

DEPT. OF INDUSTRY, LABOR & HUMAN RELATIONS 105
ILHR 42

SECTION I — POWER BOILERS

68.6 Every safety valve used on a superheater or reheater discharging superheated steam at a temperature over 450°F (232°C) shall have a casing, including the base, body, and bonnet and spindle, of steel, steel alloy, or equivalent heat-resisting material.

The valve shall have a flanged inlet connection, or a weld-end inlet connection. It shall have the seat and disk of suitable heat erosive and corrosive-resisting material, and the spring fully exposed outside of the valve casing so that it shall be protected from contact with the escaping steam.

TABLE PG-70
MINIMUM POUNDS OF STEAM PER HOUR
PER SQUARE FOOT OF SURFACE

	Firetube Boilers	Watertube Boilers
Boiler heating surface		
Hand fired	5	6
Stoker fired	7	8
Oil, gas, or pulverized fuel fired	8	10
Waterwall heating surface		
Hand fired	8	8
Stoker fired	10	12
Oil, gas, or pulverized fuel fired	14	16

NOTE:

When a boiler is fired only by a gas having a heat value not in excess of 200 Btu/cu ft, the minimum safety valve or safety relief valve relieving capacity may be based on the values given for hand-fired boilers above.

The minimum safety valve or safety relief valve relieving capacity for electric boilers shall be 3½ lb (1.6 kg) /hr/kW input.

In many cases a greater relieving capacity of safety valves or safety relief valves will have to be provided than the minimum specified by this rule, and in every case the requirements of PG-67.2 shall be met.

70.2 The heating surface shall be computed as follows.

70.2.1 Heating surface, as part of a circulating system in contact on one side with water or wet steam being heated and on the other side with gas or refractory being cooled, shall be measured on the side receiving heat.

70.2.2 Boiler heating surface and other equivalent surface outside the furnace shall be measured circumferentially plus any extended surface.

70.2.3 Waterwall heating surface and other equivalent surface within the furnace shall be measured as the projected tube area (diameter × length) plus any extended surface on the furnace side. In computing the heating surface for this purpose, only the tubes, fireboxes, shells, tubeshets, and the projected area of headers need be considered, except that for vertical firetube steam boilers, only that portion of the tube surface up to the middle gage cock is to be computed. The minimum number and size of safety valves or safety relief valves required shall be determined on the basis of the aggregate relieving capacity and the relieving capacity marked on the valves by the manufacturer. Where the operating conditions are changed, or additional heating surface such as water screens or waterwalls is connected to the boiler

PG-70 CAPACITY

70.1 The minimum safety valve or safety relief valve relieving capacity for other than electric boilers, waste heat boilers, organic fluid vaporizer generators, and forced-flow steam generators with no fixed steam and water line, when provided in accordance with PG-67.4.3, shall be determined on the basis of the pounds of steam generated per hour per square foot of boiler heating surface and waterwall heating surface, as given in the Table PG-70.

GENERAL

PFT-1 GENERAL

The rules in Part PFT are applicable to firetube boilers and parts thereof and shall be used in conjunction with the general requirements in Part PG as well as with the specific requirements in the applicable Parts of this Section which apply to the method of fabrication used.

PFT-44 OPENING BETWEEN BOILER AND SAFETY VALVE

The opening or connection between the boiler and the safety valve shall have at least the area of the valve inlet. In the case of firetube boilers, the openings in the boilers for safety valves or safety relief valves shall be not less than given in Table PFT-44, except firetube boilers used for waste heat purposes only, not equipped for direct firing, need not meet the requirements of Table PFT-44 provided the rated steaming capacity is stamped on the boiler and safety valves or safety relief valves of the required relieving capacity are supplied such that the provisions of PG-67.2 are satisfied.

After the boiler Manufacturer provides for the opening required by the Code, a bushing may be inserted in the opening in the shell to suit a safety valve that will have the capacity to relieve all the steam that can be generated in the boiler and which will meet the Code requirements.

No valve of any description shall be placed between the required safety valve or safety relief valve or valves and the boiler, or on the discharge pipe between the safety valve or safety relief valve and the atmosphere. When a discharge pipe is used, the cross-sectional area shall be not less than the full area of the valve outlet or of the total of the areas of the valve outlets discharging thereto and shall be as short and straight as possible and so arranged as to avoid undue stresses on the valve or valves.

PFT-48 FEED PIPING

48.1 When a horizontal-return tubular boiler exceeds 40 in. (1000 mm) in diameter, the feedwater shall discharge at about three-fifths the length from the end of the boiler which is subjected to the hottest gases of the furnace (except a horizontal-return tubular boiler equipped with an auxiliary feedwater heating and circulating device), above the central rows of tubes. The feed pipe shall be carried through the head or shell farthest from the point of discharge of the feedwater in the manner specified for a surface blowoff in PG-59.3.2, and be securely fastened inside the shell above the tubes.

48.2 In vertical tubular boilers the feedwater shall be introduced at a point not less than 12 in. (300 mm) above the crown sheet. When the boiler is under pressure, feedwater shall not be introduced through the openings or connections used for the water column, the water gage glass, or the gage cocks. In closed systems the water may be introduced through any opening when the boiler is not under pressure.

PFT-49 BLOWOFF PIPING

49.1 Blowoff piping of firetube boilers which is exposed to products of combustion shall be attached by screwing into a tapped opening with provisions for a screwed fitting or valve at the other end.

49.2 Blowoff piping of firetube boilers which is not exposed to products of combustion may be attached by any method provided in this Section except by expanding into grooved holes.

GENERAL

PEB-1 GENERAL

The rules in Part PEB are applicable to electric boilers and parts thereof and shall be used in conjunction with the general requirements in Part PG as well as with the special requirements in the applicable Parts of this Section which apply to the method of fabrication used.

PEB-15 SAFETY VALVES

15.1 Each electric boiler shall have at least one safety valve or safety relief valve, and if it has a power input more than 500 kW it shall have two or more safety valves or safety relief valves.

15.2 The minimum safety valve or safety relief valve relieving capacity for electric boilers shall be 3½ lb (1.6 kg)/hr/ kW input.

DEPT. OF INDUSTRY, LABOR & HUMAN RELATIONS 107
ILHR 42

PG-70.2.3-PG-71.4

SECTION I — POWER BOILERS

circulation, the safety valve or safety relief valve capacity shall be increased, if necessary, to meet the new conditions and be in accordance with PG-67.2. The additional valves required on account of changed conditions may be installed on the steam or water line between the boiler and the main stop valve except when the boiler is equipped with a superheater or other piece of apparatus, in which case they may be installed on the steam pipes between the boiler drum and the inlet to the superheater or other apparatus, provided that the steam main between the boiler and points where a safety valve or valves may be attached has a cross-sectional area at least three times the combined areas of the inlet connections to the safety valves applied to it.

70.3 If the safety valve or safety relief valve capacity cannot be computed or if it is desirable to prove the computations, it may be checked in any one of the three following ways, and if found insufficient, additional capacity shall be provided.

70.3.1 By making an accumulation test, that is, by shutting off all other steam discharge outlets from the boiler and forcing the fires to the maximum. The safety valve equipment shall be sufficient to prevent an excess pressure beyond that specified in PG-67.2. This method should not be used on a boiler with a superheater or reheater or on a high-temperature water boiler.

70.3.2 By measuring the maximum amount of fuel that can be burned and computing the corresponding evaporative capacity upon the basis of the heating value of the fuel (see A-12 through A-17).

70.3.3 By determining the maximum evaporative capacity by measuring the feedwater. The sum of the safety valve capacities marked on the valves shall be equal to or greater than the maximum evaporative capacity of the boiler. This method shall not be used on high-temperature water boilers.

PG-71 MOUNTING

71.1 When two or more safety valves are used on a boiler, they may be mounted either separately or as twin valves made by placing individual valves on Y-bases, or duplex valves having two valves in the same body casing. Twin valves made by placing individual valves on Y-bases, or duplex valves having two valves in the same body, shall be of approximately equal capacity.

When not more than two valves of different sizes are

mounted singly the relieving capacity of the smaller valve shall be not less than 50% of that of the larger valve.

71.2 The safety valve or safety relief valve or valves shall be connected to the boiler independent of any other connection, and attached as close as possible to the boiler, without any unnecessary intervening pipe or fitting. Such intervening pipe or fitting shall be not longer than the face-to-face dimension of the corresponding tee fitting of the same diameter and pressure under the applicable American National Standard listed in PG-42 and shall also comply with PG-8 and PG-39. Every safety valve or safety relief valve shall be connected so as to stand in an upright position, with spindle vertical. On high-temperature water boilers of the watertube forced-circulation type, the valve shall be located at the boiler outlet.

71.3 The opening or connection between the boiler and the safety valve or safety relief valve shall have at least the area of the valve inlet. No valve of any description shall be placed between the required safety valve or safety relief valve or valves and the boiler, nor on the discharge pipe between the safety valve or safety relief valve and the atmosphere. When a discharge pipe is used, the cross-sectional area shall be not less than the full area of the valve outlet or of the total of the areas of the valve outlets, discharging thereinto. It shall be as short and straight as possible and so arranged as to avoid undue stresses on the valve or valves.

All safety valve or safety relief valve discharges shall be so located or piped as to be carried clear from running boards or platforms. Ample provision for gravity drain shall be made in the discharge pipe at or near each safety valve or safety relief valve, and where water of condensation may collect. Each valve shall have an open gravity drain through the casing below the level of the valve seat. For iron- and steel-bodied valves exceeding 2½ in. size, the drain hole shall be tapped not less than ½ in. pipe size.

Discharge piping from safety relief valves on high-temperature water boilers shall be provided with adequate provisions for water drainage as well as the steam venting.

The installation of cast iron bodied safety relief valves for high-temperature water boilers is prohibited.

71.4 If a muffler is used on a safety valve or safety relief valve, it shall have sufficient outlet area to prevent back pressure from interfering with the proper operation and discharge capacity of the valve. The

muffler plates or other devices shall be so constructed as to avoid a possibility of restriction of the steam passages due to deposit. Mufflers shall not be used on high-temperature water boiler safety relief valves.

When a safety valve or safety relief valve is exposed to outdoor elements which may affect operation of the valve, it is permissible to shield the valve with a satisfactory cover. The shield or cover shall be properly vented and arranged to permit servicing and normal operation of the valve.

71.5 When a boiler is fitted with two or more safety valves or safety relief valves on one connection, this connection to the boiler shall have a cross-sectional area not less than the combined areas of inlet connections of all the safety valves or safety relief valves with which it connects and shall also meet the requirements of PG-71.3.

71.6 Safety valves may be attached to drums or headers by welding provided the welding is done in accordance with Code requirements.

71.7 Every boiler shall have proper outlet connections for the required safety valve, or safety relief valve, or valves, independent of any other outside steam connection, the area of opening to be at least equal to the aggregate areas of inlet connections of all of the safety valves or safety relief valves to be attached thereto. An internal collecting pipe, splash plate, or pan may be used, provided the total area for inlet of steam thereto is not less than twice the aggregate areas of the inlet connections of the attached safety valves. The holes in such collecting pipes shall be at least $\frac{1}{4}$ in. (6 mm) in diameter and the least dimension in any other form of opening for inlet of steam shall be $\frac{1}{4}$ in. (6 mm).

Such dimensional limitations to operation for steam need not apply to steam scrubbers or driers provided the net free steam inlet area of the scrubber or drier is at least 10 times the total area of the boiler outlets for the safety valves.

71.8 If safety valves are attached to a separate steam drum or dome, the opening between the boiler proper and the steam drum or dome shall be not less than required by PG-71.7.

PG-72 OPERATION

72.1 Safety valves shall be designed and constructed to operate without chattering and to attain full lift at a pressure no greater than 3% above their set pressure. After blowing down, all valves shall close at

a pressure not lower than 96% of their set pressure, except that all drum valves installed on a single boiler may be set to reseal at a pressure not lower than 96% of the set pressure of the lowest set drum valve. The minimum blowdown in any case shall be 2 psi (14 kPa). For spring-loaded pop safety valves for pressure between 200 and 300 psi (1400 and 2100 kPa), both inclusive, the blowdown shall not be less than 1% of the set pressure. To insure the guaranteed capacity and satisfactory operation, the blowdown as marked upon the valve (PG-69.5) shall not be reduced.

Safety valves used on forced-flow steam generators with no fixed steam and waterline, and safety relief valves used on high-temperature water boilers may be set and adjusted to close after blowing down not more than 10% of the set pressure. The valves for these special uses must be so adjusted and marked by the manufacturer.

72.2 The popping point tolerance plus or minus shall not exceed the following: 2 psi (14 kPa) for pressures up to and including 70 psi (480 kPa), 3% for pressures over 70 psi (480 kPa) up to and including 300 psi (2100 kPa), 10 psi (69 kPa) for pressures over 300 psi (2100 kPa) up to and including 1000 psi (6900 kPa), and 1% for pressures over 1000 psi (6900 kPa).

72.3 The spring in a safety valve or safety relief valve in service for pressures up to and including 250 psi (1700 kPa) shall not be used for any pressure more than 10% above or 10% below that for which the safety valve or safety relief valve is marked. For higher pressures the spring shall not be reset for any pressure more than 5% above or 5% below that for which the safety valve or safety relief valve is marked.

72.4 If the operating conditions of a valve are changed so as to require a new spring under PG-72.3 for a different pressure, the valve shall be adjusted by the manufacturer or his authorized representative who shall furnish and install a new nameplate as required under PG-110.

DEPT. OF INDUSTRY, LABOR & HUMAN RELATIONS 109
ILHR 42

GENERAL REQUIREMENTS

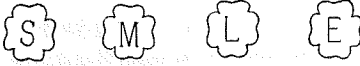


FIG. PG-105.1 OFFICIAL SYMBOLS FOR STAMPS TO DENOTE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS' STANDARD



FIG. PG-105.2 OFFICIAL SYMBOL FOR STAMP TO DENOTE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS' STANDARD FOR ASSEMBLY

FIG. PG-105.3 OFFICIAL SYMBOL FOR STAMP TO DENOTE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS' STANDARD FOR WELDED PIPING



FIG. PG-105.4 OFFICIAL SYMBOL FOR STAMP TO DENOTE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS' STANDARD

PG-105 CODE SYMBOL STAMPS

105.1 Each boiler, superheater, waterwall, and steel economizer to which a Code symbol is to be applied shall be fabricated by a Manufacturer of boilers, superheaters, waterwalls, or steel economizers who is in possession of the appropriate Code symbol stamp (see Fig. PG-105.1), and a valid certificate of authorization, except as otherwise provided in PG-109.

105.2 Seven Code symbol stamps are shown in Figs. PG-105.1 through PG-105.4. They are defined as follows:

- S—power boiler symbol stamp see Fig. PG-105.1
- M—miniature boiler symbol stamp see Fig. PG-105.1
- L—locomotive boiler symbol stamp see Fig. PG-105.1
- E—electric boiler symbol stamp see Fig. PG-105.1
- A—boiler assembly symbol stamp see Fig. PG-105.2
- PP—pressure piping symbol stamp see Fig. PG-105.3
- V—safety valve symbol stamp see Fig. PG-105.4

PG-109 STAMPING OF PRESSURE PIPING

109.1 When external piping, as defined in the Preamble, is installed by welding and is fabricated by anyone other than the Manufacturer of the boiler, the welding, other than the qualification of welding procedures, welders, and welding operators, shall be done in accordance with the applicable rules of ANSI B31.1 and by a manufacturer or contractor in possession of one of the Code symbols shown in Fig. PG-105.1 ("S" only), Fig. PG-105.2, or Fig. PG-105.3 and who has been issued a Certificate of Authorization. Qualification of welding procedures, welders, and welding operators shall be in accordance with the requirements of PW-1.2 and Section IX. Such work shall be inspected by an Authorized Inspector at such stages of the work as the Inspector may elect. The organizations which furnish and install such piping shall furnish proper Code certification (PG-104.2) for such piping including a Manufacturer's Data Report Form P-4A as required by PG-112.2.5 and PG-112.3.

109.2 Welded piping, included within the scope of this Code, over 2 in. pipe size shall be stamped with the Code symbol, together with the manufacturer's or contractor's name and serial number. Such stamping shall be on the pipe, valve, or fitting adjacent to the welded joint farthest from the boiler. For piping operating at temperatures above 800°F (427°C) the symbol may be stamped on a nameplate which is irremovably attached by welding, provided such welding is postweld heat treated, or on a circular metal band at least 1/4 in. (6 mm) thick. This band around the pipe shall be secured in such a manner as to prevent it from slipping off during handling and installation.

Welded piping 2 in. pipe size or less included within the scope of this Code shall be marked with an identification acceptable to the Inspector and traceable to the required Data Report. Such marking shall be of a type that will remain visible until the piping has been installed.

109.3 Parts of boilers, such as superheater, water-wall, or economizer headers, or any construction involving only welding as covered by PW-41, may be fabricated by a manufacturer in possession of the pressure piping symbol stamp, and so stamped and reported on a Manufacturers' Partial Data Report Form (Form P-4) as called for in PG-112.2.4.

PG-110 STAMPING OF SAFETY VALVES

Each safety valve shall be plainly marked by the manufacturer or assembler (see PG-73.3.4) in such a way that the markings will not be obliterated in service. The markings may be stamped on the casing, or stamped or cast on a plate or plates securely fastened to the casing, and shall contain the following markings:

- (1) the name or identifying trademark of the manufacturer;
- (2) manufacturer's design or type number;
- (3) size ___ in. seat diameter ___ in. (the pipe size of the valve inlet);
- (4) pressure ___ lb (the pressure at which it is to blow);
- (5) B.D. ___ lb (blowdown—difference between the opening and closing pressure);
- (6) capacity ___ lb/hr (in accordance with PG-67.5 and PG-72, and with the valve adjusted for the blowdown given in the preceding item);
- (7) capacity lift ___ in. (capacity lift—distance the valve disk rises when blowing at the accumulation test pressure);
- (8) year built, or alternatively, a coding may be marked on the valve such that the valve manufacturer can identify the year built;
- (9) ASME symbol as shown in Fig. PG-105.4.