pressure Vessel Systems Supporting a Process

PRD Related Loss	*Number of Losses*	*Number of Losses (% of total)*
Yes	10	3.1%
No	308	96.9%

The table shows that only a small percentage of losses are associated with pressure relief device issues. This result reinforces the benefits of viable PRD design, installation, operation, and ITM. PRDs can also fall under local jurisdictional requirements for code compliance to verify PRD integrity.

The PRD related losses categorized as Yes were losses where PRD issues were plausible contributors. These losses showed that PRDs may have played a role in the event. The perils were either explosions or implosions of vessels. Failure modes included:

- Operational Errors: Overfilling the vessel above vacuum relief valve (VRV) piping, rendering it inoperable. Also, operating a vessel outside of design specifications.
- Inspection, Testing and Maintenance: Valve was replaced in reverse orientation. Valves are stuck closed because of infrequent functional exercise.
- Design: PRD is undersized for the vessel or incorrectly specified as not required.

3.2 Overpressure Protection Devices

The function of overpressure protection devices is to protect the boilers, pressure vessels and piping on which they are installed by opening and releasing pressure when the vessel or system reaches a predetermined pressure. These devices are not intended for pressure regulation. Their only function is to prevent pressure from exceeding the maximum allowable pressure when operating controls and pressure-limiting devices malfunction.

3.2.1 Direct Spring-Loaded Reclosing-Type Devices

Direct spring-loaded reclosing devices (valves) are one of the most vital protection devices against overpressure explosion in boilers, vessels and piping, and usually serve as the last line of defense. Still, disasters continue to occur; because the valves have not been properly tested and maintained and do not function properly.

3.2.2 Code Requirements

Many construction codes and some in-service inspection codes have requirements for overpressure protection device construction, installation and maintenance. As an example, in North America, the ASME Boiler and Pressure Vessel Code is typically followed for new device construction, and the NBIC is followed for device repairs.

3.2.3 Hazards

A sticking/seizing corrosive attack on the seating surfaces of the valve due to water conditions is a hazard. Seating surfaces of the valves may be affected by chemical treatment of the water, which causes a thin adhesive film to form between the seating surfaces, resulting in a higher than normal popping pressure.

3.2.4 Installation

Construction standards, such as the ASME Boiler and Pressure Vessel Code, address location, mounting, quantity, operation and relieving capacity of overpressure protection devices required for boilers and pressure vessels.

3.2.5 Recommended Inspection, Testing and Maintenance Practices

The amount and type of inspection, testing and maintenance required for overpressure protection devices depends on the size, type of construction, and application. Problems encountered with the devices often vitally affect their life, operation and efficiency. The device manufacturer is the best resource for these practices.

3.2.6 Testing Frequencies

Periodic testing of reclosing-type overpressure protection devices is essential. They are expected to function properly. For boilers, the most positive test is to gradually increase boiler pressure until the valve opens.

The testing frequency will vary from facility to facility, depending on operating conditions. In all cases, the testing interval must not exceed what is necessary to keep the valves in satisfactory condition based on

operating experience. Jurisdictional regulatory valve testing requirements that are more stringent than the recommendations in this data sheet should take precedence.

3.2.7 Rupture Disks

Rupture disks, sometimes referred to as safety heads or rupture diaphragms, are membranes of metal, plastic, graphite, or other materials designed and tested to hold pressure up to a specified predictable point and then break to release that pressure. They are widely used for the protection of pressure vessels and systems, especially in the chemical and petroleum industries. Rupture disks range in size from about 3⁄16 in. (5 mm) to about 4 ft (1.25 m) in diameter and can be obtained with rupture-pressure ratings of a few ounces up to 100,000 psi (689,475.7 kPa).

3.2.8 Emergency Venting

Venting requirements for chemical reactions and unstable materials in pressure vessel systems present complex problems. For loss prevention recommendations in this area, refer to Data Sheet 7-46, Chemical Reactors and Reactions. Refer to Data Sheet 7-49, *Emergency Venting of Vessels*, for loss prevention recommendations related to non-reactive pressure vessel systems in a process.

3.2.9 Other Vented Vessels

Many other types of vessels are vented to the atmosphere. Storage vessels under static head that are drained or pumped out must be protected by a vent of proper size or a vacuum breaker. The collapse of a vessel under vacuum or external pressure usually presents results in damage to the vessel itself and to surrounding/connected equipment.

4.0 REFERENCES

4.1 FM

Data Sheet 6-21, *Chemical Recovery Boilers*
Data Sheet 6-22, *Firetube Boilers*
Data Sheet 6-23, *Watertube Boilers*
Data Sheet 7-46, *Chemical Reactors and Reactions*
Data Sheet 7-49, *Emergency Venting of Vessels*
Data Sheet 9-0, *Asset Integrity*
Data Sheet 10-8, *Operators*
Data Sheet 12-2, *Vessels and Piping*
Data Sheet 12-3, *Continuous Digesters and Related Process Vessels*
Data Sheet 12-6, *Batch Digesters and Related Process Vessels*

4.2 Other

American Society of Mechanical Engineers (ASME), 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300, www.asme.org

Boiler and Pressure Vessel (B&PV) Code:

Section I, Rules for Construction of Power Boilers
Section IV, Rules for Construction of Heating Boilers
Section VI, Recommended Rules for Care and Operation of Heating Boilers
Section VII, Recommended Guidelines for the Care of Power Boilers
Section VIII, Rules for the Construction of Pressure Vessels
Section XIII, Rules for Overpressure Protection

Performance Test Codes:

PTC 25-2023 Pressure Relief Devices

The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, www.nationalboard.org

NB-18, Pressure Relief Device Certification
NB-23, National Board Inspection Code (NBIC)
NB-27, A Guide for Blowoff Vessels

APPENDIX A GLOSSARY OF TERMS

Action, Popping or Pop: The action of a safety or safety relief valve when it opens under steam, gas pressure, or vapor pressure. The disk of the valve is designed so the force of the steam lifting the disk is increased when the disk is lifted slightly off its seat. The increase in force accelerates the rising action of the disk to the wide open position at or near the opening pressure. See definitions of safety valve and relief valve.

Blowdown (Blowback): The difference between the actual popping pressure of a pressure relief valve and the actual repeating pressure, expressed as a percentage of set pressure or in pressure units.

Boiler, High-Pressure: A boiler furnishing steam at a pressure in excess of 15 pounds per square inch (psi) (103.4 kPa), or hot water at a temperature in excess of 250°F (120°C) or at a pressure in excess of 160 psi (1,103.2 kPa).

Boiler, Low-Pressure Heating: See Boiler, Low-Pressure Hot-Water and Low-Pressure Steam.

Boiler, Low-Pressure Hot-Water and Low-Pressure Steam: A boiler furnishing hot water at pressures not exceeding 160 psi (1,103.2 kPa) or at temperatures not exceeding 250°F (120°C), or steam at pressure not exceeding 15 psi (103.4 kPa).

Boiler, Power: Same as Boiler, High-Pressure.

Breaking Pin: The load-carrying element of a non-reclosing pressure relief device.

Device, Breaking-Pin: A non-reclosing pressure relief device actuated by inlet static pressure, and designed to function by the breakage of a load-carrying section of a pin which supports a pressure-containing member.

Device, Buckling-Pin: A non-reclosing pressure relief device actuated by inlet static pressure, and designed to function by the buckling of a load-carrying section of a pin that supports a pressure-containing member.

Device, Non-Reclosing Pressure Relief: A pressure relief device designed to remain open after operation. Generally refers to a rupture disk or breaking-pin device.

Device, Primary Pressure Relief: Devices required by Code and set to open below, at, or near the maximum allowable working pressure of a vessel.

Device, Rupture Disk: A non-reclosing pressure relief device actuated by inlet static pressure, and designed to function by the bursting of a pressure-containing disk.

Device, Secondary Pressure Relief: Devices not required by code. May be set above vessel MAWP to protect vessels and systems in case of unexpected, potentially hazardous pressures or may be set below MAWP to avoid operation of primary protection device.

Gag, Safety Valve: A clamp designed to prevent a safety valve from opening (lifting) when applying a hydrostatic pressure test at a higher pressure than the safety valve setting. See Figure 9.

Holder, Rupture Disk: The structure that encloses and clamps the rupture disk in position. The material of the rupture disk holder is a material permitted by the vessel construction code (in North America, Section II of the ASME B&PV Code).

Housing, Breaking Pin or Buckling Pin: The structure that encloses the breaking or buckling pin mechanism. The material of the housing is a material permitted by the vessel construction code (in North America, Section II of the ASME B&PV Code).

Rated, Officially: Pertains to a safety, safety relief, or relief valve that has been certified as tested and capacity-rated by a testing facility accredited by a recognized authority, such as the ASME Boiler and Pressure Vessel Code Committee. Valves certified by the National Board are published in NB-18, Pressure Relief Device Certification and can be obtained from their website, www.nationalboard.org.

Rupture Disk: The pressure-retaining and pressure-sensitive element of a rupture disk device.

Rupture Disk, Manufacturing Design Range of: A range of pressure within which the average burst pressure of test disks must fall in order to be acceptable for a particular requirement as agreed upon between the rupture disk manufacturer and the user or his agent.

Rupture Disk, Minimum Flow Area of: The calculated net area after a complete burst of the disk, with appropriate allowance for any structural members that may reduce the area preventing fluid from flowing through the rupture disk device.

Valve, Dead Weight: An automatic pressure relief device that operates by using a stack of calibrated weights to maintain a specific pressure within the equipment internals. When the internal pressure exceeds the force applied by the weights, the disc lifts off the seat, allowing excess pressure to vent. Once the pressure drops back below the set point, the weights reseat the disc, closing the valve.

Valve, Lift Off of: The movement of the disk off the seat of a safety, safety relief, or relief valve when the valve is opened. It normally refers to the amount of movement of the disk off the seat when the valve is discharging at rated capacity.

Valve, Power-Actuated Relief: A pressure-relieving device whose movements to open or close are fully controlled by a source of power (electricity, air, steam, or hydraulic).

Valve, Pressure-Temperature Relief: An automatic relief device actuated by the static pressure upstream of the valve or by the temperature of the fluid. The maximum temperature setting is usually 210°F (100°C). It is used primarily for liquid service.

Valve, Relief: An automatic pressure relief device actuated by the static pressure upstream of the valve, which opens further with the increase in pressure over the opening pressure. It is used primarily for liquid service.

Valve, Safety: An automatic pressure relief device actuated by the static pressure upstream of the valve and characterized by full opening pop action. It is used for steam, gas, or vapor service.

Valve, Safety Relief: An automatic pressure-actuated relief device that may be configured for use as either a safety valve (vapor) or relief valve (liquid), depending on application. A safety relief valve configured for vapor relief will not be suitable for liquid relief and the reverse.

Valve, Weighted Lever: An automatic pressure relief device that operates by using a lever arm and a movable weight to control the pressure at which the valve opens. The position and mass of the weight determine the amount of force applied to keep the valve closed. When the internal pressure of the vessel exceeds the force exerted by the weight through the lever, the disc lifts off the seat, allowing excess pressure to be released. Once the pressure drops back below the set point, the weight reseats the disc, closing the valve.

For additional definitions refer to ASME PTC 25-2023, *Pressure Relief Devices* or the current version of PTC-25.

APPENDIX B DOCUMENT REVISION HISTORY

October 2025. Interim revision. The following changes are included:

A. Clarified the scope of the document.

B. Improved guidance on select inspection, testing and maintenance (ITM) methodologies.

C. Updated loss history.

October 2013. The Scope was expanded to include a specific resource for a common application of pressure relief devices.

May 2010. Minor editorial changes were made for this revision.

January 2007. Clarification was made to the recommendation 2.2.14.

February 2006. Recommendations and support material have been revised to clearly limit reclosing-type overpressure protection devices to direct spring-loaded valves that cannot be adjusted without breaking a seal. The May 2003 edition of this data sheet is superceded

May 2003. Test frequency for reclosing overpressure protection devices revised for consistency with current industry practice (2.2.15 and deletion of 2.2.16). Also deleted section ‘‘3.2 Illustrative Losses’’.

September 2000. The document was reorganized to provide a consistent format.

1998 — Reformatted
1983 — Original Draft