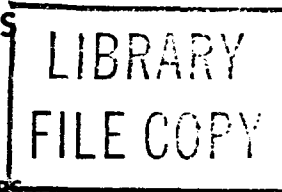


## HEATING PLANT RELIEF DEVICES

### DESCRIPTION



CONTENTS	PAGE
1. GENERAL . . . . .	1
2. STEAM BOILERS . . . . .	1
3. HOT WATER HEATING BOILERS . . . . .	2
4. HOT WATER SUPPLY BOILERS . . . . .	3
5. DOMESTIC HOT WATER . . . . .	4
A. Immersion Coil . . . . .	4
B. Heat Exchangers . . . . .	4
6. MISCELLANEOUS RELIEF DEVICES . . . . .	5

#### 1. GENERAL

**1.01** This section describes the excess pressure relief devices required on steam boilers, hot water boilers, and hot water heaters in heating plants. Descriptive information is given for safety valves used on steam boilers, safety relief valves used on hot water boilers, and temperature/pressure relief valves used on domestic hot water heaters.

**1.02** Whenever this section is reissued, the reason(s) for reissue will appear in this paragraph.

**1.03** All pressure relief devices should bear the American Society of Mechanical Engineers (ASME) cloverleaf and have ratings certified by the National Board of Boiler and Pressure Vessel Inspectors.

**1.04** The recommendations contained in this section are minimum requirements. Other codes having jurisdiction will apply if they are more stringent. Engineering judgment, based on a specific job, may dictate more stringent requirements.

#### 2. STEAM BOILERS

**2.01** Steam boilers should have one or more steam safety valves of the spring pop type adjusted and sealed to discharge at a pressure not to exceed 15 pounds per square inch gauge (psig). Seals should be attached in a manner to prevent the valve from being taken apart or reset to a higher relieving pressure without breaking the seal.

**2.02** Safety valves for a steam boiler should not be smaller than 1/2 inch or larger than 4-1/2 inches. The inlet opening should have an inside diameter equal to, or greater than, the seat diameter. The valve should be a side discharge. Top discharge valves are not permitted.

**2.03** The valve(s) capacity in pounds per hour should be at least equal to the capacity marked on the boiler.

**2.04** When operating conditions are changed or additional heating surface is installed, increase the valve capacity, if necessary, to meet the new conditions.

**2.05** The capacity of the valve(s) selected should not be too large so that the valve(s) can reseal under full firing conditions of the capacity test. This leads to short cycling of the valve, and the continued reseating can damage the disk and seat of the valve.

**2.06** When the required relieving capacity of a steam boiler exceeds the capacity of an approved 4-1/2 inch safety valve, two or more valves should be installed. The valves should be of the same manufacturer and mounted on the boiler shell. A manifold arrangement of two or more safety valves is acceptable if the manifold is provided by the manufacturer of the safety valves for the installation being considered.

**2.07** Each safety valve should have a substantial device (try lever) which will positively lift the disk from its seat at least 1/16 inch when there is no pressure on the boiler.

**2.08** Seats and disks of safety valves should be of material suitable to resist corrosion. Do not

use any materials subject to failure due to deterioration or vulcanization when exposed to saturated steam temperature corresponding to capacity test pressure.

**2.09** All safety valves should be installed in a vertical position without any intervening shutoff valve or device. Safety valves shall be installed directly into the boiler shell. Safety valves should not be connected to an internal pipe in the boiler, such as a dry pipe in the steam drum of a water tube boiler.

**2.10** Screw-end valves shall be mounted on a pipe flange to reduce the possibility of damaging the valve during installation. The valve should be bench-mounted to its flange and the other half of the flange attached to the boiler with a nipple. A wrench should not be applied to the valve body and the valve outlet should not be used with a pipe or other lever to install it on the boiler. Pipe threading compound, if used, should be used sparingly and on the male threads only.

**2.11** Valve bodies or markings should not be painted.

**2.12** Discharge piping should not be permanently connected to the safety valve outlet. If the piping is connected to the safety valve outlet for discharge to the atmosphere during a pressure test, it should be temporary and adequately supported or fixed and used only during the test period. At all other times, the connection should be broken and ample clearance provided between the safety valve outlet and the exhaust piping for rated discharge. This temporary piping should be sized at least as large as the valve discharge. If more than 20 feet of temporary piping is to be used, it should be increased at least one pipe size.

**2.13** All safety valves should have a chain attached to their lifting levers so that testing by lifting this lever can be performed from a safe and convenient location.

**2.14** Safety valves should be installed on boilers by contractor or telephone company building personnel normally engaged in this type work.

**2.15** Periodic tests of all boiler plants are required to maintain good working conditions and to assure complete safety. Exercise safety precautions at all times to protect personnel making the test and

other occupants of the building. Suggested frequencies for tests and inspections, along with needed tools, are outlined in detail in Section 770-210-302.

**2.16** ***DANGER: While testing safety valves, escaping steam can be hazardous.*** The safety valve(s) is the final line of protection against overpressure and is the most important single safety device on any boiler. All new safety valves installed on steam boilers should be capacity-tested as described in Section 760-530-116.\*

### 3. HOT WATER HEATING BOILERS

**3.01** Hot water heating boilers should have one or more safety relief valves of the spring-loaded type adjusted and sealed to discharge at or below the maximum allowable working pressure (MAWP) of the hot water boiler. Seals should be attached in a manner to prevent the valve from being taken apart or reset to a higher relieving pressure without breaking the seal.

**3.02** Safety relief valves should not have valve disk guides on the pressure side of the valve disk.

**3.03** Safety relief valves for a hot water heating boiler should not be smaller than 3/4 inch or larger than 4-1/2 inches. The inlet opening should have an inside diameter approximately equal to, or greater than, the seat diameter. The valve should be a side discharge. Top discharge valves are not permitted.

**3.04** The minimum valve(s) capacity in steam pounds per hour should be equal to the capacity marked on the boiler.

**3.05** The minimum safety relief valve capacity requirement for each hot water boiler, with the fuel-burning equipment installed and operating at maximum capacity, should be so that the pressure cannot rise more than:

- (a) Ten percent above the MAWP of the hot water boiler with a single safety relief valve
- (b) Ten percent above the set pressure of the highest set safety relief valve with more than one safety relief valve.
  - For hot water boilers up to and including 60 psig MAWP, the highest set valve can be set at 6 psig above the MAWP.

\*Check Divisional Index 760 for availability.

- For hot water boilers over 60 psig MAWP, the highest set valve can be set up to 5 percent over the MAWP.
- 3.06** When operating conditions are changed or additional heating surface is installed, increase the valve capacity, if necessary, to meet the new conditions.
- 3.07** The capacity of the valve(s) selected should not be too large so that the valve(s) can reseal under full firing conditions of the capacity test. This leads to short cycling of the valve, and the continued reseating can damage the disk and seat of the valve.
- 3.08** When the required relieving capacity of a hot water boiler exceeds the capacity of an approved 4-1/2 inch safety valve, two or more valves should be installed. These valves should be of the same manufacturer and mounted on the boiler shell. A manifold arrangement of two or more safety relief valves is acceptable if the manifold is provided by the manufacturer of the safety relief valves for the installation being considered.
- 3.09** Each safety relief valve should have a substantial device (try lever) which will positively lift the disk from its seat at least 1/16 inch when there is no pressure on the boiler.
- 3.10** Seats and disks of safety relief valves should be of material suitable to resist corrosion. Do not use any materials subject to failure due to deterioration or vulcanization when exposed to saturated steam temperatures corresponding to capacity test pressure.
- 3.11** All safety relief valves should be installed, in a vertical position, without an intervening shutoff valve or device. Safety relief valves shall be installed directly into the boiler shell. Safety relief valves should not be connected to an internal pipe in the boiler.
- 3.12** Screw-end valves should be mounted on a pipe flange to reduce the possibility of damaging the valve during installation. The valve should be bench-mounted to its flange and the other half of the flange attached to the boiler with a nipple. A wrench should not be applied to the valve body and the valve outlet should not be used with a pipe or other lever to install it on the boiler. Pipe threading compound, if used, should be used sparingly and on the male threads only.
- 3.13** Valve bodies or markings should not be painted. Valves should not be used as a pipe support.
- 3.14** Discharge piping should be run full size from the safety relief valve discharge to the floor or near a funnel drain. The end of this pipe should be cut off at 45 degrees. This piping should be adequately supported or fixed so that there is no stress on the valve. It should be terminated so that any discharge from the valve can be seen.
- 3.15** All safety relief valves should have a chain attached to their lifting levers so that testing by lifting this lever can be performed from a safe and convenient location.
- 3.16** Safety relief valves should be installed on boilers by contractor or telephone company building personnel normally engaged in this type work.
- 3.17** Periodic tests of all boiler plants are required to maintain good working conditions and to assure complete safety. Exercise safety precautions at all times to protect personnel making the test and other occupants of the building. Suggested frequencies for tests and inspections, along with needed tools, are outlined in detail in Section 770-210-301.
- 3.18** ***DANGER: While testing safety relief valves, escaping steam and hot water can be hazardous.*** The safety relief valve(s) is the final line of protection against overpressure and is the most important single safety device on any boiler. All new safety relief valves installed on hot water boilers should be capacity-tested as described in Section 760-530-116.
- 4. HOT WATER SUPPLY BOILERS**
- 4.01** Hot water supply boilers should be provided with safety relief devices, either pressure or combination temperature/pressure type of ASME-approved valve.
- 4.02** A hot water supply boiler is similar to a hot water heating boiler except that all or most of the hot water is not returned to the boiler. It is used external to the circulating loop. An example of this is domestic hot water piped in a loop to assure immediate hot water availability at each fixture, most of which is used for washing or culinary purposes.

## SECTION 760-530-112

**4.03** Hot water supply boilers should be treated as hot water heating boilers if:

- (a) Heat input exceeds 200 MBh
- (b) Water temperature exceeds 210°F
- (c) Nominal water containing capacity exceeds 120 gallons.

**4.04** All other hot water supply boilers should be treated as water heaters. (See Section 760-530-105\* for details of controls required.)

**4.05** Hot water heaters should be equipped with a combination temperature/pressure relief valve with a capacity equal to or greater than the output rating of the heater. This temperature/pressure relief valve should limit the pressure to the MAWP of the heater or 150 psig, whichever is less, and limit the temperature to 210°F. Minimum valve size should be 3/4 inch.

**4.06** The valve should be installed with the thermal element immersed in the water in the tank. It should be placed in the top portion of the tank either through the top head or top of the tank side. If the valve is mounted on a tee in the hot water discharge pipe, an extension-type thermostatic element should be used to assure that the element is in the tank water.

**4.07** The drain line should be the full size of the temperature/pressure relief valve discharge opening and run full size to the point of discharge. This drain line should be run to a boiler drain or terminate 4 to 6 inches above the floor. The end of this line should cut off at a 45-degree angle to prevent the line from being capped.

**4.08** This temperature/pressure relief valve should be ASME approved, a side discharge valve with a lifting lever capable of lifting the disk 1/16 inch from the seat with no pressure on the hot water heater. This temperature/pressure relief valve should not have valve disk guides on the pressure side of the valve disk.

### 5. DOMESTIC HOT WATER

**5.01** A building's domestic hot water can be supplied with a separate hot water heater or by one of or a combination of the following methods:

- (a) A coil immersed in the boiler

- (b) A separate heat exchanger which uses boiler hot water, boiler steam, or purchased steam.

**5.02** When a boiler is required to be operated 12 months a year (ie, runs in conjunction with an air-conditioning system), the boiler can be equipped with an immersion coil or external heat exchanger for the domestic hot water service.

#### A. Immersion Coil

**5.03** Where an immersion coil is used, a temperature-actuated mixing or blending valve should be installed to assure proper tempering of the hot water from the coil. The valve should have a range that will provide a maximum temperature of 110°F at the lavatories and service sinks.

**5.04** The immersion coil and the storage tank (when used) shall be equipped with a pressure relief valve. The set pressure of this valve should not exceed the pressure rating of the coil or the storage tank or a maximum setting of 150 psig. The valve should be located on the inlet side of the coil adjacent to the boiler. If a storage tank is used, an additional pressure relief valve shall be installed in the tank shell.

**5.05** A temperature relief valve or a combination temperature/pressure relief valve shall be installed downstream of the blending or mixing valve set to operate when the water temperature reaches 210°F.

#### B. Heat Exchangers

**5.06** Where a heat exchanger is used, a temperature-actuated control valve should be installed in the hot water or steam supply to the heat exchanger. This normally closed valve is controlled by an aquastat located in the domestic hot water line or in the storage tank and provides domestic hot water at the temperature desired.

**5.07** When a blending or mixing valve is used with a heat exchanger or storage tank, a pressure relief valve shall be installed on the heat exchanger or storage tank and a temperature relief valve or a combination temperature/pressure relief valve installed downstream of the blending or mixing valve. The set pressure of the pressure relief valves shall not exceed the pressure rating of the heat exchanger or storage tank or a maximum of 150 psig. The set

\*Check Divisional Index 760 for availability.

temperature of the temperature relief or combination temperature/pressure relief valve shall be a maximum of 210°F.

**5.08** If a blending or mixing valve is not used with the heat exchanger, a combination temperature/pressure relief valve shall be installed on the heat exchanger or storage tank shell. The valve set temperature shall not exceed 210°F and the set pressure shall not exceed the pressure rating of the heat exchanger or storage tank or a maximum of 150 psig.

## **6. MISCELLANEOUS RELIEF DEVICES**

**6.01** In addition to the steam or water side of pressure vessels, the fire side of these boilers requires pressure relief. These devices are referred to as furnace explosion doors and can be either gravity closed or spring closed. These relief devices are located on the last fire side pass where the blue gas temperatures are not high enough to burn them. In the event of a heavy puff-back, which builds up pressure on the fire side, these devices relieve some of the pressure. This pressure release protects the breeching and smoke pipe.

**6.02** Pressure relief valves are installed on the discharge side of the oil pump on an oil burner to protect against overpressure caused by a plugged nozzle or malfunctioning, modulating, or low fire start valve. These relief devices discharge back to the return line of the fuel oil piping system. If they discharge onto the floor, a fire hazard, as well as a major cleanup problem, exists.

**6.03** Relief devices are provided on gas services in the event that the utility company pressure regulator malfunctions and permits the gas pressure to rise in excess of safe conditions on the gas train. Pressure ranges and pressure relief valve settings provided by the gas utility companies vary. All are required to meet a Department of Transportation, Office of Pipeline Safety Regulation stating that a malfunction of the utility company distribution regulators should not subject the gas user's appliances to a dangerous pressure. Each installation should be reviewed with the gas utility company to determine what gas pressures would be available in the event of a malfunction. All gas controls of the diaphragm type and relief valves should be vented to the outside of the building at least 10 feet above grade—not below a window or opening and at least 5 feet laterally from any building opening.