

§750. Application of Boiler and Fired Pressure Vessel Safety Orders.

(a) These orders establish minimum standards for:

(1) The design, construction, installation, inspection, operation, and repair of all power boilers and nuclear boilers in California not specifically exempted from these Orders.

(2) The design, construction, installation, operation, and repair of all low-pressure boilers and high-temperature water boilers in California not specifically exempted from these Orders.

(3) The design and construction of fired pressure vessels in California not specifically exempted from these orders.

(b) After the date on which these orders become effective, all installations and equipment shall conform to these orders.

EXCEPTION: Existing installations and equipment which were in compliance with safety orders, or variances therefrom, in effect prior to the effective date of these safety orders, unless the hazard presented by the installation or equipment is, in the judgment of the Chief of the Division, of such severity as to warrant control by the application of the applicable sections of these orders.

NOTE: Unless otherwise designated in this subchapter, the phrase "Division" refers to the current Division of Occupational Safety and Health or any of its predecessors including the former Division of Industrial Safety or the Division of Occupational Safety and Health Administration. Reference to the former Division of Industrial Safety or Division of Occupational Safety and Health Administration in these orders is meant to refer to their successor, the Division of Occupational Safety and Health, or any subsequent successor agency.

NOTE: Authority cited: Section 6307, Labor Code. Additional authority cited: Section 142.3, Labor Code. Reference: Sections 142.3 and 6302(d), Labor Code.

HISTORY

1. Repealer and new subsection (b) filed 8-12-76; effective thirtieth day thereafter (Register 76, No. 33). For prior history, see Register 66, No. 38.

2. Amendment of subsection (b) filed 7-6-79 as procedural and organizational; effective upon filing (Register 79, No. 27).

§751. Boilers and Fired Pressure Vessels Not Subject to These Orders.

These orders are not applicable to the following:

- (a) Boilers and fired pressure vessels under the jurisdiction or inspection of the United States Government.
- (b) Boilers and fired pressure vessels used in household service.
- (c) Automobile boilers and boilers used exclusively to operate highway vehicles.

§752. Variances.

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- (a) Any employer may apply to the Division for a temporary order granting a variance from an occupational safety and health standard. Such temporary order shall be granted only if the employer files an application which meets the requirements of Sections 6450 through 6457, inclusive, of the California Labor Code.
 - (b) Any employer may apply to the Occupational Safety and Health Standards Board for a permanent variance from an occupational safety and health standard, order, or portion thereof upon a showing of an alternative method, program, practice, means, device or process which will provide equal or superior safety for employees. Such application shall conform to the requirements of the California Administrative Code, Title 8, Chapter 3.5.

NOTE: Authority cited: Section 142.3, Labor Code.

HISTORY

- 1. Repealer and new section filed 8-12-76; effective thirtieth day thereafter (Register 76, No. 33).

§753. Definitions.

Age: Period of time since date of manufacture or nearest estimate if date of manufacture is unknown.

ANSI Standards: Standards approved as American National Standards by the American National Standards Institute, Inc.

Appurtenance A device installed on and used in the normal operation of the boiler. This includes the piping between the boiler and device, but does not include piping beyond that point unless specifically required elsewhere in these Orders.

ASME: The American Society of Mechanical Engineers.

Automatic Safety Shutdown Devices: Safety controls (other than operating controls) which monitor certain essential operating conditions of a fired boiler and which will shut down the boiler in the proper sequence when any of the essential conditions vary from set limits and require the services of the attendant to place the boiler back in operation.

Automatically Controlled Boiler: A boiler equipped with devices to maintain the burner firing conditions, the pressure and/or temperature, and the water level or water content within the predetermined limits without manual manipulation.

Boiler: A fired or unfired pressure vessel used to generate steam pressure by the application of heat. (This definition is intended to include "steam generators" and "forced--circulation boilers" but excludes "unfired evaporators.") [Note definition of: Code Boiler, High Temperature Water boiler, Low Pressure Boiler, Miniature Boiler, Nuclear Boiler, Power Boiler, Secondhand Boiler].

Certificate of Competency: Certification issued by the Division to persons who have satisfactorily passed the written boiler inspector's examination prescribed by the Division.

Certified Inspector: a person who is qualified to make inspections or examinations of boilers or tanks according to the rules under which the vessel is constructed, who has an unrevoked certificate of competency issued pursuant to this part, and who is employed by any one of the following:

A county.

A city

An insurer.

An employer, for the purpose of inspecting only tanks and boilers under his jurisdiction.

Code: The applicable sections of the ASME Boiler and Pressure Vessel Code and of the ANSI Standards.

Power Boilers. Section I, 1977 edition, (except PG--39 and PW--35 for which the 1974 edition will be used).

Material Specification, Section II, 1977 edition.

Nuclear Power Plant Components, Section III, 1977 edition, Division 1 and 2 (except NB/NC/ND--3612(a)(3), for which the 1974 edition will be used).

Heating Boilers, Section IV, 1977 edition.

Pressure Vessels, Section VIII, 1977 edition.

Welding and Brazing Qualifications, Section IX, 1977 edition.

Rules for In service Inspection of Nuclear Power Plant Components, Section XI, 1977 edition.

Power Piping, ANSI B 31, 1, 1977 edition (except nonmetallic pipe such as plastic is not acceptable unless permitted by specific safety orders).

Code addenda shall become effective six months after the date of issuance unless exception to specific parts thereof are made in the interim by the Division.

Code Boiler: a boiler constructed, inspected, and stamped as required by the code.

Division: Division of Industrial Safety.

Evaporator: An apparatus, usually closed, for driving off superfluous liquid, as in concentration plants for sugar and syrup, in fruit drying, etc., or for evaporating liquid for subsequent condensation to purify it, as from salts held in solution.

Existing Installations: Boilers installed in California prior to the adoption of these orders and in compliance with the safety orders of the Division in effect at the time of installation.

External Inspection: An inspection of all visible external surfaces and appurtenance of an installed boiler or fired pressure vessel. Where practicable this inspection shall be made with the boiler in operation to permit the inspector to witness the operation of the controls.

Field Inspection: An inspection of an installed boiler or fired pressure vessel.

Fired Pressure Vessel: A metallic vessel other than a boiler in which vapor pressure is generated in excess of 15 psi by direct firing with a solid, liquid, or gaseous fuel or by electric heating elements. (This does not apply to a coil or tubular section in which a fluid or other product is being continuously circulated by means of a pump or other mechanical device, provided the pipes or tubes do not exceed 6--inch size.)

Full Safety Pilot Control: A control that will shut off the fuel to the main burner and to the pilot burner and require manual resetting if:

The pilot burner flame should be extinguished, or

In the case of spark ignition, the main burner fails to light after 1 recycle of operation of the ignition mechanism.

High Temperature Water Boiler: A fired or unfired pressure vessel used to heat water to temperatures above 212° F. At pressure exceeding 160 psi or to temperatures exceeding 250° F regardless of pressure.

Internal Inspection: Inspection of all accessible internal and external surfaces of a boiler or fired pressure vessel and its appurtenances.

Low--pressure Boiler: A boiler which does not:

Operate at steam pressure or with steam safety valve settings exceeding 15 psi (low--pressure steam boiler), or

Operate at water pressure exceeding 160 psi or water temperatures exceeding 250° F (hot water heating boiler).

This definition is not intended to include domestic type water heaters provided all of the following are complied with:

The heater does not have more than 120--gallon water capacity.

The heater is used only for heating service water.

The operating control on all automatically controlled heaters is installed by the manufacturer and is of a type that cannot be regulated to increase the water temperature at the top of the heater to more than 200° F.

A non--adjustable control is installed on all automatically controlled heaters by the manufacturer and set to shut off the heat input when the temperature at the top of the heater is 210° F or less. This control and the necessary fuel valve, switch, etc., shall be separate from the operating mechanisms required in (C) above.

Automatically controlled gas or oil fired heaters shall have a safety pilot mechanism installed by the manufacturer and so arranged that fuel will be shut off to both the main burner and pilot burner in case of failure of the pilot burner flame or of the spark igniter.

The heater is approved by the American Gas Association or other testing laboratory acceptable to the American National Standards Institute.

The heater is protected against over--pressure than the maximum allowable working pressure of the heater and having a relieving capacity in BTU/hr at least equal to the burner output.

Coil--type swimming pool heaters at places of employment rated at or below 400,000 BTU/hr input need not be considered boilers provided all of the following conditions are complied with:

They are used to heat pool water to a maximum temperature of 140° F, with a maximum pressure stamping of 150 psi.

The inside diameter of the tubes shall not exceed 1/8".

The water volume within the casing does not exceed 6 gallons.

Pool heaters with 200,000 BTU/hr input and less need not be ASME Code, but shall be built to good engineering practice, and have a minimum factor of safety of 4.

They shall have an ASME Code safety valve rated at the full BTU output, and set at or below the stamped maximum allowable working pressure of the heater.

The maximum voltage of the control circuit shall be 120 volts.

The burner shall have a safety pilot mechanism installed by the manufacturer that will shut off the fuel to both the main burner and pilot burner in case of failure of the pilot burner or of the spark ignitor. The maximum time until the fuel valve is fully closed shall be 90 seconds for burners not exceeding 400,000 BTU/hr input.

There shall be a flow switch or low water pressure switch installed by the manufacturer within the heater casing to monitor flow through the coil.

There shall be a high temperature limit switch set below the boiling point at atmospheric pressure. This is in addition to the operating temperature control, set at 140° F.

There shall be two main burner fuel valves piped in series, or a single fuel valve having two seats.

Coil--type steam vapor cleaners need not be considered as boilers provided all of the following conditions are complied with:

The largest nominal pipe or tubing size is 3/4," and has no drums or headers attached. They shall be built to good engineering practice with a factor of safety of at least 4.

The nominal water containing capacity does not exceed 6 gallons.

A non--adjustable high limit temperature control shall be set to operate at or below 350oF.

Steam is not generated within the coil.

A safety valve set at or below the stamped maximum allowable working pressure, with relief capacity at least equal to the BTU output of the burner, shall be installed near the outlet.

The burner shall have a safety pilot mechanism installed by the manufacturer that will shut off the fuel to both the main burner and pilot burner in case of failure of the pilot burner or of the spark ignitor. The maximum time until the fuel valve is fully closed shall be 90 seconds for burners not exceeding 400,000 BTU/hr input.

Miniature Boiler: A boiler which does not exceed any of the following limits:

16 inches inside diameter of shell.

5 cubic feet gross volume, exclusive of casing and insulation. (This volume includes the total volume of the steam and water containing parts of the boiler plus the volume of the combustion space and gas passages up to the point of attachment of the smokestack or chimney breeching.)

20 square feet water heating surface.

100 psi maximum allowable working pressures.

National Board: The National Board of Boiler and Pressure Vessel Inspectors.

New Installations: Boilers and fired pressure vessels installed or reinstalled after the effective date of these Orders.

Nuclear Boiler: A device consisting of a vessel or system of vessels in which nuclear fuel is present and a nuclear chain reaction may take place or in which the reactor coolant is circulated for the purpose of heating a fluid for generating useful energy. Such nuclear boiler shall include the interconnecting piping up to and including the required valve or valves needed to isolate the vessel or system of vessels.

Oil Field Recovery Heater: A forced--circulation, once--through, water tube steam generator, used only in oil field thermal recovery operations, having no fired pressure parts larger than 4--inch pipe size and no other pressure part larger than 6--inch pipe size.

Power Boiler: Steam boiler operated at pressure exceeding 15 psi.

Proved Pilot: a device that will not permit the fuel valve to the main burner to open until a proper source of ignition is established to light the main burner.

Psi: Pounds per square inch gage.

Qualified Inspector: Either a certified inspector or qualified safety engineer.

Qualified Safety Engineer: A person who is qualified to make inspections or examination of boilers or tanks according to the rules under which the vessel is constructed and who holds a valid certificate of competency issued by the Division.

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

Resale Inspection: The inspection of any used boiler to determine its maximum allowable working pressure when reinstalled in accordance with these Orders.

Safety Relief Valve: An automatic pressure actuated relieving device suitable for use either as a safety valved or relief valved, depending on application.

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

Secondhand Boiler: A boiler that has changed both ownership and location.

Shop Inspection: Inspection of boilers and fired pressure vessels in a fabricator's shop, or at the jobsite during erection, as required by the Code.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Repealer of subsection (e--2) and amendment of subsection (s--4) filed 8--12--76; effective thirtieth day thereafter (Register 76, No. 33). for prior history, see Register 75, No.6
2. Amendment filed 6--15--79; effective thirtieth day thereafter (Register 79, No. 24).
3. Amendment filed 5--28--81; effective thirtieth day thereafter (Register 81, No. 22).
4. Editorial correction of printing error in Internal Inspection (Register 92, No. 29).

§754. Design and Construction of Power Boilers and High Temperature Water Boilers.

All new power boilers and high temperature water boilers shall be constructed, inspected, and stamped in full compliance with the applicable sections of the Code, unless the design and construction of the boiler are accepted by the Division as equivalent to Code.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.
2. Repealer and new section filed 8-12-76; effective thirtieth day thereafter (Register 76, No. 33).

§755. Design and Construction of Fired Pressure Vessels.

(a) All fired pressure vessels shall be constructed, inspected, and stamped in accordance with the Code insofar as applicable. Those vessels not included in the scope of the Code shall be designed and constructed in accordance with good engineering practice regarding pressure vessel design for the pressure and temperature to be expected in service with a factor of safety of at least four.

(b) Good engineering practice as used in this article shall be construed to require the employer to provide details of design and construction which will be as safe as otherwise provided by the rules in the Code including shop inspection.

HISTORY

1. Repealer and new subsection (a) filed 8-12-76; effective thirtieth day thereafter (Register 76, No. 33).

§756. Design and Construction of Low-Pressure Boilers.

All new low-pressure boilers shall be constructed, inspected, and stamped in accordance with the Code, unless the design and construction are accepted by the Division as equivalent to Code.

HISTORY

1. Repealer and new section filed 8-12-76; effective thirtieth day thereafter (Register 76, No. 33).

§757. Design and Construction of Nuclear Boilers.

All pressure vessels installed as a part of a nuclear boiler shall be constructed, inspected, and stamped in accordance with the Code, unless the design and construction are accepted by the Division as equivalent to Code.

All piping included as a part of a nuclear boiler, up to and including the valve or valves required to isolate the boiler system, shall be constructed, inspected, and stamped in accordance with the requirements for pressure piping in Section I of the Code--except that the Code symbol stamp may be omitted from the stamping required by that section of the Code.

NOTE: Authority cited: Section 6307, Labor Code. Additional authority cited: Section 142.3, Labor Code.

HISTORY

1. New section filed 12-17-65; effective thirtieth day thereafter (Register 65, No. 24). Former section 757 renumbered to 758.
2. Repealer and new section filed 8-12-76; effective thirtieth day thereafter (Register 76, No. 33).

§758. Maximum Allowable Working Pressure of Existing Installations.

(a) The maximum allowable working pressure of any code boiler shall be determined by the provisions of the code effective when the boiler was manufactured and upon its condition, determined after an internal inspection.

(b) The maximum allowable working pressure of any non-code power boiler shall be determined by the standards of the Code with a factor of safety not less than:

- (1) Five if the boiler had been inspected and reported to the Division prior to January 1, 1936.
- (2) Eight if the boiler had not been inspected and reported to the Division prior to January 1, 1936, and is of lap seam construction.

(3) Seven if the boiler had not been inspected and reported to the Division prior to January 1, 1936, and is of butt-strap construction.

(4) Six if of welded construction, providing it can be proven to the satisfaction of the Division that the material, workmanship, and details of construction are equivalent to the requirements for Code boilers.

(5) The factor of safety permitted at the time of last internal inspection prior to the adoption of these orders; provided, however, that a lower factor of safety may be allowed at the discretion of the Division.

(c) A higher factor of safety than provided for in (b) above may be applied at subsequent inspections by any qualified inspector when deterioration or other defects are found that affect the safety of the boiler.

(d) The maximum allowable working pressure of a fired pressure vessel constructed prior to the effect date of these orders shall be established in accordance with the rules of the code when applicable, or in accordance with good engineering practice regarding pressure vessel design.

HISTORY

1. Renumbered from former Section 757 (Register 65, No. 24).

§761. Safety Valves and Pressure Relieving Devices, Boilers.

(a) Each power boiler, nuclear boiler, and high temperature water boiler shall have safety valves or pressure relieving devices constructed, stamped and installed in accordance with the applicable section of the Code, except:

(1) For existing installations the stamping required by the Code at the time of original installation may be accepted until the valves are replaced.

(2) Upon written request by the employer, the Division may permit three-way two-port valves to be installed under two safety valves, each with the required relieving capacity, provided they are so installed that both safety valves cannot be closed off from the boiler at the same time and provided the three-way valve will permit at least full flow to the safety valve in service at all time.

(b) The user shall maintain all pressure relieving devices in good operating condition. Where the valves cannot be tested in service, the user shall maintain and make available to the inspector records showing the test dates and set pressure for such valves.

(c) Pressure relieving devices with open discharge installations shall have piping and supports designed for pressure relief reaction forces in accordance with Appendix II of ANSI B 31.1.

The discharge from pressure relieving devices shall be piped to a safe location where:

- (1) The discharge of steam or hot water will not present a hazard to employees.
- (2) The discharge of steam or water will not be detrimental to any electrical or other machinery or equipment.
- (3) The discharge pipe cannot be readily plugged or otherwise obstructed.

NOTE: Authority cited: Section 142.3, Labor Code . Reference: Section 142.3, Labor Code .

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.
2. Amendment filed 6-16-79; effective thirtieth day thereafter (Register 79, No. 24).
3. Change without regulatory effect inserting "(a)" immediately preceding the first paragraph and "(b)" immediately preceding the fourth paragraph, filed 1-24-91 pursuant to section 100, Title 1, California Code of Regulations (Register 91, No. 7).

§762. Safety Valves and Pressure Relieving Devices, Fired Pressure Vessels.

(a) Boilers (or vaporizers) of the Dow-therm, mercury vapor or similar types shall be fitted with adequate safety relieving devices to assure their safe operation. Safety valves of Dow-therm vaporizers and similar equipment shall be removed at least once each year for inspection and cleaning of any deposits that might affect their operation. (To eliminate the necessity of shutting the unit down for this inspection, a three-way stop valve may be installed under 2 safety valves, each with the required relieving capacity, and so installed that both safety valves cannot be closed off from the vaporizer at the same time; or 2 or more separate safety valves may be installed with individual shutoff valves, in which case the shutoff valve stems shall be mechanically interconnected in a manner which will allow full required flow at all times.)

(b) Fired pressure vessels other than those mentioned in (a) above shall be fitted with safety relieving devices of sufficient capacity to relieve all vapor that can be generated in

the vessel during normal operation and shall be fitted with proper controls to assure their safe operation.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38).
Approved by State Building Standards Commission.

§763. Low-Pressure Boilers.

(a) All low-pressure boilers shall be installed and fitted with the fittings and appliances required by the Code, and any additional appurtenances required in the following subsections.

(b) When a hot water heating boiler is equipped with an electrically operated circulating pump and electrically operated burner controls, the control switches shall be labeled to show which is for the burner circuit and which is for the pump circuit, or the electrically operated burner controls shall be connected in the electric circuit ahead of the automatic pump switch or the burner control switch shall be mechanically interlocked to the disconnect switch for the circulating pumps.

(c) All low-pressure boilers shall be equipped with one or more pressure relieving device adjusted and sealed so as to discharge at a pressure not to exceed the maximum allowable working pressure of the boiler. The combined capacity of these devices shall be such that with the fuel burning equipment installed and operating at maximum capacity the pressure cannot rise more than 5 psi for steam boilers or 10% for water boilers above the maximum allowable working pressure of the boiler. All pressure relieving devices shall be installed as required by the Code and be ASME stamped and rated and shall be installed with the valve spindle vertical and shall have a manual lifting device to permit periodic testing.

The discharge from all drains and pressure relieving devices shall be piped to a safe place of discharge and shall have no shutoff valves in the pipe between the pressure relieving device and point of discharge.

A safe place of discharge as used in this section shall be a location where:

(1) The discharge of steam or hot water will not present a hazard to employees.

(2) The discharge of steam or water will not be detrimental to any electrical or other machinery or equipment.

(3) The discharge pipe cannot be readily plugged or otherwise obstructed.

(d) All automatically controlled low-pressure boilers shall be equipped with:

(1) A low-water control that will close the main burner fuel valve when the water in the boiler reaches the lowest operating level, or for boilers with no fixed steam or water line, when the highest permissible operating temperature is reached.

(2) A low-water safety cutout that will shut off the fuel to the burner when the water in the boiler reaches a predetermined level which shall not be below the lowest permissible level, and manual resetting of the low-water control or of the fuel valve or of the emergency control system shall be required to place the boiler back in operation after it has been shut down due to the operation of the low-water safety cutout.

(3) An adjustable operating control and fuel valve to regulate the flow of fuel to the burner to maintain the pressure or temperature below the following limits:

(A) 15 psi gage pressure for steam boilers.

(B) 250 F water temperature for water boilers.

(4) A high-limit safety control that will shut off fuel to the burner when the pressure in a steam boiler reaches a predetermined maximum not to exceed 15 psi gage or when the temperature in a water boiler reaches a predetermined maximum not to exceed 250 F. The high-limit safety control mechanism shall be in addition to the operating control required in (d)(3) above and manual resetting of the high-limit control or of the fuel valve or of the emergency control system shall be required to place the boiler back in operation after it has been shut down due to the operation of the high-limit safety control.

(5) (A) A full safety pilot control on boilers equipped with standing pilot burners, other than those included in subsection 763 (d)(5)(B), that will shut off the fuel to the main burner and any extinguished pilot burners if a pilot light is extinguished.

Such device shall actuate to close the safety fuel shutoff valve required in Subsection 763 (d)(6) within the time limits specified for flame failure shutoff in Table 1.

(B) A programmed flame safeguard system on burners equipped with spark ignition that will include a flame failure shutoff time not greater than specified in Table 1. Such system shall require the services of the attendant to place the boiler back into operation if a flame failure should occur while in operation or if the flame is not established within the time limit programmed into the system. Such time limits shall not exceed that specified for flame failure shutoff in Table 1.

<i>Maximum Firing rate Oil Gal. per hr.</i>	<i>Maximum Firing rate Gas BTU/hr.</i>	<i>Type of Ignition</i>	<i>Maximum time until valve is fully closed, seconds</i>	
3 gallons or less		Unapproved Pilot or Ignition	90	
Over 3 gallons to 7 gallons			30	(2)
Over 7 gallons to 20 gallons			10	(2)
Over 20 gallons		Proved Pilot	60	(3)
	400,000 BTU and under	Proved or Unapproved Pilot	90	
	400,001 BTU and over	Proved Pilot (4)	10	

NOTE 1. Flame failure shutoff as used in these Orders means the total elapsed time from the time of flame failure or other abnormal condition occurs until the fuel shutoff valve is closed.

NOTE 2. Where a burner is designed or equipped for a "starting firing rate" of less than the maximum firing rate of the burner, the flame failure shutoff time shown in Table 1 for the lesser firing rate may be used for establishing ignition, provided that firing rate cannot be increased until ignition is proven. The time limit for flame failure shutoff shall be determined by the maximum burner input.

NOTE 3. The 60-second time limit for flame failure shutoff may be used for burners having less than 20 gallons per hour input if equipped with a proved pilot.

NOTE 4. In case of pilot flame failure, the proved pilot shall de-energize the safety fuel shutoff valve electrical circuit and cause that valve to close within 10 seconds.

(6) In addition to the operating fuel shutoff valve(s) required in 763 (d) (1) and (3), an additional safety fuel shutoff valve that will be operated by the controls required by Section 763 (d) (2), (4), and (5). This valve shall be of a type that will close within 2 seconds after being de-energized if the burner input rating exceeds 400,000 BTU/hr.

(7) A means for obtaining adequate combustion chamber purging and for limiting the burner "trial for ignition" time during start up to 15 seconds or that permitted for flame failure shutoff in Table 1, whichever is greater.

(e) All low-pressure boilers shall be equipped with a pressure or altitude gage as required by the code. All water boilers shall be equipped with a thermometer to indicate temperature conditions at or near the hot water outlet. These devices shall be visible to the operator from the operating area.

(f) All low-pressure steam boilers shall be equipped with one or more water gage glass with shutoff valves and drain cocks. These devices shall be located on the boiler, or on a water column, within the permissible water level range for the boiler (unless specifically exempted by the Code).

(g) All hot water heating systems shall be equipped with a suitable expansion tank that will be consistent with the volume, temperature, pressure, and capacity of the system as required by the Code. All such expansion tanks shall have an allowable working pressure at least equal to the maximum allowable working pressure of the boiler with which they are used, and the maximum allowable working pressure shall be stamped on a nameplate visible after installation.

All expansion tanks connected into systems having boilers designed for more than 30 psi working pressure shall be constructed, inspected, and stamped according to the Code, Section VIII, unless it can be proven to the satisfaction of the Division that the design and construction will provide equivalent safety. Expansion tanks connected into systems having boilers designed for 30 psi or less shall be designed, constructed, and stamped according to the Code, Section VIII, or according to good engineering practices with a factor of safety of at least 4.

All expansion tanks shall be fitted with either: (1) a water gage glass or other means for indicating visually the water level in the tank, or (2) a bladder-type expansion tank provided the tank is fitted with an airtight bladder inside the tank and it is provided with a means of determining the presence of air cushion in the tank. The hot water heating system shall be installed, inspected, and equipped with the required safety relief and shut-off devices in accordance with the Uniform Mechanical Code, Chapter 10, February 1997 Edition.

Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

(h) When low-pressure boilers are equipped with a float-type automatic water feeder, such water feeder shall be fitted with a valved drain on the float chamber. Float chambers of other control devices shall also be provided with valved drains on the float chambers.

(i) All valves, fittings, and controls shall be suitable for the pressures and temperatures expected in service and all such devices used in the fuel system shall be suitable for and compatible with the fuel and fuel pressures used. All electrically operated fuel valves shall be of the normally closed type to open only when energized. Fuel valves of a type that will fail to close due to abnormal fuel pressure shall not be permitted. Automatically operated fuel valves shall not be designed with integral manually operated by-passes unless such by-pass is of the constant pressure type.

(j) The electrical circuit for boiler controls shall not exceed 120 volts and shall be 2-wire with 1-conductor grounded and have the controls in the ungrounded conductor.

(k) After installation and before being placed in operation, the employer shall require all controls and burners to be checked for proper operation by a responsible person familiar with burner controls.

Instruction for the proper method of lighting, relighting, and shutting down the burner, type of fuel or fuels to be used, and the maximum fuel pressure shall be shown on a permanent and legible plate attached to the boiler or boiler casing and an operating manual giving complete boiler operating instructions, shall be furnished by the installer for each installation. The employer shall require operating personnel to become thoroughly familiar with these operating instructions before they are permitted to operate the boiler. These instructions shall include an instruction to the operator that the boiler shall not be placed back in service after having been shut down by the operation of the safety fuel shutoff valve required in 763 (d) (6) until the cause of such shutdown has been determined and corrected and the combustion chamber is properly purged.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.
2. Amendment of subsection (c) filed 5-31-74; effective thirtieth day thereafter (Register 74, No. 22).
3. Amendment filed 8-12-76; effective thirtieth day thereafter (Register 76, No. 33).
4. Amendment of subsection (g) and new Note filed 12-2-97; operative 1-1-98 (Register 97, No. 49).

§764. Blowoff Valves and Tanks.

(a) All boilers subject to these orders shall have blowoff valves and piping installed in accordance with the Code.

(b) All blowoff pipes shall terminate at a safe place of discharge and shall be adequately supported to prevent undue stresses on the valves or lines, and shall not be reduced in size between the blowoff valve and point of discharge.

Blowoff valves constructed with integrally threaded bonnets shall not be permitted.

No blowoff pipe shall discharge directly into a sewer. When the blowoff discharge is to be ultimately led to a sewer, local plumbing codes shall be consulted concerning requirements for discharging products into sewers.

When a blowoff tank is used, it shall be designed and constructed in accordance with good engineering practice for the maximum pressure and temperature expected during the blowdown period with a factor of safety of at least 4. All blowoff tanks shall be provided with means for cleaning and inspection.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

§765. Means of Feeding Water to Boilers.

All power boilers subject to these Orders shall be equipped with at least one means for feeding water to the boiler at the maximum allowable pressure. Boilers having more than 500 square feet of water heating surface shall have at least 2 means of feeding when required by paragraph PG-59(d)(2)(g) of the Code. A water supply system may be considered as a means of feeding water to the boiler where the water pressure in the system is not less than 6 percent above the pressure at which the safety valve is set to open. Feed piping, valves, and appurtenances shall be installed as required by the Code.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

§766. Water and Pressure Gages.

All power boilers and high-temperature water boilers subject to these Orders shall be equipped with water gages and pressure gages as required by the Code.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

§767. Reinstallation of Secondhand Power Boilers.

When a power boiler changes both ownership and location, the purchaser shall report the state serial number and the new proposed location to the division.

§768. Access for Inspection and Cleaning.

(a) Where it is impracticable to remove the hood of any vertical fire-tube boiler for inspection purposes, an access opening of the following dimensions shall be provided in the hood:

(1) For boilers not exceeding thirty-six inches (36") diameter, not less than six inches by eight inches (6" x 8") or equivalent area with a minimum dimension of six inches (6") in any direction.

(2) For boilers over thirty-six inches (36") diameter, not less than twelve inches by sixteen inches (12" x 16") or equivalent area with a minimum dimension of eleven inches (11") in any direction and a minimum diameter of fifteen inches (15") for circular openings.

(b) Access for inspection and cleaning shall be provided in all boiler settings. The minimum dimension of access openings shall be 12 inches by 16 inches, unless the size and/or design of the boiler setting is such that inspection and cleaning can be adequately accomplished through smaller openings.

(c) When 2 or more steam, high-temperature water, or hot water heating boilers having manhole openings are installed in battery or connected to a common main or header, each boiler having a manhole opening shall be fitted with 2 stop valves between the boiler and the common main or header. An ample free blow drain shall be provided between the stop valves and the discharge from the drain shall be visible to the operator while manipulating the drain valve.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38).
Approved by State Building Standards Commission.

§769. Boiler Supports.

(a) Effective for boiler installation and/or relocation building permits issued on or after November 1, 2002, all boiler supporting structures shall be designed for the following loads:

(1) The live and dead load of the boiler as prescribed in the 2001 California Building Code.

(2) Other imposed loads including those resulting from wind, and seismic forces, as prescribed in the 2001 California Building Code.

(b) Each member of a structural support shall be so located or insulated that the heat from the boiler cannot warp or impair its strength.

(c) The installation of water-tube boilers in battery settings shall be prohibited unless provisions are made at the time of installation to make possible the periodic inspection of the exterior surfaces of all heads installed in the common wall.

(d) The installation of horizontal tubular boilers in battery settings shall be prohibited, unless the boilers are suspended by independent outside suspension structures with top crossbeams sufficiently strong to safely carry all the boilers without intermediate supports.

(e) Each boiler shall be installed in such a manner that all external surfaces and all appurtenances can be made accessible for inspection, cleaning, maintenance, and operation.

(f) Adequate passageways or work areas at least 24 inches wide shall be provided for safe access to and operation of controls.

NOTE

Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

2. Amendment filed 4-1-77; effective thirtieth day thereafter (Register 77, No. 14).

3. Amendment of subsection (a)(3) filed 7-27-77; effective thirtieth day thereafter (Register 77, No. 31).

4. Amendment of section heading and section and new Note filed 1-9-2003; operative 2-8-2003 (Register 2003, No. 2).

§770. Boilers Subject to Annual Inspection.

(a) All boilers subject to these Orders are subject to annual internal and external inspection, except as provided in subsection (b), and except those boilers exempted from annual inspection in Section 771.

(b) Boilers installed in turboelectric plants in such a manner that each boiler furnishes steam to a single turbine only shall be inspected internally at least once each eighteen (18) months. The permit to operate issued following internal inspection shall expire not more than twelve (12) months after the date of inspection. The boiler shall be externally inspected prior to or on the expiration date of the permit by a qualified inspector who may, if conditions warrant, issue a temporary permit which shall expire not more than six (6) months after the date of external inspection. A copy of the external inspection report shall be forwarded to the Division by the qualified inspector. Such report shall show the expiration date of the temporary permit to operate.

The Division, upon individual application from petroleum companies, chemical plants, public utilities or other industries considered by the Division as having superior preventive maintenance and examination programs, may grant a maximum interval of thirty-six (36) months between internal inspection of fired boilers. A fired boiler is defined for this section as one whose temperature input can cause metallurgical damage to the boiler, or whose combustion of fuel can cause a furnace explosion. For boilers other than fired boilers, the Division may grant a maximum interval of seventy-two (72) months between internal inspections, provided the temperature input cannot cause metallurgical damage. Boilers of the latter type are typically called process steam generators. Such applications, to be reviewed by the Division, shall contain as a minimum the following information and proposals:

(1) The history of the unit (or of a similar installation) that shows that there is no significant deterioration from scaling, corrosion, erosion or overheating.

(2) Wall thickness reference points shall be established. Following internal inspection of each boiler, a complete record showing the total corrosion and any other conditions found which need correction at the time of inspection shall be forwarded to the Division as part of the inspection report required by 774(a)(1). This record shall show the location and extent of any corrosion, erosion or other defects noted and shall be verified and signed by the certified inspector making the inspection required by Section 770(a).

(3) The "Permit to Operate" shall expire one (1) year from the date of the internal inspection, or the date of startup if so noted on the inspection report and the "Permit to Operate." Prior to or on the expiration date of this "Permit," a certified inspector, who will review the operating logs and water treatment records, shall inspect the boiler externally. If conditions warrant, the certified inspector may issue a temporary permit not to exceed six (6) months. Prior to or on the expiration date of the second permit, the boiler shall again be inspected externally by a certified inspector; if conditions warrant, a "Permit" may be issued for an additional six (6) months.

Boilers operating longer than twenty-four (24) months between internal inspections shall have a program of on-stream examination of corrosion points, and inspection of operations and safety controls that is acceptable to the Division, and the certified inspection agency. The maximum interval of each temporary permit shall be six (6) months.

If the boiler is located within a local jurisdiction that has regulations concerning boiler inspections, the jurisdiction must also be consulted concerning the acceptability of the inspection program.

The certified inspector shall submit reports to the Division of each external inspection, noting the expiration date of the permit issued, and recording any unusual condition found. The inspection report shall include a statement that water treatment records have been reviewed. Reports of on-stream wall thickness readings must also be submitted to the Division via the certified inspector.

(4) For boilers and process steam generators where metallurgical damage may occur, the Division may categorize the boiler or process steam generator as unfired upon acceptance of a risk engineering analysis submitted by the owner of the boiler to the Division. The risk engineering analysis shall include the design basis for categorizing the boiler as unfired, the potential consequences to the boiler and to the safety of the person(s) responsible for attending the boiler, and a discussion of protective devices and specific procedures to prevent the consequences.

(5) The boiler water treatment and specific chemical limits shall be prescribed by a competent water treatment specialist, such as a chemical engineer. The boiler water chemistry shall be maintained within desirable limits and documentary records shall be kept of the tests and methods used to maintain the water chemistry within the prescribed limits. A summary of weekly test results shall be kept, and the records shall be available to the certified inspector.

(6) A copy of the Division letter granting the longer interval between internal inspections shall be posted near the boiler, the boiler control center, or the process unit control room.

<General Materials (GM) - References, Annotations, or Tables>

Note: Authority cited: Sections 142.3 and 7682, Labor Code. Reference: Sections 142.3 and 7682, Labor Code.

HISTORY

1. Amendment of subsection (b) filed 10-25-74; effective thirtieth day thereafter (Register 74, No. 43).
2. Amendment of section and new Note filed 8-2-2005; operative 9-1-2005 (Register 2005, No. 31).

§771. Boilers Not Subject to Annual Inspection.

(a) The following boilers are not subject to annual inspection and do not require a permit to operate providing they comply with all of the provisions of subsection (b):

- (1) Low-pressure boilers.
- (2) Miniature boilers.
- (3) High-temperature water boilers.
- (4) Boilers, including forced circulation boilers, in which none of the following are exceeded:
 - (A) One hundred square feet (100 sq. ft.) of heating surface.
 - (B) Steam drum does not exceed 16 inches inside diameter.
 - (C) Maximum allowable working pressure does not exceed 100 psi.
 - (D) Water capacity does not exceed 35 gallons when filled to normal operating level.
 - (E) The BTU input to the burners does not exceed 400,000 BTU/hr.
- (b) Boilers exempt from annual inspection in subsection (a) shall comply with all of the following:
 - (1) All other provisions of these Orders including construction and installation.

(2) Automatically controlled fired boilers shall be fitted with all the applicable controls required for low-pressure boilers in 763(d).

(3) All automatic controls shall be maintained in operating condition.

(c) Nothing in sections (a) and (b) above shall prohibit any qualified safety engineer employed by the Division from requiring any boiler to be prepared for inspection when in his opinion such inspection is necessary to determine the safety of the boiler.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38).
Approved by State Building Standards Commission.

§772. Preparation of Boilers for Inspection.

(a) The owner or user of a boiler or boilers herein required to be inspected shall, after 14 days' notice from the division, prepare the boiler for internal inspection.

If the owner or user finds the date set for inspection not to his convenience, he shall immediately advise the division, or qualified inspector, and ask for a postponement and state the reasons therefor, in which case the inspection date may be postponed for a period not to exceed thirty (30) days from the date first set for inspection.

(b) To prepare a boiler for internal inspection the water shall be drawn off and the boiler thoroughly washed. Manhole and handhold covers and washout plugs in the boiler feed lines and water column connections necessary for adequate inspection shall be removed and the furnace and combustion chamber thoroughly cooled and cleaned. Enough of the brickwork, refractory, or insulating material shall be removed to permit the qualified inspector to determine the condition of the boiler, furnace, or other parts and to enable the qualified inspector to obtain such data as is required at each annual inspection. The steam gage shall be removed for testing. At the discretion of the Division, data obtained by nondestructive examination may be used in lieu of visual inspection.

(c) The owner or user shall prepare the boiler for hydrostatic test when required by the qualified inspector. If the boiler to be hydrostatically tested is connected with other boilers that are under steam pressure, such connections shall be blanked off unless provided with double stop valves with a free blow drain between the valves.

(d) Before a resale inspection or other inspection of a secondhand boiler is made, the interior of the shell or drum may be required to be descaled and cleaned, such tubes shall be removed as the qualified inspector deems necessary to enable him to ascertain their

condition, the lagging and brickwork shall be removed, and the exterior of the shell or drum shall be cleaned. No paint shall be applied before the inspection is made.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38).
Approved by State Building Standards Commission.

§773. Identification of Boilers.

(a) Qualified inspectors making the first field inspection of boilers required by these Orders to have a permit to operate, shall stamp on the boiler a state serial number (unless a state serial number has previously been stamped thereon) which shall become a permanent means of identification. This assigned number shall be made either by steel die figures not less than 5/16-inch in height, or outlined by means of center punch dots, with figures not less than 3/4-inch in height, and shall be stamped adjacent to the manufacturer's code stamping.

(b) No state serial number or code stamping shall be permanently covered by insulating material, unless such number and stamping is transferred to a fixed plate where readily visible outside of all insulating material.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38).
Approved by State Building Standards Commission.

§774. Boilers Exempt from Inspection by Qualified Safety Engineers Employed by the Division.

(a) Boilers annually inspected internally and externally by qualified inspectors employed by a company, city or county, may be exempt from annual inspections by qualified safety engineers employed by the division providing:

(1) Reports of inspection are submitted on prescribed forms to the Division within 21 days after the date of inspection.

(2) The boiler and all of its appurtenances complies with these orders as a minimum standard of safety.

(3) The report of inspection lists all repairs or changes ordered and the qualified inspector notifies the division when such repairs or changes have been satisfactorily completed.

(4) The permit to operate is posted on or near the boiler to which it applies.

(b) Nothing in this order shall prevent a qualified safety engineer employed by the division from inspecting any boiler. However, no fee shall be charged by the division where the annual inspection has been made and the report of inspection submitted to the division by a qualified inspector within the 21 days specified above and the permit to operate is posted on or near the boiler.

(c) Qualified inspectors employed by insurance companies shall notify the Division within 21 days of the name of the owner or user, as shown on the permit to operate, and the location and state serial number of every boiler requiring a permit to operate on which insurance has been refused, canceled, or discontinued, and shall give the reasons why.

(d) Qualified inspectors employed by other than insurance companies shall notify the Division within 21 days of the name of the owner or user and the location and state serial number of every boiler requiring a permit to operate and inspected by them which is removed from service or which is considered unsafe for further service as a boiler and shall give the reasons why.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38).
Approved by State Building Standards Commission.

§775. Operation of Unsafe Boilers.

(a) If the operation of any boiler, including those exempt from annual inspection, constitutes a serious menace to the life or safety of any person employed about it, the division or any of its safety engineers, or any person affected thereby, may apply to the superior court of the county in which the boiler is situated for an injunction restraining its operation until the condition has been corrected.

(b) Whenever the condition of a boiler is such as to make it unfit for any pressure, a qualified safety engineer, employed by the division, may affix a rejection mark

[Refer to printed version of Title 8 for graphic material] consisting of an "X" at least one inch (1") high with a circle at least one-half inch (1/2") diameter located between the upper arms of the "X." The rejection mark shall be outlined in center punch marks and located immediately above the state serial number.

§776. Special Inspection of Lap Seam Boilers.

(a) Horizontal return tubular boilers over thirty-six-inch (36") diameter with longitudinal lap-riveted seams shall not be operated at a pressure in excess of fifty pounds (50 lbs.) per square inch unless all of the following are done every five (5) years of operation:

(1) Sufficient tubes are removed to permit the internal surfaces of the shell to be completely cleaned of scale.

(2) Sufficient brickwork is removed to permit the external surfaces of the longitudinal seam to be cleaned.

(3) Before the tubes and brickwork are replaced the boiler shall be thoroughly inspected internally and externally by a qualified inspector. The tubes shall then be replaced and the boiler shall be subject to a hydrostatic test of one and one-half (1 1/2) times the working pressure. This pressure shall be maintained for at least thirty (30) minutes after which a qualified inspector shall examine all riveted joints for leakage and/or cracks.

The term five (5) years used in this section shall mean five (5) years under steam, but in no case shall the time of service be taken as less than six (6) months per calendar year; a hydrostatic test of one and one-half (1 1/2) times the allowed pressure on the boiler shall be made in the presence of a qualified inspector at least every five (5) calendar years. Each boiler shall be subject to any additional requirements found necessary by the qualified inspector.

(b) Secondhand lap seam horizontal return tubular boilers exceeding thirty-six inches (36") diameter shall not be permitted a maximum allowable working pressure in excess of fifty (50) psi.

(c) The shell or drum of a boiler in which a typical lap seam crack is discovered along a longitudinal riveted seam for either butt-strap or lap-riveted construction shall be permanently discontinued for use under pressure. By lap seam crack is meant the typical crack frequently found in lap seams extending parallel to the longitudinal joint and located either between or adjacent to rivet holes.

§777. Boiler and Fired Pressure Vessel Inspection Fees.

See the Division of Industrial Safety's regulations contained in Chapter 3.2, Group 2, Title 8, California Administrative Code. The shop inspection fees, permit fees, and

inspection fees for boilers and fired pressure vessels are reprinted in Appendix 2 of these orders.

NOTE: Authority cited: Section 142.3, Labor Code.

HISTORY

1. New section filed 3-28-78; effective thirtieth day thereafter (Register 78, No. 13). For history of former section, see Register 77, No. 49.

§778. Field Inspection Fees. (Repealed)

HISTORY

1. Repealer filed 12-1-77; effective thirtieth day thereafter (Register 77, No. 49). For prior history, see Register 76, No. 33.

§779. Certification of Inspectors.

(a) Upon the written request of his employer, a certificate of competency may be issued to a person who is employed as provided in subsection (c) following and who obtains a passing grade in the examination prescribed by the division. The prescribed examination may be that of the National Board and shall determine the fitness and competency of any candidate for this certificate. An average of at least seventy percent (70%) shall be required for a passing grade.

(b) An applicant for a certificate of competency shall be at least three (3) years experience in boiler or unfired pressure vessel construction or repair or as an operating engineer in charge of high-pressure boilers or as inspector of steam boilers or unfired pressure vessels.

(1) bachelor of science degree in engineering from an accredited school plus one year experience in design, construction, operation or inspection of high pressure boilers and pressure vessels.

(2) An associate degree in mechanical technology plus two years experience in design, construction, operation or inspection of high pressure boiler and pressure vessels.

(3) A high school education or the equivalent plus three years experience:

(A) in high pressure boiler and high pressure vessel construction or repair, or

(B) in charge of high pressure boiler and pressure vessel operations, or

(C) in the inspection of high pressure boilers and pressure vessels.

(c) A certificate of competency may be issued only to a person employed as an inspector of steam boilers or pressure vessels by any county, city, insurance company, or by the division, or to an inspector continuously employed by a corporation or company to inspect only boilers and pressure vessels to be used by such company and not for resale. The certificate of competency shall be automatically revoked after a period of eighteen (18) months if the inspector does not make any boiler or pressure vessel inspections as evidenced by reports submitted to the division; provided, however, that this provision does not apply to supervising engineers whose regular duties include the supervision and review of the work of qualified inspectors. A written examination is required to revalidate such certificate. The employer shall notify the division when the employment of a certified inspector is terminated.

(d) Any applicant, who has previously obtained and continues to hold a commission as a boiler inspector issued by the National Board of Boiler and Pressure Vessel Inspectors, may be exempted from the written portion of the prescribed examination provided such applicant appears for an interview to determine his physical fitness and to prove his knowledge of the applicable Safety Orders of the Division. He shall have been actively engaged as a boiler inspector within eighteen (18) months prior to his application for the California certificate of competency.

(e) As near as practicable, the examination for certificate of competency shall be conducted on the first Wednesday in March, June, September, and December of each year.

(f) The Division reserves the right to decline to examine any candidate who has not had at least ninety (90) days' practical field boiler inspection experience under the supervision of a qualified inspector.

(g) Upon good cause being shown therefor, and after notice and an opportunity to be heard, the Division may revoke any certificate of competency.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

2. Amendment of subsection (b) filed 6-15-79; effective thirtieth day thereafter (Register 79, No. 24).

3. Amendment of subsections (a) and (b) filed 5--12--89; operative 6--11--89 (Register 89 No. 29).

§780. Permit to Operate.

(a) Except during the time that a request for a permit remains unacted upon, no boiler subject to annual inspection by these orders shall be placed in operation until a permit to operate has been issued and posted on or near the boiler.

(b) Upon the form supplied by the division, a permit to operate shall be issued by the qualified inspector making the inspection. The permit to operate shall indicate the date of inspection, state serial number of the boiler, the pressure allowed at the time of the internal inspection, the name of the inspector, and the name of the inspection agency. No permit shall be issued until the boiler is in compliance with these Safety Orders and satisfactory notice of compliance has been transmitted to the division.

EXCEPTION: The division may issue and renew temporary permits not to exceed thirty (30) days each, to permit replacements or repairs to be made.

(c) Each permit shall be posted under glass in a conspicuous place on or near the boiler. The permit shall be available to any safety engineer employed by the division. The permit to operate shall expire when a boiler changes both ownership and location.

HISTORY

1. Editorial correction restoring inadvertently omitted article heading (Register 97, No. 25).

§781. Attendance on Boilers.

(a) All boilers subject to these orders shall be under the direct supervision of a responsible person. Such person shall be responsible for:

- (1) Safe operation of the boiler by a competent attendant.
- (2) Proper maintenance of the boiler and its appurtenances.

(b) While in operation, no fired boiler subject to these orders [except those boilers exempted from annual inspection by Order 771 that are automatically controlled and oil field recovery heaters complying with subsection (d)] shall be left unattended for a period of time longer than it will take the water level to drop from the normal operating level to the lowest permissible water level in the water gage glass--or indicated by indicating devices or recorders--when the feedwater is shut off and the boilers are forced to their maximum capacity unless all of the following are complied with:

(1) The boiler is equipped with an audible alarm that will operate when the water reaches the highest and lowest permissible operating level, or, for boilers having no fixed steam or water line, when the highest permissible operating temperature is reached.

(2) The audible alarm shall be sufficiently loud that it can be plainly heard by the attendant, without the use of an auxiliary paging system, at any point in any area that the attendant is required to work. He must be close enough to the boiler room so that he can safely respond to the alarm. The response time is that period of time that it takes the water level to go from the level at which the low level alarm sounds down to the lowest permissible water level of the boiler. The high water level alarm must be set so that the attendant will have time to respond before there will be carryover from the boiler.

(3) The boiler is equipped with a low water safety device that will shut off the fuel to the burner or burners when the water reaches the lowest permissible operating level, or, for boilers having no fixed steam or water line, when the highest permissible operating temperature is reached. This device shall require manual resetting unless the pilot is equipped with a full safety pilot control.

(4) The attendant shall personally check the operation of the boiler, the necessary auxiliaries and the water level in the boiler at such intervals as are necessary to insure the safe operation of the boiler; provided, however, that the maximum interval the boiler and its auxiliaries can be left without checking shall not exceed 60 minutes. The operation of the automatic controls shall be checked at the beginning of each shift. It is the intent of this Section to prohibit the use of time clocks to control the operation of fired boilers covered under this subsection 781(b).

(5) All float chambers of automatic controls shall be dismantled for inspection at the annual boiler inspection.

(c) The competent attendant shall be a person who is familiar with the boiler and who has been properly instructed in its safe operation.

The recommended minimum standards to be used by the employer to determine the competency of an attendant are:

(1) He shall be able to explain the function and operation of all controls on the boiler or boilers.

- (2) He shall be able to light off the boiler or boilers in a safe manner.
 - (3) He shall know all possible methods of feeding water to the boiler or boilers.
 - (4) He shall know how to blow down the boiler or boilers in a safe manner.
 - (5) He shall know what would happen if the water was permitted to drop below the lowest permissible operating level.
 - (6) He shall know what would happen if the water in the boiler was carried too high.
 - (7) He shall know how to shut down the boiler or boilers.
- (d) An oil field recovery heater designed for automatic operation shall be checked by a competent attendant at least once every 24 hours while in operation to determine that the heater is operating safely within the set operating conditions and provided that each of the following are complied with:

(1) The heater is equipped with automatic safety shutdown devices for each of the following conditions:

- (A) Excessive tube skin or steam temperature
- (B) Excessive steam pressure
- (C) Flame failure
- (D) Inadequate combustion air

(2) Within intervals not to exceed every 60 days of operation of the heater, the following inspection checks shall be performed by a person familiar with the equipment and who has been properly instructed in making such checks:

- (A) Each safety shutdown device shall be tested for proper operation.
- (B) All external piping and wiring shall be visually checked for obvious defects.
- (C) All indicating gages shall be checked for proper calibration.

Equipment defects found in (A), (B), or (C) above shall be corrected before continuing the boiler in service.

(3) At the time of the annual inspection of the heater and its accessory equipment, all automatic operating controls and automatic safety shutdown devices which are not failsafe shall be serviced as necessary to assure their continued reliability to include:

(A) Replace vacuum tubes and check sensing devices in the flame-failure system and replace if not operating properly.

(B) Test all coils, diaphragms, and other operating parts of all safety shutdown and operating control valves. Such servicing shall be done by a person familiar with such controls and devices and who has been properly instructed in their servicing.

(4) A record shall be kept of the inspection and maintenance operations required by (2) and (3) above and this record shall be available to the certified inspector at the time of the annual inspection.

NOTE: Authority cited: Sections 6312, 6500 and 6502, Labor Code.

HISTORY

1. Amendment filed 12-17-65; effective thirtieth day thereafter (Register 65, No. 24).
2. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.
3. Amendment of subsection (b)(2) filed 12-31-74; effective thirtieth day thereafter (Register 75, No. 1).

§782. Safe Practices.

(a) The following Safety Orders from Title 8, California Administrative Code are hereby made a part of these orders:

- (1) General Industry Safety Order 3228(i): Number of Exits, Boilers Furnace and Incinerator Rooms. See Appendix 1.
- (2) General Industry Safety Order 3274: Valves and Controls. See Appendix 1.
- (3) General Industry Safety Order 3311: Flarebacks. See Appendix 1.
- (4) General Industry Safety Order 3312: Entering Combustion Chambers, Flues, Boilers or Unfired Steam Pressure Vessels. See Appendix 1.
- (5) General Industry Safety Order 3310: discharge Location. See Appendix 1.
- (6) General Industry Safety Order 3514: Tubular Gage Guard. See Appendix 1.

(7) General Industry Safety order 3515: Try Cock Discharge Resceptable. See Appendix 1.

(8) General Industry Safety Order 3516: Steam Gage and Water Gage Glass Location. See Appendix 1.

(b) All fired boilers, not included in Sections 763 and 771, equipped with controls to permit the burners to be ignited automatically shall be equipped with a full safety pilot or other device that will provide equivalent safety. Such safety pilot or other device shall be of a type that will de--energize the electrical circuit and/or cause the main burner fuel valve to close within the following burner input and time limits.

400,000 BTU/HR and under..... 90 seconds

400,001 to 2,500,000 BTU/HR..... 9 seconds

Over 2,500,000 BTU/HR..... 5 seconds

(c) All dampers used in smokestacks of boilers which use natural draft shall have suitable openings to vent the furnace.

(d) When portable electric lights are used inside any boiler or pressure vessel they shall be equipped with a vaportight globe, substantial guard, rugged nonconducting lamp holder and handle, and shall have type S cord or equivalent sufficiently long to reach to a plug-in or junction box outside the vessel.

HISTORY

1. Repealer and new subsection (b) filed 8-12-76; effective thirtieth day thereafter (Register 76, No. 33). For prior history, see Register 74, No. 42.

2. Amendment of subsection (a) filed 12-14-76; effective thirtieth day thereafter (Register 76, No. 51).

§783. Renewals and Replacements.

All renewals or replacement boiler drums, shells, headers, tubes or appurtenances shall comply with the requirements of the code for new construction.

§784. Approval and Reporting of Repair.

(a) No repairs to drums, shells, stayed or unstayed surface of a boiler shall be made until the contemplated repairs have been approved by a qualified inspector. (This order shall not prohibit the replacement of tubes, staybolts and/or appurtenances without inspection where replacement is necessitated by normal usage and wear.)

(b) No repairs shall be made to any boiler which has moved from its setting or foundation due to the failure of the boiler or any part thereof until approved by the division.

(c) All repairs by fusion welding or riveting to a damaged boiler or boiler support, where the safety of the boiler is concerned, shall immediately be reported to the division by the qualified inspector who authorized the repair. Complete details with sketches of all repairs, including the identification number of the welder, if welding is used, shall be submitted to the division by the qualified inspector.

§785. Permissible Welded Patches and Welded Repair of Cracked Plates in Material of Known Weldable Quality.

The following welded repairs are permissible:

(a) Cracks in unstayed shells, drums, or headers of boilers or fired pressure vessels may be repaired by welding provided:

(1) The cracks do not extend between rivet holes in a riveted longitudinal seam.

(2) The crack is not located within six inches (6") of the calking edge of any longitudinal riveted seam.

(3) The total length of any one crack shall not exceed sixteen (16) times the plate thickness or eight inches (8") unless the completed repair is radiographed and stress-relieved.

(b) Cracks or patches in stayed surfaces may be welded provided:

(1) The crack or patch seam is located between two (2) rows of staybolts.

(2) The crack or patch seam if located in a flange or knuckle runs in a direction transverse to the flange or knuckle.

(3) The patch is set flush with adjacent plate and the welds are located between two (2) rows of staybolts.

(c) Cracks between tube holes in water-tube boiler drums or heads may be welded, provided there are not more than two (2) such cracks in any one row in any direction, nor more than a total of four (4) such cracks in any one drum or header and providing the diameter of the drum is not more than one percent (1%) out of round.

(d) Fire cracks extending from rivet hole to rivet hole in girth seams may be welded, provided there are not more than three (3) consecutive cracked ligaments nor more than a total of six (6) cracked ligaments in any one girth seam.

(e) Cracks between tube holes in fire-tube boilers not exceeding three (3) consecutive cracked ligaments may be welded.

(f) Cracks not to exceed two inches (2") in length in wrought or cast steel (not cast iron) sectional headers of water-tube boilers may be welded except that not more than four (4) such cracks in any one header may be welded.

(g) Circumferential cracks in the knuckle or turn of a flange of a furnace or flue opening or adjacent to manhole opening of unstayed heads shall not be repaired by welding. When such cracks occur in an ogee flange, the affected material including the flange shall be removed and replaced by a flush patch of similar shape. The abutting edges shall be welded and the flange shall be riveted to the shell. Scotch marine and similar boilers shall have one (1) flange riveted to the shell or furnace and the other flange shall be attached by rivets or patch bolts.

(h) All welded patches installed in unstayed drums, shells or heads and exceeding the size of an unreinforced opening in paragraph PG-32 of the Code shall be flush-welded patches and shall be radiographed and post weld heat treated. The corner radius of such patches shall be rounded to a radius of at least twice the plate thickness. A joint efficiency of 90 percent (or more if allowed by the Code to which the boiler was built) shall be used in calculating the maximum allowable working pressure of such patches.

(i) Lap welded patches may be used to close openings in unstayed shells, drums, or heads providing:

(1) The maximum dimension of the opening does not exceed the size of an unreinforced opening in paragraph PG-32 of the Code.

(2) Two or more of such openings are not so located that they form a ligament in the longitudinal direction of the shell or drum.

(3) The patch plate is installed on the pressure side of the plate and has a lap of at least one inch (1").

(4) The patch plate is not exposed to the products of combustion.

(j) Any portion of the tube sheet of a horizontal tubular boiler may be repaired by a flush welded patch providing:

(1) No welded repair shall be permitted in the knuckle in a circumferential direction.

(2) The patch shall be held in place by stays, tubes, or both.

(3) Where the patch extends to the outer row of tubes, it shall include the flanged portion of the head and be secured to the shell in the same manner as the original construction.

(k) The top tube sheet of a vertical tubular boiler may be replaced by a flush welded patch, provided the welded seam is not located nearer than one inch (1") to the knuckle or curved part of the original head. The bottom tube sheet of a vertical tubular boiler shall not be so repaired.

(l) Pipe connections up to three-inch (3") pipe size may be installed by welding without stress-relieving, provided the coupling used has a flange on the pressure side of the sheet and the welding is for tightness only. This type of repair shall not be used for blowoff connections or openings exposed to the products of combustion.

(m) Post weld heat treatment of a repaired part by heating, when necessary, shall be done in accordance with paragraph PW-39 of the Code. Care should be exercised in applying heat in the vicinity of riveted joints to avoid loosening of rivets. Peening may be used in lieu of post weld heat treatment at the discretion of the Division.

(n) Radiography of welded repairs, when required, shall be done in accordance with paragraph PW-51 of the Code.

(o) The thickness of any patch shall be equal to but not more than one-eighth inch (1/8") thicker than the plate being patched.

(p) All flush welded patches in unstayed surfaces shall be butt-doubled-welded or equivalent. Patch material shall conform to the requirements of Order 794(g) and (h).

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

§786. Preparation for Welding.

(a) All cracks permitted to be repaired by welding shall be chipped or ground to form a clean welding groove with an included angle of not less than sixty degrees (60) and extending to a depth equal to at least the plate thickness less one-sixteenth inch (1/16"). The welding groove shall be extended until the crack has been removed for its entire length. Whenever possible the root of the weld shall be chipped out to clean metal and welded.

(b) Prior to repairing cracks by welding, all tubes, rivets, and threaded staybolts within 6 inches of the crack shall be removed. After welding is completed, such tube, rivet and/or staybolt holes shall be reamed before installing new tubes, rivets, or staybolts. For threaded staybolts the holes shall be tapped and new threaded staybolts installed. If a crack originates or terminates at a welded staybolt, the staybolt shall be removed prior to repairing the crack. After welding is completed, the hole shall be properly prepared for installation of the new staybolt in accordance with paragraph PW-19 of the Code.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

§788. Repair of Corroded Surfaces.

The following corroded surfaces may be built up by fusion welding:

(a) Corroded surfaces in stayed sheets including tube sheets of fire-tube boilers, provided the remaining thickness is at least fifty percent (50%) of the original thickness and further provided the affected areas are not sufficiently extensive to seriously impair the safety of the object; the qualified inspector shall decide when such areas shall be repaired by other means.

(b) Corroded surfaces in plate around handholes or manholes in unstayed sheets within three inches (6") of the opening, provided the remaining thickness is not less than fifty percent (50%) of the original thickness.

(c) Calking edges of girth seams, provided the metal remaining between the rivet and calking edge to be built up is at least fifty percent (50%) of the original thickness and also provided the length of calking edge to be built up does not exceed a length equal to the diameter of the boiler. Before any welding is done, all rivets in the affected area and six inches (6") beyond each portion to be built up shall be removed. After the welded repair has been completed the rivet holes shall be reamed and new rivets driven.

(d) The building up or repair by welding of rivet heads, staybolts, braces, or attachments to braces, or grooved areas is not permitted.

(e) Scattered pits and corrosion in unstayed shells may be built up by welding, provided the largest dimension of such corroded area does not exceed the diameter of an unreinforced opening in paragraph PG-32 of the Code and providing such areas are not so located that they form a ligament in the longitudinal direction.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38).
Approved by State Building Standards Commission.

§789. Permissible Repair by Seal Welding.

(a) The ends of all tubes, suspension tubes, and nipples of water-tube boilers and superheaters may be seal-welded in accordance with the provisions of paragraph PWT-11 of the Code.

(b) Seal-welding of circumferential joints is permissible, provided the seam is calked first and made tight under hydrostatic pressure equal to the working pressure.

(c) The ends of fire tubes may be seal-welded provided the thickness of the tube is at least seventy-five percent (75%) of its original thickness, and the tubes are first rolled and beaded and found tight under hydrostatic pressure at least equal to the working pressure. The throat of the weld shall not exceed three-sixteenths inch (3/16").

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38).
Approved by State Building Standards Commission.

§790. Permissible Tube Repair.

(a) All the tubes in a firetube boiler may be retipped, provided the tube wall thickness of the original tube is not less than ninety percent (90%) of the original thickness and the retipped ends are from new material. The new end shall be located in the tube sheet subject to the greatest heat. The circumferential welds in such tubes shall not exceed four (4) in number.

(b) Complete replacement of sections of tubes or pipe in water-tube boilers is permitted, providing the remaining tube is not less than the thickness required for the designed working pressure and the requirements of paragraph PW-41 of the Code are complied with.

(c) Bulges in tubes of water-tube boilers may be repaired when:

(1) The maximum dimension of the repaired area does not exceed the diameter of the tube or two inches (2") whichever is the least.

(2) There are not more than three (3) such repairs in any one (1) tube.

(3) The tube wall adjacent to the bulge is not less than the thickness required for the designed working pressure.

(4) The requirements of paragraph PW-41 of the Code are complied with.

HISTORY

1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

§793. Qualification of Welding Procedures and Operators.

No welded repair shall be made to any boiler or boiler appurtenance until the welding procedure and operator have been qualified in accordance with Section IX of the code in the overhead and horizontal positions. The certificate of competency number of the qualified inspector authorizing the repair shall be stamped adjacent to all welded repairs made to power boilers.

On welded repairs that are completely radiographed the operator qualification may be eliminated at the discretion of the division provided the welding procedure is properly qualified inspector indicates on his report the welding procedure used and the operator employed in making the repair.

§794. Riveted Patches.

(a) Riveted patch seams exposed to the products of combustion may be double-riveted or constructed similar to the original seams of the boiler.

(b) Patches exceeding twenty-four inches (24") in length shall have the proper width as determined by these orders. Patches exceeding fifteen inches (15") to and including twenty-four inches (24") in length shall be triangular, crescent, diamond, or oval in shape and width, W, in the circumferential direction, shall be at least twice the length, L, in the longitudinal direction. Patches fifteen inches (15") or less in longitudinal direction may be circular in shape.

(c) If it is found that a patch will extend extremely high, and also to avoid calking in sharp corners, it may be shortened in width to the extent that not more than four (4) rivets will be in a longitudinal line, as shown in Figure 2.

(d) If it is found that a patch will have to be sixty inches (60") or more in length, consideration should be given to the use of a sheet having a width equivalent to five-eighths (5/8) of the circumference of the boiler, and the longitudinal seam shall be of a design similar to the design of the original seam of the boiler.

(e) In laying out new patches over twenty-four inches (24") long, it is recommended that they be triangular or diamond in shape as may be required for the particular job; with definite straight-line sides but with corners properly rounded to permit adequate caulking, as illustrated in Figures 1, 2, 3, and 4. The length designated as "L" and the width designated as "W" are also shown in Figures 1, 2, 3, and 4.

(f) Rivets shall be used in "riveted" patch seams unless their use is difficult or impossible, in which case, patch bolts may be used. Rivet holes may be countersunk in patches on shells that have the heads supported by tubes or braces, providing the angle of the chamfer with the center line of the rivet hole does not exceed forty-five degrees (45°), and the depth does not exceed half the thickness of the plate.

(g) Patch material shall be of fire box or flange steel depending upon the plate it replaces. Tank steel shall not be used. The repair shop shall be required to produce a copy of the manufacturer's mill test report for the material to be used.

(h) The patch plate material shall contain the steelmaker's brand. If only a part of a plate is required and this part does not contain the brand, the brand shall be transferred to the patch plate in the presence of a qualified inspector or a representative of the plate manufacturer before the plate is cut. Replacement rivets, patch bolts, and staybolts shall be of material approved for new construction by the code.

(i) All patch plates except patch plates containing blowoff connections shall be placed inside of the boiler shell or drum if exposed to the products of combustion and if installed where there is a possibility that scale deposits may be pocketed. Patch plates containing blowoff connections shall be placed on the outside of the boiler shell.

§795. Installation of Riveted Patches.

(a) The following procedure shall be followed when installing riveted patches:

(1) Distorted sheets which require patching shall first be set back straight as nearly as possible before proceeding with the cutting out of the plate so that the patch may be kept as small as possible.

(2) All defective or deteriorated material shall be removed and properly trimmed to provide for caulking and neat workmanship in attaching the patch.

(3) The edges of a patch shall be beveled for calking by planing, chipping, or gas cutting before applying it to the boiler. Rivets should be driven by gun, if at all possible.

(4) All rivet holes shall be drilled full size or the holes may be punched not to exceed one-fourth inch (1/4") less than full size for plates over five-sixteenths inch (5/16"), and one-eighth inch (1/8") less than full size for plates five-sixteenths inch (5/16") or less in thickness, and then reamed to full size with patch in place. Rivet holes shall be not more than one-sixteenth inch (1/16") greater in diameter than the nominal diameter of the rivet.

(5) Seal welding of the patch plate is permissible if a single bead is used with a throat thickness not more than three-sixteenths inch (3/16"). The patch shall be tight under a hydrostatic test pressure equal to the operating pressure before seal welding. Rivets and patch bolts shall not be seal welded.

(6) When three (3) plates are lapped at the corners of a patch, the middle plate shall be scarfed carefully to a feather edge the entire width of the lap as shown in Figure 1.

(7) Upon the completion of repairs, a hydrostatic test of one hundred fifty percent (150%) of the maximum allowable operating pressure shall be applied. All seams shall be tight at this pressure.

§796. Riveted Patch Seam Calculations.

(a) Riveted patch seams are calculated as follows:

(1) Determine the length, L , of the patch from the area of the defect to be repaired (Figures 1, 2, 3, and 4). The normal efficiency, e , of the single-riveted seam that is to be used in the patch should then be determined from Table 1. This is governed by the thickness of plate and diameter of rivet holes.

Table 1

EFFICIENCIES OF SINGLE--RIVETED SEAMS

<i>Plate Thickness, t</i>	<i>Rivet Hole Diameter, d</i>	<i>Pitch of Rivet, p</i>	<i>Efficiency of Seam, e</i>
1/4	11/16	1 7/8	63.6
9/32	3/4	1 7/8	60.3
5/16	3/4	1 7/8	60.0
11/32	13/16	1 15/16	58.0
3/8	13/16	1 15/16	57.0
13/32	7/8	2 1/16	57.5
7/16	15/16	2 1/4	56.0
15/32	15/16	2 1/8	55.5
1/2	1	2 1/4	55.7
9/16	1 1/16	2 3/8	53.0
19/32	1 1/16	2 1/4	52.8
5/8	1 1/16	2 1/4	50.5
21/32	1 1/8	2 5/16	51.4
11/16	1 1/8	2 5/16	51.4

Tensile strength assumed at 55,000 psi and shearing strength at 44,000 psi.

After determining the length, L, of a patch, determine its width girthwise, W. This is found by multiplying the length by the constant, C, as shown in Table 2 or 3, depending upon the type of boiler to be repaired. These tables give a constant, C, for a given efficiency, e, of patch and efficiency, E, of the longitudinal seam.

(2) To determine the longitudinal efficiency of an existing patch, the length, L, and width, W, the pitch, P, and the diameter, d, of rivet, should be measured. "W" divided by "L" will give the constant, C. Table 1 will give "e." Then under "e" in Table 2 or 3, depending upon the type of boiler to be repaired, find the constant, C. Whatever "E" is in the first column is the longitudinal or allowed efficiency of the patch seam.

§797. Example of the Application and Explanation of Patch Tables and Charts.

(a) A patch is to be placed in the fire sheet of a horizontal return tubular boiler having a shell plate seven-sixteenths-inch (7/16,) thick, a longitudinal seam efficiency of seventy-four percent (74%), and a length of patch of thirty-six inches (36.). Find the width, W, of patch to be applied so that there will be no reduction in pressure, using a single-riveted seam of normal design.

Referring to Table 1, it is found that seven-sixteenths-inch (7/16") plate with fifteen-sixteenths-inch (15/16") diameter rivet holes, pitched two and one-fourth (2 1/4) gives a seam efficiency of fifty-six percent (56%).

Referring to Table 2, $E = 0.74$ and $e = 0.56$ gives a constant $C = 1.75$; then width $W = L \times C = 36 \times 1.75 =$ sixty-three inches (63").

(b) Pressure Allowed on an Existing Patch.

A crescent-shaped patch has already been installed on a horizontal-tubular boiler. It is thirty inches (30") long and forty-eight inches (48") wide. The seam is single riveted with thirteen-sixteenths-inch ($13/16$ ") rivet holes pitched one and fifteen-sixteenths inches ($1 \frac{15}{16}$ "). The boiler shell plate is three-eighths-inch ($3/8$ ") thick. The longitudinal seam is of the double-riveted butt-strap type having an efficiency of eighty-two percent (82%). The safety valve is set for one hundred twenty-five pounds (125#) pressure. What maximum pressure should be allowed on the boiler? Reference to Table 1, shows that the normal efficiency of the patch seam is fifty-seven percent (57%). (If the efficiency is not found in the Table, refer to any other available table or determine it in the manner described in paragraphs A-1, A-2 and A-3 of the Appendix of the A.S.M.E. Boiler Code.)

Divide the width of the patch, $W =$ forty-eight inches (48") by the length, $L =$ thirty inches (30") to find the constant, $C = 48/30 = 1.60$. Follow down column 0.57 of Table 2 until 1.60 is found. It will be noted that this is somewhere between 1.56 and 1.62 representing E somewhere between 0.72 and 0.73. As the difference between 1.56 and 1.62 is 6, and the difference between 1.56 and 1.60 is 4, E will be 0.72 plus $4/6$ of 0.01 which is 0.7266.

The maximum allowable working pressure varies directly as the seam efficiency. Accordingly, $P = (0.7266/0.82) \times 125 = 110\#$. If this pressure allowance interferes with the operation of the plant, the patch shall be replaced by a new one with the proper dimensions giving a diagonal efficiency of eighty-two percent (82%).

(c) Design of Patch for Water-tube Boiler.

Reference to Table 1 shows that a single-riveted lap seam with seven-sixteenths-inch ($7/16$ ") plate, fifteen-sixteenths-inch ($15/16$ ") diameter rivet holes, and two-and-one-half-inch ($2 \frac{1}{2}$ ") pitch has a normal efficiency of fifty-six percent (56%).

Reference to Table 3, shows $E = 0.82$ and $e = 0.56$, the constant C is 3.16.

Then width $W = C \times 1P2$.

$W = 3.16 \times 36P2 = 56.88$ or practically fifty-seven inches (57").

[Figure 1](#)

[Figure 2](#)

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HISTORY

1. Repealer and new subsections (a) and (b) filed 8-12-76; effective thirtieth day thereafter (Register 76, No. 33).
2. Change without regulatory effect repealing and adopting new Figures 1-6 within subsection (b) filed 5-19-2008 pursuant to section 100, title 1, California Code of Regulations (Register 2008, No. 21).

Appendix 1

3228. (i)¹ Boiler, Furnace and Incinerator Rooms.

Any room containing a boiler, furnace, incinerator, or other fuel-fired equipment must be provided with two means of egress when both of the following conditions exist:

- (1) The area of the room exceeds 500 square feet, or
- (2) The largest single piece of fuel-fired equipment exceeds 1,000,000 B.t.u. per hour input capacity.

Exception: Rooms housing high-pressure boilers (greater than 15 lbs. psi) where either of the conditions listed in (1) or (2) exist shall be provided with 2 exits.

If two means of egress must be provided, one may be a fixed ladder. The means of egress must be separated by a horizontal distance not less than half the greatest horizontal dimension of the room. All openings shall be protected with a self-closing fire assembly having a minimum one-hour fire-protection rating. Where oil-fired boilers are used, a 6-inch noncombustible sill (dike) shall be provided. There shall be no interior openings between any occupancy where flammable or explosive concentrations may be expected to accumulate.

¹Reprint of General Industry Safety Order, Section 3228(i), Exits, Boiler, Furnace and Incinerator Rooms, of the California Administrative Code, Title 8, Subchapter 7 (Register 72, No. 23).

3274.² Valves and Controls.

(a) Where pipe valves require daily manipulation and are so located that they cannot be reached or operated from the floor, a permanent platform or other safe means of operation shall be provided.

(b) Valves or other controls shall not be so located that their manipulation exposes the employee to hazards of dangerous moving parts of prime movers, machines, or transmission equipment. (Title 24, T8-3274)

²Reprint of General Industry Safety Order, Section 3274, Valves and Controls, of the California Administrative Code, Title 8, Subchapter 7 (Register 76, No. 29).

3311.³ Flarebacks.

(a) To provide greater safety in lighting and relighting fixed fired equipment, the employer shall designate one or more employees who shall be trained in the safe lighting and relighting of the equipment. It shall be the responsibility of the employer to limit lighting and relighting of the equipment to employees so designated. It shall be the responsibility of the employees to follow the instructions given them. Copies of the instructions shall be prominently displayed at a location near the equipment.

(b) In addition to the above fire boxes or combustion chambers shall be purged or allowed sufficient time to vent themselves before a source of ignition is introduced into them.

(c) Provision shall be made, for the furnishing of extension lighting rods, where their use is indicated. Valves and other controls shall be so located as to avoid placing the employee in an unsafe position if a flareback occurs.

³Reprint of General Industry Safety Order, Section 3311, Flarebacks, of the California Administrative Code, Title 8, Subchapter 7 (Register 72, No. 23).

3312.⁴ Entering Combustion Chambers, Flues, Boilers or Unfired Steam Pressure Vessels.

(a) Before employees are allowed to enter, through a manhole, the shell or drum of a steam boiler or an unfired steam pressure vessel for maintenance or repair, where such a boiler or pressure vessel is one of a battery of two or more boilers or vessels or is connected to another source of steam, the valves connecting to the steam header or other source of steam shall be closed and effectively blinded or two valves shall be installed with a bleeder between them and the valves shall be closed and bleeder open. Blow down valves and other valves on lines through which harmful material might accidentally flow back to the boiler or vessel shall be either sealed or closed and locked and the key retained by the employee or his supervisor while the employee is in the boiler or vessel. When lines are effectively blinded the valves need not be locked or sealed.

(b) Employees shall not enter or be required to enter the fire boxes, flues or combustion chambers of fired apparatus until:

(1) The pilot light, fuel and steam lines to burners entering the fire box or combustion chamber have been blinded, disconnected or effectively closed by the use of two block valves with an open bleeder between them.

(2) All probability of ignition of any solid combustibles in the fire box or combustion chamber has been removed.

⁴Reprint of General Industry Safety Order, Section 3312, Entering Combustion Chambers, Flues, Boilers or Unfired Steam Pressure Vessels, of the California Administrative Code, Title 8, Subchapter 7 (Register 72, No. 23).

3310.⁵ Discharge Location.

(a) The discharge opening from traps, drains, and blowoffs shall be located so as not to endanger the safety of employees.

⁵Reprint of General Industry Safety Order, Section 3310(a), Discharge Location (Register 72, No. 23).

3514.⁶ Tubular Gage Guard.

(a) Tubular water gages on portable steam boilers shall be protected with a substantial guard affording protection at least equivalent to that obtained by an enclosure of one-half (1/2) inch wire mesh of No. 18 U.S.S. gage.

(b)(NI) Every portable steam boiler shall be equipped with liquid level gages of the reflex type.

⁶Reprint of General Industry Safety Order, Section 3514, Tubular Gage Guard (Register 72, No. 23).

3515.⁷ Try Cock Discharge Receptacle.

Where discharge presents hazards to employees, try cocks shall discharge into a funnel, dripper, or other similar receptacle, which in turn shall be piped to a safe place of discharge.

⁷Reprint of General Industry Safety Order, Section 3515, Try Cock Discharge Receptacle (Register 72, No. 23).

3516.⁸ Try Cock Manipulation.

Provisions shall be made whereby each of the try cocks can be manipulated by the employee while standing on the floor or platform on which the boiler is mounted.

⁸Reprint of General Industry Safety Order, Section 3516, Try Cock Manipulation (Register 72, No. 23).

3517.⁹ Steam Gage and Water Gage Glass Location.

The steam gage and water gage glasses shall be so located on the boiler that they can be clearly seen by the operator.

⁹Reprint of General Industry Safety Order, Section 3517, Steam Gage and Water Gage Glass Location (Register 72, No. 23)

HISTORY

1. New Appendix 1 (Sections 3228, 3274, 3311, 3312, 3310, 3514, 3515, 3516 and 3517) filed 12-14-76; effective thirtieth day thereafter (Register 76, No. 51).

Appendix 2

Boiler and Fired Pressure Vessel Inspection Fees

NOTE: The following fee schedule adopted by the Division of Industrial Safety is reprinted from Chapter 3.2, Group 2, Title 8, California Administrative Code, solely for informational purposes. Should any discrepancy exist between this reprinting and the regulations of Chapter 3.2, then Chapter 3.2 will prevail.

344.3.¹ Boiler Shop Inspection Fees.

(a) Fees shall be charged for shop inspections made by qualified safety engineers of the Division as follows:

(1) Boilers and fired pressure vessels inspected in the fabricator's shop at \$20.00 per hour.

(4) Watertube Boilers not exceeding 500 square feet of heating surface:

Internal Inspection at \$30.00

External Inspection at \$20.00

(5) Watertube Boilers exceeding 500 square feet of heating surface to
and

including 2500 square feet of heating surface:

Internal Inspection of \$50.00

External Inspection of \$25.00

(6) Watertube Boilers exceeding 2500 square feet of heating surface:

Internal Inspection at \$60.00

External Inspection at \$30.00

(7) Boilers other than firetube, watertube or miniature:

Internal Inspection at \$20.00

per hour with \$20.00

minimum per boiler

External Inspection at \$20.00

(8) Resale or repair inspection of all boilers and pressure vessels at
\$20.00 per hour:

Minimum charge per boiler is at \$20.00

(b) Whenever an owner or user of any apparatus or equipment fails to pay the fees required under this section within 60 days after notification, said owner or user shall pay, in addition to the fees required under this section a penalty fee equal to 100 percent of such fee. For the purposes of this section, the date of the invoice shall be considered the date of notification.

HISTORY

1 New Appendix 2 filed 3-28-78; effective thirtieth day thereafter (Register 78, No. 13).

²Reprint from Chapter 3.2, Group 2, Title 8 (Register 77, No. 49).