PART 14

CONSTRUCTION, INSTALLATION, INSPECTION AND MAINTENANCE OF HIGH PRESSURE BOILERS; CONSTRUCTION OF UNFIRED PRESSURE VESSELS

(Statutory authority: Labor Law, §§ 27, 204)

SUBPART 14-1

DEFINITIONS

§ 14-1.1 Definitions.

(a) *Alteration* means a change in a boiler that substantially alters the original design and that requires consideration of the effect of the change on the original design. *Alteration* does not include the addition to a boiler of nozzles smaller than an unreinforced opening size.

(b) *Approved* means, in respect to a device or material: in compliance with a subsisting resolution of approval adopted by the Commissioner; in respect to action by the commissioner: made the subject of a resolution of approval.

(c) *ASME Code* means the boiler and pressure vessel code published by the American Society of Mechanical Engineers.

(d) *Boiler* means a closed vessel in which water is heated, steam is generated, steam is superheated, or any combination thereof, under pressure or vacuum for use externally to itself by the application of heat from combustible fuels, electricity, or any other source, but shall not include a device or apparatus used solely to heat water for a hot water supply system. The term *boiler* shall include the apparatus used by which heat is generated, and all controls and devices related to such apparatus or to the closed vessel. The term *boiler* also shall include fired units for heating or vaporizing liquids other than water where these units are separate from processing systems and are complete within themselves.

(e) *Boiler external piping* means piping within the scope of ASME Code section I and which requires ASME Code stamping as specified in section I and this Code.

(f) *Certificate of competence* means a certificate issued to a boiler inspector by the department.

(g) *Commissioner* means the Commissioner of Labor of the State of New York.

(h) *Component* means a constituent part of a boiler assembly.

(i) *Condemned,* with reference to a boiler, means declared to be unsafe and having an applied stamping designating its condemnation.

(j) *Defect* means a condition which may directly or indirectly cause a boiler to be or become a source of danger to any person by reason of fire, explosion, leakage, electricity or ionizing radiation.

(k) *Defective boiler* means one which as an assembly includes a defect, or a boiler which is not provided with all required controls and devices in good operating condition.

(1) *Department* means the Department of Labor.

(m) *External inspection* means an inspection made while the boiler is in operation.

(n) *Fusion welding* means the melting together of filler metal and base metal, or of base metal only, which results in coalescence.

(o) *High temperature water boiler* means a boiler completely filled with water intended for operation at pressures in excess of 160 psi or temperatures in excess of 250° Fahrenheit.

(p) *Hot water heating boiler* means a boiler in which no steam is generated, from which hot water is circulated for heating purposes and then returned to the boiler, and which operates at a pressure not exceeding 160 psi or a temperature of 250° Fahrenheit at or near the boiler outlet.

(q) *Hot water supply boiler* means a boiler completely filled with water that furnishes hot water to be used externally to itself at pressures not exceeding 160 psi at temperatures not exceeding 250° Fahrenheit at or near the boiler outlet.

(r) *Incompetence* means conduct which evidences a lack of ability to discharge a duty required to protect the health, safety and welfare of the public, lack of knowledge of the fundamental principles of inspection services or an inability to apply those principles, or failure to maintain competency in the current practices and methods applicable to inspection services and the rules of New York State.

(s) *Inspector* means a boiler inspector who holds a valid certificate of competency issued by the department.

(t) *Installed* means, in respect to a heating system boiler as a vessel, placed in a fixed operating location and connected to the heat distributing system; in respect to an unfired pressure vessel, placed in a fixed operating location. The term does not include a reassembly not involving a change of location.

(u) *Insurance company* means a company which has been licensed in this State to write boiler insurance and which is actively engaged in writing such insurance for the general public.

(v) *Internal inspection* means an inspection made when the boiler is shut down and handholes and manholes or other

inspection openings are opened or removed for inspection of the interior as required by the inspector.

(w) *Low pressure boiler* means a steam boiler on which the safety valves are set at pressures not exceeding 15 psi.

(x) *Maximum allowable working pressure* means the maximum gage pressure permissible at the top of a completed vessel in its operating position for a designated temperature.

(y) *Maximum allowable working temperature* means the maximum temperature at or near the outlet of a hot water boiler, measured in degrees Fahrenheit, at which the boiler may be safely operated.

(z) *Miniature boiler* means a power boiler or high temperature water boiler which does not exceed any of the following limits:

(1) 16 inches inside diameter of shell;

(2) 20 square feet of heating surface, except for electric boilers;

(3) 5 cubic feet gross volume exclusive of casing and insulation; and

(4) 100 psi maximum allowable working pressure.

(aa) *National Board* means the National Board of Boiler and Pressure Vessel Inspectors, Columbus, Ohio.

(bb) *Owner* means the owner or a lessee of a boiler or unfired pressure vessel.

(cc) *Portable boiler* means an internally fired boiler primarily intended for temporary location and whose construction and usage is of a movable nature.

(dd) *Post-1917 installations* means installations made on or after January 1, 1918.

(ee) *Power boiler* means a boiler in which steam or other vapor is generated at a pressure of more than 15 psi.

(ff) *Pre-1918 installations* means installations made before January 1, 1918.

(gg) *Relief valve* means an automatic pressure relieving device actuated by the static pressure upstream of the valve which opens further with the increase in pressure over the opening pressure. *Note:* A relief valve is used primarily for liquid service.

(hh) *Repair* means work necessary to restore a boiler to a safe operating condition.

(ii) *Safety relief valve* means an automatic pressure actuated relieving device suitable for use as either a safety valve or a relief valve, depending upon application.

(jj) *Safety valve* means an automatic pressure relieving device actuated by the static pressure upstream of the valve and characterized by full-opening pop action. Note: A safety valve is used for gas or vapor service.

(kk) *Secondhand vessel* means a boiler or unfired pressure vessel that has changed location subsequent to the original installation.

(ll) *Standard* means, with reference to a boiler or unfired pressure vessel, constructed and stamped in accordance with the ASME Code.

(mm) *Unfired pressure vessel* means a container for the containment of internal or external pressure which may be obtained from an external source or by the application of heat from a direct or indirect source, or any combination thereof, but excluding:

(1) a pressure vessel meeting the requirements of the United States department of transportation for the shipment of liquids or gases under pressure;

(2) an air tank used on a vehicle used for carrying passengers or freight or used directly in the operation of trains;

(3) a pressure vessel having a volume of five cubic feet or less or having an inside diameter not exceeding six inches;

(4) a pressure vessel designed for pressures of less than 15 psi;

(5) a hot water supply storage tank, provided none of the following limitations is exceeded:

(i) a heat input of 200,000 BTU's per hour;

(ii) a water temperature of 210° Fahrenheit; or

(iii) a nominal water containing capacity of 120 gallons;

(6) a pressure vessel under Federal control or regulation;

(7) a pressure vessel containing water under pressure, including one containing air, the compression of which serves only as a cushion, provided neither of the following limitations is exceeded:

(i) a design pressure of 300 psi;

(ii) a design temperature of 210° Fahrenheit; and

(8) a pressure vessel used for agricultural purposes.

§ 14-1.2 Inspection frequency.

No high pressure boiler shall be operated until an internal and external inspection has been made by the commissioner or an insurance company. There shall be regular inspections of every boiler subject to the provisions of this Part made at intervals no less frequent than the following:

	Internal	*External*
Low pressure Steam Boilers	3 years	2 years
Low Pressure Hot Water Boilers	5 years	2 years
High Pressure Steam Boilers	1 year	1 year [2]
High Pressure Hot Water Boilers	3 years [1]	1 year [2]

[1] If equipped with manholes and handholes, an annual internal inspection is required.

[2] Approximately 6 months after each internal inspection.

§ 14-1.3 Certificate of inspection.

(a) A certificate of inspection shall be issued for the operation of a boiler when the boiler is found upon inspection to comply in every respect with this Part.

(b) No boiler shall be operated until a certificate of inspection has been issued.

(c) The certificate of inspection shall be conspicuously posted under glass in the boiler room or the engine room. The certificate of inspection for a portable boiler shall be on the premises where the boiler is being operated and shall be available at all times.

§ 14-1.4 Allowable pressure.

(a) No boiler shall be operated at a pressure in excess of the working pressure specified in the latest inspection certificate. Boilers of standard construction shall have an original factor of safety as determined by the ASME Code.

(b) Standard boilers of lap seam construction shall have a factor of safety determined in accordance with the ASME Code.

(c) For nonstandard boilers and reinstalled boilers see sections 14-10.1 through 14-10.4 of this Part.

(d) If it shall become necessary to increase the steam pressure allowed before the expiration of the certificate of inspection under which a boiler is being operated, a new certificate shall be required and the commissioner notified.

§.14-1.5 Safety appliances.

(a) No person shall remove or tamper with any safety appliance prescribed by this Part except for the purpose of making repairs.

(b) No person shall in any manner load the safety valve to a greater pressure than allowed by the certificate of inspection.

§ 14-1.6 Numbers.

(a) Numbers assigned to boilers by the commissioner shall be of metal and shall be securely attached to a metal plate. Such plate shall be securely attached to the front of the boiler or front of boiler setting. Such numbers shall be not less than two inches in height for power and locomotive boilers and shall be not less than one inch in height for miniature boilers. In no case shall these numbers be removed until the boiler is permanently discontinued.

(b) No person except an inspector shall deface or remove any certificate of inspection or mark of identification number on a boiler.

§ 14-1.7 Portable boilers.

(a) The owner or user of a portable boiler shall report the location of same to the commissioner or to the insurance company insuring such boiler 30 days prior to the expiration of the certificate of inspection.

(b) No rebuilt portable boiler shall be operated unless the manufacturer has filed with the commissioner a copy of the manufacturer's data covering its construction and the name of the original owner.

§ 14-1.8 Defective boilers.

A boiler showing any defect affecting its safety, shall be immediately discontinued from service and the Department of Labor and the insuring company shall be notified.

§ 14-1.9 Condemned boilers.

Any boiler that has been recommended for condemnation shall be immediately discontinued from service. The commissioner shall be promptly notified of such action and shall reinspect the boiler for final action. Boilers that have been condemned shall have distinctly stamped thereon:

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in a location as specified in section 14-9.43 of this Part.

§ 14-1.10 Platforms, ladders, exits.

(a) Wherever platforms are herein required they shall hereafter be not less than 24 inches wide constructed of metal with four-inch toeboard, and have railings 42 inches high. Railings shall consist of one and one-quarter inch pipe or equivalent and have intermediate rails.

(b) Ladders giving access to same may be vertical or inclined and shall be of substantial construction and at least 18 inches wide between side rails. Stairs shall be at least 24 inches wide and provided with hand rails.

(c) Where the distance from the floor to top of the boiler or boiler setting exceeds eight feet, a permanent stairway, inclined or vertical ladder shall be provided to give safe access to and permit exit from boiler tops.

(d) Where space permits, stairways or inclined ladders shall be used. Where more than two boilers are operated in battery, two means of access remote from each other shall be provided, one of which may be a vertical ladder.

(e) A permanent platform providing access to the main stop valve of the boiler shall be installed except where the tops of the boiler setting are flat, without obstruction to the operating valve.

(f') Where the low point of a water column is located 15 feet or more above the floor or walkway, a platform with standard toeboard shall be installed. A permanent ladder need not be provided.

(g) Platforms shall be installed opposite one end of all drums of water tube boilers which are over four feet above the floor or walkway, to permit safe access to the interior of drums for cleanouts and inspection.

(h) All boilers hereafter installed shall be provided with platforms at cleanout openings on the side walls of setting which are over four feet above the floor or walkway. A permanent ladder need not be provided.

(i) One means of escape and where possible two means remote from each other shall be provided from every place where there is danger of employees being trapped in a confined space.

§ 14-1.11 Electrical steam generators.

All electrical steam generators shall be installed in accordance with the requirements of the ASME Code.

§ 14-1.12 Blowoff tanks.

(a) Boilers operating at pressures in excess of 100 psi and boilers not having a safe place of discharge shall be provided with blowoff tanks. The blowoff tanks shall be constructed in accordance with the provisions of the ASME Code, section VIII, division 1.

(b) The outlet from the blowoff tank shall be twice the area of the boiler blowoff pipe and made to extend internally within six inches from the bottom of the tank.

(c) A vent pipe, at least twice the diameter to the inlet, shall lead to the outside atmosphere.

(d) Vents shall be as direct as possible to the outside atmosphere and discharge at a point not less than seven feet above the adjacent walkway or areas without a valve or other possible obstruction such as a water pocket.

(e) For convenience in cleaning the tank, a manhole or an access opening shall be provided in the upper head or shell of same.

(f) All pipe connections between tank and blowoff valves on the boiler shall be made as direct as possible. The piping and fittings shall be in accordance with the ASME Code.

§ 14-1.13 Boiler operator.

(a) Every person attending a boiler shall be provided sufficient training to allow that person sufficient knowledge to operate the boiler in a safe and efficient manner.

(b) The boiler operator shall keep a log for each shift that he is responsible for operating the boiler. That log shall provide the following information, which may vary according to type of boiler:

(1) blowdown of water column and sight glass and other safety equipment;

(2) blowdown of mud drum and headers

(3) record of water treatment;

(4) test of safety valves;

(5) record of any operating problems or deficiencies; and

(6) signature of boiler operator.

(c) The log shall be available for inspection by the State boiler inspector and the insurance carrier inspector.

§ 14-1.14 Mechanical fuel and feed.

(a) All boilers hereafter installed with gas, oil or mechanical firing, shall be provided with an automatic low water fuel cutout of the manual reset type. All boilers installed after the effective date of this Part shall be provided with two automatic low water cutouts of the manual reset type except as follows:

(1) boilers of 1,500 square feet or more of heating surface when there is an attendant present during boiler operation;

(2) boilers of 100 square feet or less of heating surface when the boiler is operated with no extraction of steam (closed system), provided that the boiler is on the same floor or the floor immediately below the steam using equipment and provided that the total length of connected steam piping does not exceed 50 feet; and

(3) boilers of 20 square feet of heating surface or less (see section 14-11.12 of this Part).

(b) Fuel cutouts, water feeding and regulating devices of the float type hereafter installed, shall comply with the following requirements:

(1) The float chamber of a water feeder or regulator shall be set at a level that will start feeding when the water level drops below the predetermined water level of that particular boiler.

(2) A fuel cutout switch, if installed, shall be so set or adjusted that it will shut off the fuel supply before the water drops lower than one-quarter inch above the lowest visible level of the gage glass. The design and material of the float chamber shall comply with the requirements of section 14-9.22 of this Part and be properly marked for pressure. Float chambers made of cast iron in accordance with specifications SA-278 may be used for maximum boiler pressures not exceeding 250 pounds per square inch. Float chambers made of malleable iron in accordance with specifications SA-395 may be used for maximum boiler pressures not exceeding 350 pounds per square inch. For higher pressures steel construction shall be used.

(3) The float shall have a displacement adequate to insure positive movement of the mechanism operating the feed

valve and/or the cutout switch. It shall be tested against collapse at a pressure of at least twice the boiler pressure. Bearings, shafts, water valves and seats and other similar parts shall be of material that is resistant to corrosion.

(4) Electric switches shall be designed to prevent deterioration from atmospheric conditions and be approved by the Underwriters' Laboratories. Accessibility for inspection, cleaning and repairing shall be provided for all parts.

(5) The steam connection to a float chamber, including pipe, fittings, and valves, if any, shall comply with the requirements of sections 14-9.22 and 14-9.23 of this Part. There shall be no sag or offset in the piping which will permit the accumulation of water.

(6) The water connection to a float chamber and drains from the float chamber, including pipe, fittings and valves, if any, shall comply with the requirements of sections 14-9.22 and 14-9.23 of this Part.

(7) The water connections shall be provided at each right angle turn with a cross or a fitting with a back outlet to permit cleaning in both directions. The upper edge of the water connection at the boiler shall not be above the lowest visible water level in the gage glass. No part of this pipe connection shall be above point of connection at the float chamber.

(8) The minimum size of pipes connecting the float chamber to a boiler shall be one inch for the connection below the water line and three-quarters inch for the steam connection. When shutoffs are used on the connection pipes, they shall be either outside-screw-and-yoke gate valves or stopcocks or valves with levers permanently fastened thereto and marked in line with their passage, or of such other through flow construction as to prevent stoppage by deposits of sediment and to indicate by the position of the operating mechanism whether they are in open or closed position; and such valves or cocks shall be locked or sealed open. Where stopcocks are used they shall be of a type with the plug held in place by a guard or gland. Connecting the float chamber to gage glass connections is not recommended unless the gage glass connections are at least one inch pipe size below the water line and three-quarters inch for the steam.

Exception: For boilers of less than 50 square feet of heating surface the minimum size pipe shall be three-quarters inch for the connection below the water line and one-half inch for the steam connection.

(9) No outlet connection, except for damper regulation, drains, steam gages or such apparatus which does not permit the escape of an appreciable amount of steam or water therefrom, shall be placed on the float chamber or pipes connecting the float chamber to a boiler.

(10) The float chamber shall be fitted with a drain valve having a suitable connection to the ashpit, or other safe point of waste, and if the water connection thereto has a rising bend or pocket which cannot be drained by means of the float chamber drain, an additional drain shall be placed on this connection in order that it may be blown off to clear any sediment from the pipe. The float chamber blowoff pipe shall be at least three-quarters inch pipe size, except for boilers of 50 square feet or less of heating surface, when it can be one-half inch.

(11) Feed water regulator and low water cut-off shall be tested daily and maintained in good working condition.

(12) Boilers consisting of continuous piping affording no reservoir or water level practicable for the operation of a low water cutoff may be equipped with a flow valve or other suitable control which has been tested and approved in accordance with a code or standard commonly applied in the industry, *e.g.*, AGA or UL.

§ 14-1.15 Fusible plugs.

(a) Internally fired boilers having more than 50 square feet of heating surface shall be fitted with a fusible plug if required, in accordance with the ASME Code.

(b) This provision shall not apply to boilers of the vertical tubular type or to dryback scotch type. The use of fusible plugs in these types of boilers is optional.

(c) Fusible plugs shall not be used where boilers are gas or oil fired, except when the fusible plug is located in such a position that its operation cannot extinguish the flame.

§ 14-1.16 Maximum allowable working pressure.

The maximum allowable working pressure of a power boiler shall be determined in accordance with the ASME Code.

§ 14-1.17 Pressure controls.

The exceptions in section 14-1.14(a) of this Subpart also apply to the following requirements:

(a) Each automatically fired steam power boiler shall have at least one steam pressure control device that will shut off the fuel supply to each boiler when the steam pressure reaches a preset maximum operating pressure.

(b) In addition to the pressure control required in subdivision (a) of this section, each automatically fired steam power boiler installed after the effective date of this Subpart shall have a high limit manual reset steam pressure control that will

prevent generation of steam pressure in excess of the maximum allowable working pressure.

(c) The flame safeguard requirements for high pressure boilers should be the same as they are for low pressure boilers (see Code Rule 4, Subparts 4-9, 4-10, 4-11 and 4-12 of this Part).

§ 14-1.18 Notification in case of accident.

When an accident occurs which results in injury to persons, or results in property damage in excess of $1,000, the owner or operator of the boiler shall report the accident to the commissioner within 24 hours. If the accident results in death to a person or persons, or results in property damage in excess of $25,000, the report shall be given immediately by telephone, and confirmed by registered mail within 24 hours.

§ 14-1.19 Unfired pressure vessels.

(a) All unfired pressure vessels purchased and installed on or after the first date of final promulgation of this section shall be constructed and stamped in accordance with section VIII of the ASME Code and registered with the National Board of Boiler and Pressure Vessel Inspectors.

(b) Compressed air tanks intended for use in conjunction with reciprocating air compressors shall not have the motor and compressor unit mounted on the vessel unless the unit is designed in accordance with paragraph UG-22 of section VIII of the ASME Code.

SUBPART 14-2
INSPECTION

§ 14-2.1 Preparation for inspection.

(a) A boiler shall be prepared for internal inspection or hydrostatic pressure by the owner or user on a date specified by the commissioner or an insurance company. Unless the owner or user agrees to a shorter period, such inspection shall be made not less than 15 days after notice thereof.

(b) The owner or user shall prepare a boiler for internal inspection in the following manner unless the inspector advises to the contrary:

(1) Water shall be drawn off and the boiler thoroughly washed.

(2) All manhole and handhole plates and washout plugs and the water column connection shall be removed and the furnace and combustion chambers thoroughly cooled and cleaned.

(3) All grates of internally fired boilers shall be removed.

(4) At each annual inspection brick work shall be removed as required by the inspector.

(5) The steam gage shall be removed for testing where there is evidence that its operation has been inaccurate and faulty.

(6) All leaks of steam or hot water into the boiler shall be stopped.

§ 14-2.2 Setting and insulating.

All boilers hereafter installed shall comply with the following requirements:

(a) Boilers which require access to permit of proper care and inspection shall have a minimum clearance of 24 inches from the building walls or partitions.

Exception: Boilers other than horizontal tubular or watertube type or not exceeding 30 inches in diameter may be set with a minimum clearance of not less than 16 inches from building walls or partitions in the clear.

(b) Where more than one firebox or economic type of boiler are installed, a space of at least 24 inches shall be provided between the boilers for inspection and repair.

(c) Wet-bottom boilers shall be set not less than 12 inches above the floor.

(d) The setting walls of a water tube boiler shall be so constructed that all drum heads will be accessible for external inspection.

(e) Where it is necessary to go on top of boiler or boilers for maintenance or operating purposes, a clearance of at least seven feet shall be maintained from the working platform to the underside of any overhead structure.

Exception: Where boilers are to be installed in an existing building where it is necessary to go on top, there shall be a clearance of at least three feet. There shall be not less than six inches of clearance space above the highest point of any valve or other fitting when such valve or fitting is at maximum opening.

(f) The clearance above a vertical boiler (except of the water tube type) shall be sufficient to permit of inspection and necessary repairs of the upper tube sheet.

(g) When boilers have riveted nozzles attached, the flanges of nozzles where attached shall not be covered permanently with insulation. Provision shall be made by using removable sections of insulating material to expose the flanges for inspection purposes.

(h) Where boilers are of riveted construction and the dimensions of the riveted joint cannot be determined for computation purposes on the inside of the shell, the insulating material covering the exterior of the shell shall be so attached that a sufficient amount of same may be readily removed for examination of the joint to determine the size and pitch of rivets and such other data as may be required by the inspector.

§ 14-2.3 Preparation for hydrostatic test.

The owner or user shall prepare a boiler for hydrostatic pressure test in the following manner:

(a) The boiler shall be filled with water to the stop valve.

(b) The connections of such boiler when connected with other boilers that are under steam pressure shall be blanked off.

Exception: Where double stop valves are installed in all connecting pipes with open drains between, such connections need not be blanked off.

§ 14-2.4 Inspection report.

A report of the inspections shall be made upon a form approved by the commissioner.

§ 14-2.5 Inspection by insurance companies.

All boilers which are inspected by a duly authorized insurance company shall be exempt from inspection by the commissioner and by cities which qualify under the provisions of subdivision seven of section 204 of the Labor Law, under the following conditions:

(a) that the insurance company complies with the provisions of this Part;

(b) that the inspectors of the insurance company hold certificates of competence;

(c) that inspections by the insurance company are made at least once each year (the company writing the insurance must make provision for the annual inspection);

(d) that the insurance company gives written notice to the owner or lessee of each boiler inspected listing all violations of any of the provisions of this Part;

(e) that a certified copy of the report of each inspection is filed with the commissioner or the inspecting agency of such city, as the case may be, within 21 days of the inspection, on such forms and in such manner as required by the commissioner or the inspecting agency of such city, as the case may be. If insurance is refused, cancelled or discontinued for the boiler inspected the report shall so state, together with the reasons therefor; the report shall also list any instances of the failure of an owner or lessee of the boiler to comply with the provisions of this Part.

§ 14-2.6 Application of provisions relating to certified boiler inspectors.

The provisions of sections 14-2.7 through 14-2.14 of this Subpart shall not apply in derogation of lawful examination requirements relating to employees in the classified Civil Service of the State or a qualified city.

§ 14-2.7 Certified boiler inspectors.

A person shall be a certified boiler inspector whose competence has been certified by the commissioner and who lawfully possesses a valid certificate of competence as such issued by the commissioner.

§ 14-2.8 Application for certification.

Any person having the following qualifications may file with the commissioner on a form furnished by him, an application for certification of his competence as a boiler inspector and for the issuance to him of a certificate of competence:

(a) He shall be at least 21 years old.

(b) He shall have had at least five years consecutive or discontinuous practical experience in any or any combination of the following occupations:

(1) boilermaking;

(2) boiler installation and inspection;

(3) boiler shop practice;

(4) operation or maintenance of boilers;

(5) inspection of boilers;

(6) or as a complete or partial alternative to such experience, he shall have had technical education or special training which the commissioner may reasonably find equivalent in instructive value.

(c) He shall be actually in the employ of the State of New York, a duly authorized insurance company or a qualified city, except that this qualification may be waived by the commissioner upon his finding in his discretion that such waiver is necessary or convenient for the enforcement or administration of section 204 of the Labor Law or of the Industrial Code.

§ 14-2.9 Examination as to qualifications.

A person who has filed with the commissioner an application for certification as above provided may in the discretion of the commissioner be examined orally as to his qualifications before his application is accepted. If the commissioner waives such oral examination or after such examination finds the applicant's qualifications proper, the application shall be accepted and the applicant deemed eligible for examination as to his competence or directed to file other evidence thereof. Nonacceptance shall be by order of the commissioner.

§ 14-2.10 Examination for certification.

An applicant for certification of his competence as a boiler inspector whose application has been accepted may take an examination for such certification at such reasonable time and place and upon such reasonable notice as the commissioner may determine. The examination shall be written and shall be limited to testing the extent of the applicant's knowledge of the construction, installation, operation, maintenance and inspection of boilers as defined by subdivision 6 of section 204 of the Labor Law.

§ 14-2.11 Examining boards.

For the purposes of p reparing, giving, conducting, marking, and reviewing such written examinations the commissioner shall appoint by order such examining boards as he may deem necessary from time to time to serve at his discretion. Each board shall have at least three members, in addition to the department's chief boiler inspector, appointed by the commissioner on the basis of their experience, knowledge and judgment in regard to boiler design, construction and operation.

§ 14-2.12 Results of examination.

The result of each written examination as to each applicant shall be certified to the commissioner by the examining board or majority thereof as satisfactory or unsatisfactory. If unsatisfactory, the applicant may upon his written request made within 20 days from notice of the result have a hearing before the examining board or a member thereof to inquire into the reasons for the certified result. Within 20 days thereafter the examining board or the majority thereof shall affirm or alter the certified result.

§ 14-2.13 Certificate of competence.

(a) Unless for good and sufficient cause he shall make an order to the contrary, the commissioner shall issue a certificate of competence to each applicant whose application has been accepted and who has:

(1) taken such examination with a result finally certified as satisfactory; or

(2) not taken such examination but has filed with the commissioner such evidence of competence as the commissioner in his discretion may deem proof of the applicant's sufficient knowledge of the construction, installation, operation, maintenance and inspection of boilers. For illustration and not by way of limitation, such evidence may consist of relevant experience or achievement in the Civil Service of this or any other state, the United States, a

qualified city, or in industry.

(b) The commissioner shall not issue such certificate to any other person.

(c) The certificate of competence shall state that the holder is a certified boiler inspector whose competence as such is thereby certified and shall contain such other matter as may be proper.

(d) The certificate of competence shall be renewed annually. A certificate shall remain valid until the expiration date set forth on the certificate unless it is voluntarily surrendered to the commissioner or is suspended or revoked by the commissioner.

(e) Upon request and proof that a valid certificate has been lost or destroyed the commissioner shall issue another in its place.

(f) Nothing in this Part (rule) is intended to contravene any law by which a fee for a certificate may be required.

§ 14-2.14 Suspension and revocation of certificate.

If the commissioner shall find good cause to believe that the holder of a certificate of competence is incompetent or untrustworthy as a boiler inspector, or has willfully made a false statement of a material fact in an application or a report, he may by order enjoin the certificate holder from further action as a boiler inspector pending a hearing. The order shall provide for a hearing before the commissioner's representative at a reasonable time and place and a copy thereof shall be served personally or by mail on the inspector and such others as the commissioner may deem interested. Upon the evidence produced at the hearing the commissioner shall order the injunction terminated or the certificate suspended or revoked.

SUBPART 14-3

REPAIRS, ALTERATIONS AND MISCELLANEOUS REQUIREMENTS

WELDED REPAIRS AND ALTERATIONS

§ 14-3.1 General requirements.

(a) *Acceptable methods.* Welded repairs or alterations to any boiler or its fittings, settings, or appurtenances shall be completed in accordance with the requirements of sections 14-3.1 through 14-3.18 of this Subpart. Other methods may be acceptable provided they are approved by the department. In the absence of specific rules, the rules for new construction shall apply. Except as provided in section 14-3.2(a) of this Subpart, no welded repair or alteration may be made without prior approval of the authorized inspector who shall, if it is considered necessary, inspect the object before granting approval.

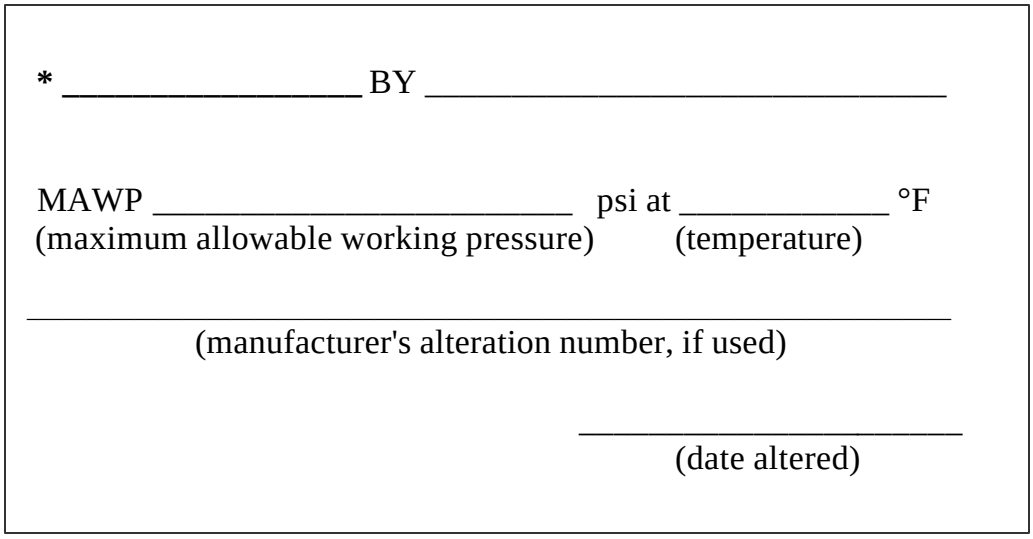
(b) *Acceptance of repairs and alterations.* It shall be the responsibility of the organization making the repair or alteration to provide for inspection, documentation and certification of the work and to ensure prior acceptance of the procedures for the work. The inservice inspection agency shall be notified prior to starting repairs.

§ 14-3.2 General rules for repairs.

(a) *Authorization.* (1) Repairs to boilers shall be performed by an organization in possession of a valid National Board or New York State Repair Certificate of Authorization and/or a valid ASME Certificate of Authorization. The repair organization shall have a documented quality control program containing a description of the scope of work it intends to perform with supporting welding procedures and qualification reports in accordance with section IX of the ASME Code. Welded repairs of a routine nature as specified in paragraphs (c)(1) through (9) of this section may be performed without stamping by the repair organization of the boiler (Fig. 14-3 b) or signoff of the repair form by the insurance company inspector.

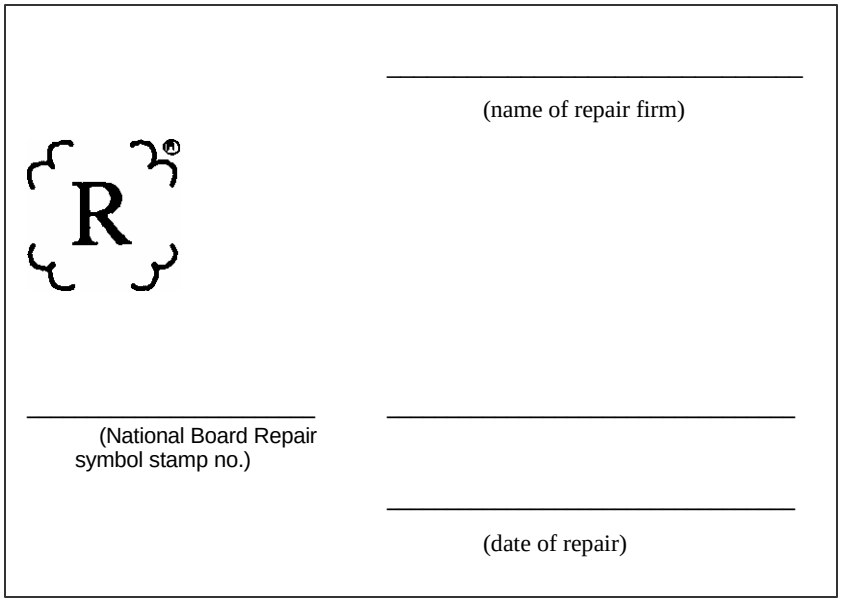
(2) Stamping or nameplate application. When required by this Part, the nameplate or stamping (Fig. 14-3 b) shall be applied to the repaired boiler adjacent to the original manufacturer's stamping or nameplate. The letters shall be at least 5/32 inch high.

FIGURE 14-3(a) STAMPING OR NAMEPLATE OF AN ALTERED BOILER OR PRESSURE VESSEL



Insert the word "ALTERED" or "RERATED" as applicable. Stamping or nameplate shall be applied adjacent to the original manufacturer's stamping or nameplate in letters at least 5/32 in. (4 mm) high. The temperature is to be shown if it is on the original stamping.

FIGURE 14-3(b) STAMPING OR NAMEPLATE OF A BOILER OR PRESSURE VESSEL REPAIRED BY WELDING



Stamping or nameplate shall be applied adjacent to the original manufacturer's stamping or nameplate. A single nameplate or stamping may be used for more than one repair to a boiler or pressure vessel provided it is carried out by the same repair organization. The date of each repair shall be stamped on the nameplate. This date should correspond with the date on the Report of Welded Repairs. Letters shall be at least 5/32 in. (4 mm) high.

(b) *Examples of repairs.* Repairs shall be work such as, but not limited to, the following examples:

(1) welded repairs or replacements of pressure parts or attachments that have failed in a weld or in the base material;

(2) the addition of welded attachments to pressure parts such as, but not limited to:

(i) studs for insulation or refractory lining;

(ii) hex steel or expanded metal for refractory lining;

(iii) ladder clips;

(iv) brackets;

(v) tray support rings;

(vi) corrosion-resistant strip lining;

(vii) corrosion-resistant weld overlay; and

(viii) weld build-up of wasted areas;

(3) replacement of heat exchanger tube sheets in accordance with the original design;

(4) replacement of boiler or heat exchanger tubes where welding is involved;

(5) in a boiler, a change in the arrangement of tubes in furnace walls, economizer or superheater sections;

(6) replacement of pressure retaining parts identical to those existing on the boiler and described on the original manufacturer's data report such as, but not limited to:

(i) replacement of furnace floor tubes or sidewall tubes, or both, in a boiler;

(ii) replacement of a shell or head in accordance with the original design;

(iii) rewelding a circumferential or longitudinal seam in a shell or head; and

(iv) replacement of nozzles;

(7) installation of new nozzles or openings of such a size that reinforcement is not a consideration;

(8) the addition of a nozzle where reinforcement is a consideration may be considered to be a repair provided the nozzle is identical to one in the original design, is located in a similar part of the vessel, and is not closer than three times its diameter from another nozzle;

(9) the installation of a flush patch to a boiler;

(10) welding of gage holes;

(11) welding of wasted or distorted flange faces;

(12) replacement of slip-on flanges with weld neck flanges or vice versa;

(13) seal welding of butt straps and rivets; and

(14) the replacement of a riveted section by welding, subject to the administrative procedures of the jurisdiction and acceptance of the authorized inspector.

(c) *Repairs of a routine nature.* Routine repairs include, but are not limited to:

(1) welded repair or replacement of tubes or pipes and attachments;

(2) the addition of nonpressure attachments to pressure parts where postweld heat treatment is not required;

(3) weld build-up of wasted areas;

(4) corrosion-resistant weld overlay;

(5) replacement of boiler tubes where welding is involved;

(6) a change in arrangement of tubes in furnace walls, economizer or superheater sections;

(7) replacement of nozzles where reinforcement is not a consideration;

(8) welding gage holes; and

(9) replacement of slip-on flanges with weld neck flanges or vice versa where nondestructive examination of the welded joints is not a requirement of the applicable ASME Code.

§ 14-3.3 General rules for alterations.

(a) *Authorization.* (1) Alterations to boilers, with the exception of rerating, shall be performed in accordance with the National Board Inspection Code.

(2) An organization holding only a National Board or New York State Repair Certificate of Authorization may do alterations provided the design changes involved are certified by the holder of an appropriate ASME Code Symbol Stamp and Certificate of Authorization and such changes are verified by the ASME Code Stamp holder's authorized inspector.

(3) Except as provided in paragraph (a)(2) of this section, alterations to boilers shall be performed by an organization that holds an ASME Code Symbol Stamp listed in the same section of the ASME Code as the code symbol on the boiler to be altered. The work involved in the alteration must be within the scope of the ASME Code Symbol Stamp holder's Certificate of Authorization.

(b) *Stamping or nameplate attachment to altered boilers.* (1) Authorization. The stamping of, or attaching of a nameplate to, an altered (including rerated) boiler in accordance with the National Board Inspection Code shall indicate that the alteration was carried out in compliance with the requirements of this Code. Such stamping or attaching of a nameplate shall be done only with the knowledge and authorization of the inspector. The organization responsible for completing the Report of Alteration, shall also be responsible for marking by means of a nameplate or stamping on the boiler as shown and in a location indicated in Figure 14-3(a).

(2) ASME Code Symbol Stamp. Altered boilers shall not be restamped with the ASME Code Symbol Stamp.

(3) Removal of original stamping or nameplate. When an alteration requires removal of that part of a boiler containing the ASME Code stamping, the authorized inspector shall, subject to the approval of the jurisdiction, witness the making of a facsimile of stamping, the obliteration of the old stamping and the transfer of the stamping to the new part. When the stamping is on a nameplate the inspector is to witness the transfer of the nameplate to the new part. Any relocation shall be described on the Report of Alteration. The Code Symbol is not to be restamped.

(c) *Documentation of alterations.* (1) The Welded Repair/Alteration Report is a dual purpose form that shall be used for documenting either repairs or alterations, unless otherwise specified in this Code or by the National Board Inspection Code. For purposes of this Code, when such form is used to document alterations, it is referred to as the Report of Alteration.

(2) Preparation of the report of alteration. The Report of Alteration, indicating the changes that have been made, shall be prepared and distributed in accordance with section 14-3.20(c) of this Subpart for each alteration of a boiler as described below:

(i) Where the alteration involves rerating with no physical change in the boiler, the Report of Alteration shall be prepared by the original manufacturer or the holder of a valid ASME Certificate of Authorization described in the National Board Inspection Code. The manufacturer's authorized inspector shall indicate acceptance of the design change on the Report of Alteration. Where such preparation cannot be obtained from this source, the Report of Alteration shall be prepared by a registered professional engineer with verification by the authorized inspection agency responsible for the inservice inspection of the object. In each instance revised calculations shall accompany the Report of Alteration, and all such documentation shall be subject to the acceptance by the jurisdiction.

(ii) Where the alteration involves a rerating where a physical change has been made to the boiler, the documentation in subdivision (a) of this section shall be accompanied by a Report of Alteration, prepared by the holder of the ASME Certificate of Authorization who performed the alteration and shall be verified by his inspector.

(iii) Where an alteration is made without rotating the boiler, the Report of Alteration shall be prepared by the holder of the ASME Certificate of Authorization who performed the alteration and shall be verified by his inspector.

(3) A copy of the original manufacturer's data report and any required manufacturer's partial data reports shall be a part of the completed report of alteration and shall be attached thereto. Where the manufacturer's data report is unavailable, documentation acceptable to the department shall be submitted.

(d) *Test.* A pressure test as required for new construction shall be applied to the boiler after the alteration has been completed, at a pressure of at least the set pressure of the lowest set safety or safety relief valve on the altered object, but not to exceed 150 percent of the maximum allowable working pressure, except that the authorized inspector may accept an alternate test.

Note: Where water is used in a hydrostatic test, the temperature of the water should be not less than the ambient temperature and in no case less than 70° Fahrenheit and the maximum temperature during inspection should

not exceed 120° Fahrenheit. If a test is conducted at 1-½ times the maximum allowable working pressure (MAWP) and the owner specified a temperature higher than 120° Fahrenheit, the pressure should be reduced to the MAWP and the temperature should be reduced to 120° Fahrenheit for the close examination.

(e) *Examples of alterations.* Alterations shall include, but are not limited to, the following examples:

(1) to increase the maximum allowable working pressure or temperature of a boiler regardless of whether or not a physical change was made to the boiler;

(2) the addition of new nozzles or openings in a boiler except those classified as repairs;

(3) an increase in any heating surface which results in increasing the heat output or the final temperature above that specified in the original design;

(4) replacement of a pressure retaining part in a boiler with a material of different nominal strength or nominal composition from that used in the original design; and

(5) a decrease in the minimum temperature such that additional mechanical tests are required as specified in the Code.

§ 14-3.4 Reports.

(a) *General* Except as provided in subdivision (b) of this section, anyone making welded repairs or alterations in accordance with these rules shall furnish the department with a report of every welded repair or alteration. The report shall be signed by the authorized inspector who inspected or approved the repair or alteration. The owner of the equipment shall retain a copy of the report for review by an authorized inspector.

(b) *Exemptions.* The following items are exempt only from the reporting requirements:

(1) the installation of backing rings in handhole or manhole openings or the building up of same; and

(2) the seal welding of tubes to the tube sheet.

§ 14-3.5 Hydrostatic and nondestructive tests.

If, in the opinion of the inspector, a hydrostatic test is necessary, the test shall be applied at a pressure of at least the set pressure of the lowest safety valve or safety relief valve, but not to exceed 150 percent of the maximum allowable working pressure. In lieu of a hydrostatic test, if approved by the inspector, radiographic testing, ultrasonic testing, or other applicable nondestructive testing of the repair may be utilized. All tests shall be applied after the repair has been completed.

§ 14-3.6 Welders.

Preparation of welding procedure specifications and the conducting of tests of procedures and welders shall be the responsibility of the party undertaking repairs or alterations. Before repairs or alterations are started, the inspector shall examine the written welding procedure and records of qualification tests to determine if procedures and welders have been properly qualified as required in section IX of the ASME Code. Witnessing of the tests by the inspector is not mandatory, but the inspector shall have the right to call for and witness the making of test coupons by any welder, at any time, and to observe the physical testing of the coupons.

§ 14-3.7 Welder's qualification record.

Any person undertaking repairs or alterations shall have available at the job site a copy of such person's welder's qualification traceable to a supporting weld procedure specification and procedure qualification record of same. These documents shall be made available to the authorized inspector. If more than one welder is undertaking the repair or alteration a welder's qualification record for each welder shall be on the job site.

§ 14-3.8 Welding repairs of cracks.

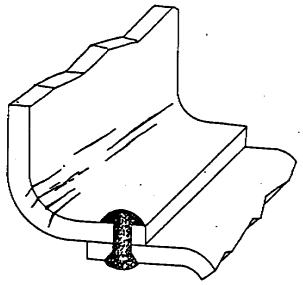
(a) *Removal of defects.* A repair of a defect, such as a crack in a welded joint or base material, may not be made until the defect has been removed. A suitable nondestructive examination method shall be used to assure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a complete penetration weld such as a double butt weld or a single butt weld with or without backing.

Note: Before repairing a cracked area, care should be taken to investigate its cause and to determine its extent. Where circumstances indicate that the crack is likely to recur, consideration should be given to removing the cracked area and installing a patch or other corrective measures.

(b) *Cracks in unstayed areas.* Cracks in unstayed shells, drums or headers of boilers may be repaired by welding, provided the cracks do not extend between rivet holes in a longitudinal seam or parallel to a rivet seam within eight inches, measured from the nearest caulking edge. The total length may be welded, provided the complete repair is radiographed and stress relieved in accordance with section 14-3.15 of this Subpart. Cracks in unstayed areas shall be repaired as specified in figure 14-3.8(2) or by other equivalent methods.

(c) *Cracks in unstayed furnaces.* Cracks of any length in unstayed boiler furnaces may be welded provided the welds are thermally stress relieved in accordance with section 14-3.15 of this Subpart. Welds applied from one side only shall be subject to the approval of the inspector. Field repair of cracks at the knuckle or the turn of the flange of the furnace opening require immediate replacement of the affected area. See Figure 14-3.8 (1) which follows:

FIGURE 14-3.8(1)--UNSTAYED BOILER FURNACES



Cracks at the knuckle or at the turn of the flange of the furnace opening require immediate replacement of the affected area.

(d) Cracks between tube holes in water-tube boiler drums or in wrought or cast steel (but not cast iron) sectional headers may be repaired by welding, provided the plate thickness does not exceed one inch and further provided that there are no more than two such cracks in any one row in any direction, nor more than a total of four such cracks in any one drum or header. The tubes on each side of a cracked ligament shall be removed before any welding is done, and after the welding is completed, the tube holes shall be reamed or otherwise properly prepared for reinstallation of the tubes.

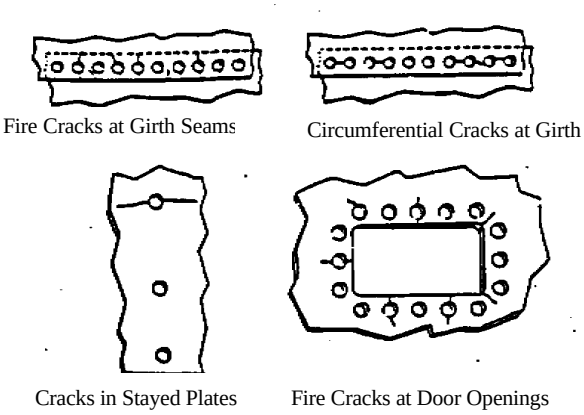
(e) Cracks in plain circular, corrugated, Adamson ring or similar type furnaces may be repaired by welding, provided they are locally stress relieved as required by section 14-3.15 of this Subpart.

(f) Cracks in the fiat portion of tube sheets adjacent to furnaces in Scotch marine boilers require immediate replacement of the affected area.

(g) Prior to repairing a crack between tube holes in a boiler, the tubes at each end of the crack shall be removed and, if considered necessary by the inspector, additional tubes shall be removed. When the welding is completed, the tube holes shall be reamed or otherwise properly prepared for reinstallation of the tubes.

(h) Circumferential cracks in the knuckle or turn of a flange of a furnace or flue opening or adjacent to a manhole opening of an unstayed head require immediate replacement of the affected area.

FIGURE 14-3.8(2) -- RIVET AND STAYBOLD HOLE CRACKS



(i) Cracks radiating from rivet or staybolt holes may be repaired if the plate is not seriously damaged. If the plate is seriously damaged, it shall be replaced. The repair method shall be as follows:

(1) Prior to welding, the rivets or staybolts from which the cracks extend and the adjacent rivets or staybolts shall be removed.

(2) In riveted joints, tack bolts shall be replaced in alternate holes to hold the plate laps firmly.

(3) The cracks shall then be prepared for welding by chipping, grinding or gouging.

(4) In riveted joints, cracks which extend past the inner edge of the plate lap shall be welded from both sides.

(5) Rivet holes shall be reamed before new rivets are driven.

(6) Threaded staybolt holes shall be retapped and new staybolts properly driven and headed.

§ 14-3.9 Wasted areas.

(a) *Shells, drums and headers.* Wasted areas in stayed and unstayed shells, drums and headers may be built up by welding provided that in the judgment of the authorized inspector the strength of the structure will not be impaired. Where extensive weld build-up is employed, the authorized inspector may require an appropriate method of nondestructive examination for the complete surface of the repair. Wasted areas shall be built up by welding as specified in Figure 14-3.9(1) or by other equivalent methods.

(b) *Access openings.* Wasted areas around access openings may be built up by welding provided that in the judgment of the inspector the strength of the structure will not be impaired, or they shall be repaired as specified in Figure 14-3.9(2) or by other equivalent methods. The area to be repaired may not be closer than two inches from any knuckle.

(c) *Flanges.* (1) Wasted flange faces may be cleaned thoroughly and built up with weld metal. Built-up flange faces should be machined in place, if possible, and shall be machined to a thickness not less than that of the original flange or that required by calculations in accordance with the provisions of the applicable section of the ASME Code.

(2) Wasted flanges may also be remachined in place without building up with weld metal provided the metal removed in the process does not reduce the thickness of the flange to a measurement below that calculated above. Flanges which leak because of warpage or distortion and which cannot be remachined shall be replaced with new flanges which have at least the dimensions conforming to the applicable section of the ASME Code.

(d) *Tubes.* Wasted areas on tubes may be repaired by welding provided that in the judgment of the inspector the strength of the tube has not been impaired. Where deemed necessary, competent technical advice shall be obtained from the manufacturer or from another qualified source. This may be necessary when considering such items as size limitations of repaired areas, minimum tube thickness to be repaired, tube environment, location of the tube in the boiler and other similar conditions.

(e) The building up or repair by welding of rivet heads, staybolt ends, braces or attachments to braces, ogee sheets,

grooved, pitted or corroded areas of unstayed surfaces other than as provided above is prohibited.

§ 14-3.10 Seal welding.

(a) *Seal welding of tubes.* Tubes may be seal welded provided the ends of the tube have sufficient wall thickness to prevent burnthrough and the requirements of the appropriate sections of the ASME Code are satisfied. Seal welding of tubes shall be done as specified in Figure 14-3.10(1) or by other equivalent methods.

(b) *Seal welding of riveted joints.* Edges of butt straps or of plate laps and nozzles or connections attached by riveting may be restored to original dimensions by welding. Seal welding may not be used except with the special approval of the authorized inspector, and in no case where cracks are present in riveted areas. Seal welding shall be done as specified in Figure 14-3.10(2) or by other equivalent methods.

(1) Caulking edges of riveted joints, except longitudinal seams of unstayed cylindrical shells or drums subjected to internal pressure, may be seal welded provided the seam is first mechanically caulked and made tight under hydrostatic pressure. Seal welding shall not be considered a strength weld after hydrostatic test.

(2) (i) Leakage at riveted joints or tube ends must be carefully investigated to determine the cause before welding is permitted.

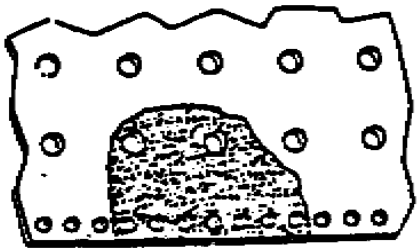
(ii) Prior to seal welding riveted joints, the area should be examined by an appropriate method of nondestructive examination to assure that there are no cracks radiating from the rivet holes. If necessary, the rivets should be removed to assure complete examination of the area. Seal welding should not be performed if cracks are present in riveted areas.

(3) On tubes, seal welding may be applied on either the outside or the inside. On a riveted joint, seal welding shall be applied on only one side.

(4) Care shall be exercised so that the heat from seal welding will not distort the plates or loosen the rivets.

(5) On dished heads, seal welding shall not be applied to the flange closer than one-half inch to the point of tangency of the knuckle of the flange.

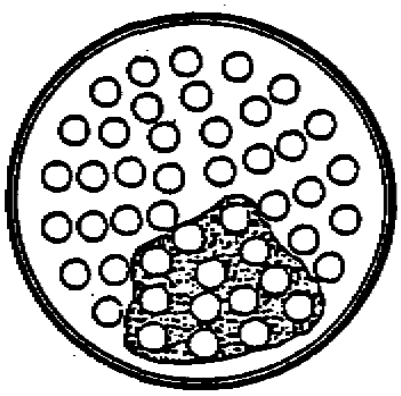
FIGURE 14-3.9(1)--WELD BUILD-UP OF WASTED AREAS



RIVETS AND STAYBOLTS

a. Prior to welding, the rivets or staybolts in the wasted area shall be removed.
b. Threaded staybolt holes shall be retapped after welding.
c. Rivet holes shall be reamed after welding.
d. Welding may not cover rivet or staybolt holes.

TUBESHEET

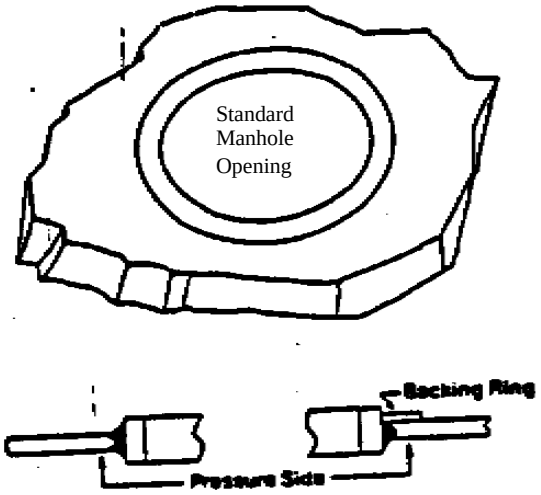


a. Prior to welding, the tubes in the wasted area shall be removed.
b. After welding, the tube holes may be reamed before new tubes are installed.

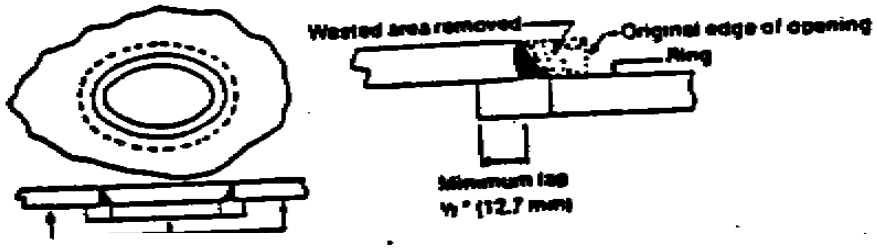
Wasted areas in stayed and unstayed surfaces may be built up by welding provided that in the judgment of the authorized inspector the strength of the structure will not be impaired. Where extensive weld build-up is employed, the authorized inspector may require an appropriate method of nondestructive examination for the complete surface of the repair.

FIGURE 14-3.9(2)

REPAIRS FOR ACCESS OPENINGS



A badly wasted manhole flange may be removed and replaced with a ring-type flame as shown above. The requirements of 14-3.16(a) of flush patches shall be met. A full penetration weld shall be required. The weld may either be double welded or welded from one side with or without a backing ring.

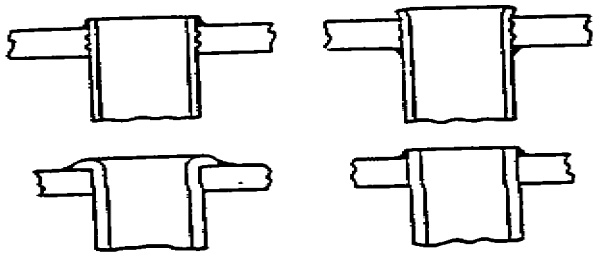


Pressure Side

A badly wasted area around a handhole opening shall be repaired by adding a ring as shown above on the inside of the object.

FIGURE 14-3.10(1)

SEAL WELDING OF TUBES

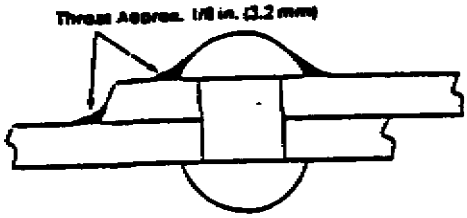


Tubes may be seal welded provided the ends of the tubes have sufficient wall thickness to prevent burn through. Seal welding shall be applied with a maximum of three light layers in lieu of one or two heavy layers.

In watertube boilers, tubes may be seal welded on the inside or outside of the tubesheet.

FIGURE 14-3.10(2)

SEAL WELDING OF RIVETED JOINTS



TYPICAL RIVET JOINT SHOWING SEAL WELD

Seal welding of riveted joints requires the approval of the department. Seal welding may not be considered a strength weld. Seal welding shall be applied in one light layer if practicable, but not more than two layers shall be used.

Prior to welding, the area shall be examined by an appropriate method of nondestructive examination to assure that there are not cracks radiating from the rivet holes. If necessary, the rivets shall be removed to assure complete examination of the area. Seal welding may not be performed if cracks are present in riveted area.

§ 14-3.11 Re-ending and piecing tubes.

Re-ending or piecing of tubes or pipes in either fire tube or water tube boilers is permitted provided the thickness of the remaining tube or pipe is not less than 90 percent of that required by the applicable section of the ASME Code.

§ 14-3.12 Materials.

The materials used in making repairs or alterations shall conform to the requirements of the applicable section of the ASME Code. Materials shall be of known weldable quality, have at least the minimum physical properties of the material to be repaired and be compatible with the original material. The thickness of any patch shall be at least equal to, but not more than 1/8-inch greater than, the material being patched. Carbon or alloy steel having a carbon content of more than 0.35 percent may not be welded.

§ 14-3.13 Welding procedures.

Groove welds shall completely penetrate the thickness of the material being welded. If possible, welding shall be applied from both sides of the plate or a backing strip or ring may be used to ensure complete penetration. Manually applied welds shall have a convex surface on both sides if applied on both sides of the plates being joined, or on one side if welding is applied from one side only. Valleys and undercutting at edges of welded joints are not permitted. The reinforcement may be chipped, ground, or machined off flush with the base metal, if so desired, after the welding has been completed.

§ 14-3.14 Preheating.

Preheating may be required during welding to assist in completion of the welded joint. Where deemed necessary, advice shall be sought from a qualified source.

§ 14-3.15 Postweld heat treatment.

(a) *General.* In repairing carbon or low alloy steels, postweld heat treatment shall be required if it would be required for new construction by the ASME Code. Under certain conditions, postweld heat treatment as outlined in this subdivision may be inadvisable or impractical. In these instances, any other method of postweld heat treatment or special welding method acceptable to the inspector may be used.

(b) *Peening.* In lieu of postweld heat treatment of carbon steels, peening or other methods acceptable to the inspector may be used.

§ 14-3.16 Welded patches.

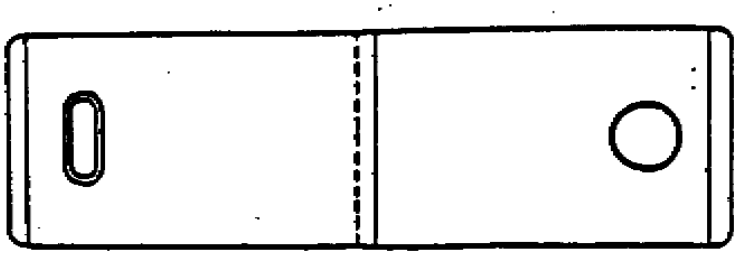
(a) *Flush patches.* The weld around a flush patch shall be a full penetration weld and the accessible surfaces shall be ground flush where required by the applicable section of the ASME Code. The welds shall be subjected to the nondestructive examination method used in the original construction or an acceptable alternate. Flush welded patches shall be applied as specified in Figure 14-3.17-1 or by other equivalent methods.

(b) *Tube patches.* In some situations, it is necessary to weld a flush patch on a tube, such as replacement of tube sections resulting in the restriction of accessibility around the complete circumference of the tube, or when it is necessary to repair a small bulge. This is referred to as a window patch. Window patches shall be applied as specified in Figure 14 3.17-2 or by other equivalent methods.

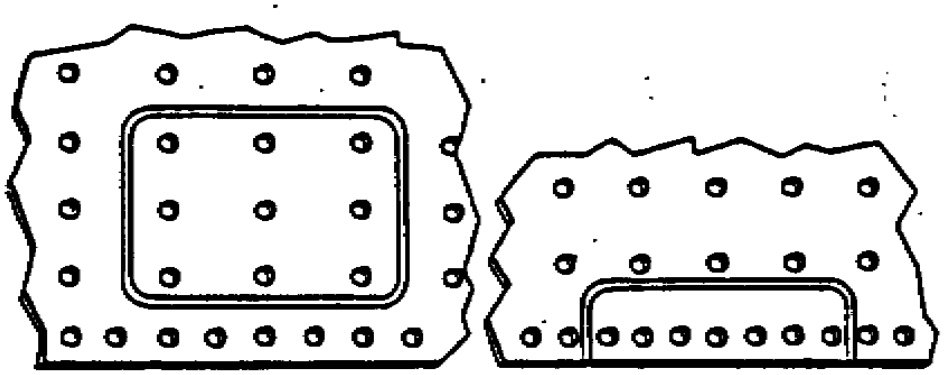
(c) *Lapped and fillet welded patches.* Lapped and fillet welded patches may be applied provided they are not exposed to radiant heat. Lapped and fillet welded patches shall be applied on the pressure side of the sheet. Lapped and fillet welded patches shall have a minimum lap of 1/2 inch. If the area to be patched includes a riveted seam, rivets shall be removed before the patch is applied and new rivets driven before the patch is welded at the edges. New staybolts shall be installed in the patched area, and the heads of the staybolts shall be covered by welding.

FIGURE 14-3.17(1)

FLUSH PATCHES



FLUSH PATCHES IN UNSTAYED AREAS



FLUSH PATCHES IN STAYED AREAS

Before installing a flush patch, the defective metal shall be removed until sound metal is reached. The patch shall be rolled or pressed to the proper shape or curvature. The edges shall align without overlap.

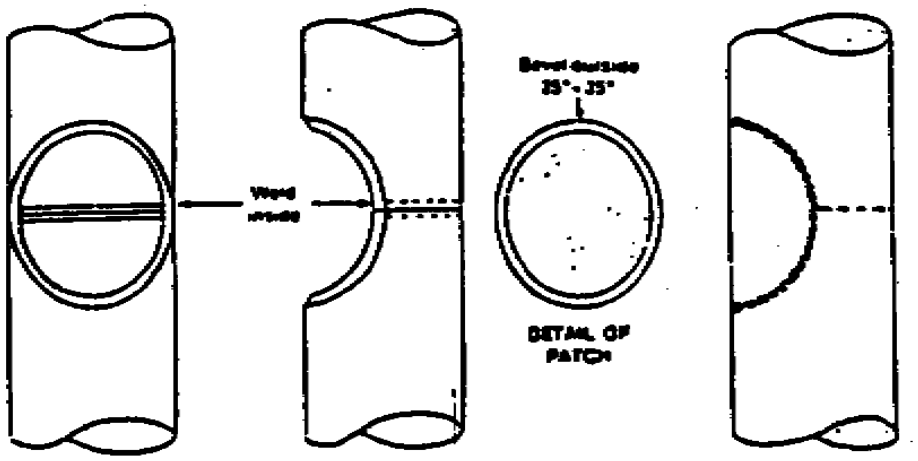
In stayed areas, the weld seams shall come between staybolt rows and riveted seams.

Patches shall be made from material that is at least equal in quality and thickness to the original material.

Patches may be of any shape or size. Corners of patches shall have a radius of such size as is necessary to avoid creating a stress point.

FIGURE 14-3.17(2)

TUBE WINDOW PATCHING METHOD



FRONT AND SIDE VIEW OF TUBE SIDE VIEW SHOWING A PATCH FIT AND WELDED

It may be necessary to weld a flush patch on a tube, since in some situations, accessibility around the complete circumference of the tube is restricted. Window patches shall be applied as follows:

a. The patch shall be made from tube material of the same type, diameter and thickness as the one being repaired.

b. Fitup of the patch is important to weld integrity. The root opening shall be uniform around the patch.

c. The gas tungsten arc welding process shall be used for the initial pass on the inside of the tube and for the initial pass joining the patch to the tube.

d. The balance of the weld may be completed by any appropriate welding process.

§ 14-3.17 Stays.

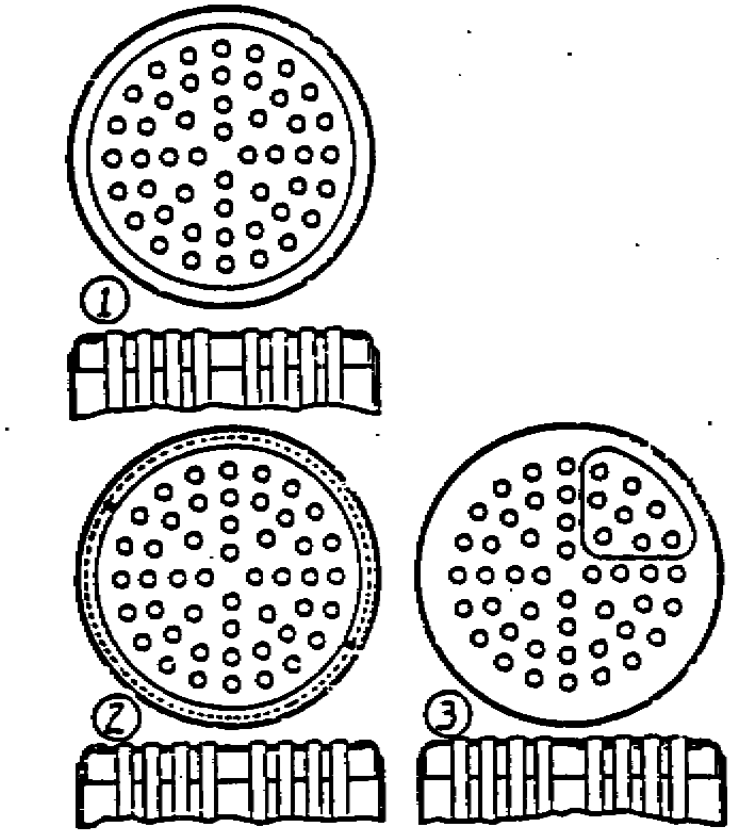
Threaded stays may be replaced by welded-in stays provided that in the judgment of the inspector the plate adjacent to the staybolt has not been materially weakened by wasting away. All requirements of the ASME Code governing welded-in stays shall be met, except that stress relieving other than thermal may be used as provided in section 14-3.15 of this Subpart.

§ 14-3.18 Additional acceptable repair methods.

Repairs and repair methods not covered in this chapter may be used if acceptable to the inspector. Additional methods illustrated in Figures 14-3.19-1 and 14-3.19-2 are acceptable if performed as specified in the figures.

FIGURE 14-3.19(1)

ACCEPTABLE REPAIRS FOR CORRODED OR WORN HEADS OF VERTICAL TUBE OR SIMILAR TYPE BOILERS



1. Flush Butt Welded Head

With this repair, the old head shall be cut close to the point of tangency of the knuckle of the flange, and the new head, previously drilled for tube holes and beveled for adequate welding groove, shall be butt welded to the flanged session of the old head. A back up ring, inserted in sections if necessary, shall be used to ensure weld penetration for the full head thickness.

2. Lapped and Fillet Welded Head

With this repair, the new head shall be lapped under the flange knuckle of the old head, previously slotted as shown to admit the new head, and then fillet welded at the edge.

3. Segmental or Pie-Shaped Butt Welded Patch

FIGURE 14-3.19(2)

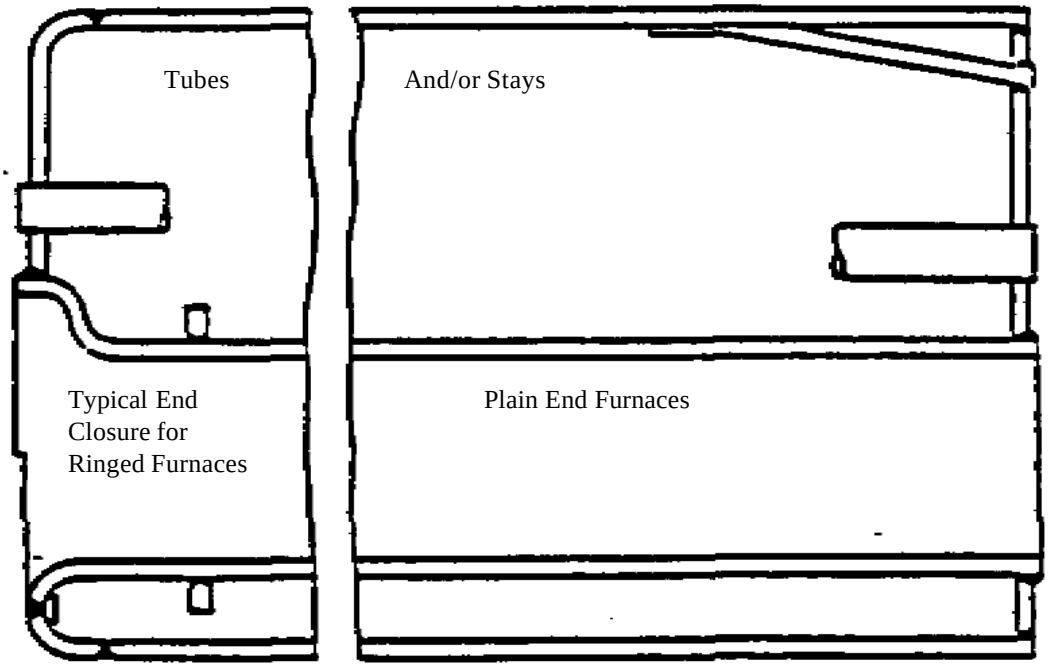
ACCEPTABLE FURNACE RENEWAL

Full Penetration Welds Required.

Do Not Use Backing Ring In Area

Subject To Radiant Heat

Alternate End Assemblies For Ringed Furnaces



Longitudinal seam in furnace double butt-welded and thermally stress-relieved.

For repair, the final joint to each bead may be stress-relieved by peening. The furnace may be welded into a riveted boiler by using adaptable end closures. Ringed furnaces shall be thermally stress-relieved after longitudinal seam and rings have been applied.

RIVETED REPAIRS

§ 14-3.19 Riveted patches.

(a) *General.* When riveted patches are used, they shall be designed and applied using methods acceptable to the department.

(b) *Materials for riveted repair.* Patch material shall meet the applicable requirements of section 14-3.12 of this Subpart.

(c) *Report of riveted repair.* Anyone making a riveted repair shall furnish the department and the owner of the equipment with a report of the repair as specified in sections 14-3.2 and 14-3.3 of this Subpart, after completion of a riveted repair.

RERATING AND DERATING

§ 14-3.20 Rerating of a boiler.

(a) *General requirements.* Rerating of a boiler by increasing the maximum allowable working pressure (MAWP) or temperature or decreasing the minimum temperature such that additional mechanical tests are required, shall be considered an alteration and may be done only after the requirements of paragraphs (1) through (5) of this subdivision have been met.

(1) Revised calculations verifying the suitability of the vessel for the new service conditions shall be requested from the original manufacturer and shall be made available to its authorized inspection agency and the jurisdiction. Where these calculations cannot be obtained from this source, they may be prepared by a registered professional engineer and forwarded for review by the authorized inspection agency and the jurisdiction.

(2) All reratings shall be established in accordance with the requirements of the ASME Code to which the boiler was built, or by computation using the appropriate formulas in the ASME Code, if all essential details are known definitely to comply with said Code.

(3) Current inspection records shall verify that the boiler is satisfactory for the proposed service conditions.

(4) The boiler rerating shall be acceptable to the authorized inspector employed by the authorized inspection agency responsible for the inservice inspections of the object.

(5) The boiler shall be pressure tested, as required, for the new service conditions.

(b) *Report requirements.* After complying with the requirements of paragraphs (a)(1) through (5) of this section, a Report of Alteration (Figure 14-3 c) shall be prepared and completed in accordance with section 14-3.3(c)(1) through (3) and distributed as indicated in subdivision (c) of this section.

(c) *Distribution of report of alteration including rerating.* Legible copies of the complete Report of Alteration, together with attachments, shall be distributed by the organization responsible for the alteration, to the authorized inspection agency responsible for the inservice inspection of the boiler, the owner or user, the department and to the National Board, if the object is so registered.

(d) Stamping or nameplate attachment and authorization of same shall be in accordance with section 14-3.3(b)(1) of this Subpart.

§ 14-3.21 Derating of a boiler.

(a) *General requirements.* Derating of a boiler by decreasing the maximum allowable working pressure may be done only after the requirements of subdivisions (b) through (d) of this section have been met. Derating may be initiated by the owner or the inspector.

(b) *Nameplate requirements.* When a boiler is derated, an additional nameplate shall be permanently attached. The nameplate for derating shall be as follows:

DERATED

_____PSIG AT _____

(MAWP) (Temp)

_____

Registration Number

_____

(Date Derated)

(c) *Nameplate attachment.* Attachment of the nameplate shall be witnessed by the inspector.

(d) *Reports.* The inspector shall report the derating to the department.

SUBPART 14-4

REINSTALLATION OF BOILERS

§ 14-4.1 Permission.

Any boiler that was operated in New York State prior to January 1, 1918, or any boiler changing location within the State may be reinstalled provided an "Application for Permission to Install a Second-Hand Boiler" is filed with the commissioner and permission is granted for reinstallation of same.

Exception: Horizontal-return tubular boilers having a continuous longitudinal lap seam of more than 12 feet in length, shall not be reinstalled.

§ 14-4.2 Inspection.

The boiler shall be thoroughly inspected internally and externally and a hydrostatic pressure test shall be applied if required by the inspector. If the boiler is found to be safe, a certificate of inspection shall be issued.

SUBPART 14-5

HEATING OF LIQUIDS

§ 14-5.1 Internal heater installation prohibited.

A heater for either liquid fuels or other liquids harmful to the boiler shall not be installed directly in the steam or water space within a boiler.

§ 14-5.2 External type heater.

Where an external type heater for such service is used, means must be provided to prevent the introduction into the boiler of liquid fuels or other liquids harmful to the boiler.

SUBPART 14-6

REMOVAL OF WASTE GASES FROM BOILERS

§ 14-6.1 Necessary equipment.

All boilers shall be equipped with means for conducting the products of combustion to a safe place in the outer atmosphere.

§ 14-6.2 Gas-fired boilers.

Gas-fired boilers not exceeding 100 square feet of heating surface shall be provided with a single or double cone type of hood diverter in the stack.

SUBPART 14-7

FORCED CIRCULATION BOILERS

§ 14-7.1 Material and construction requirements.

The material for forced circulation boilers with no fixed steam or water line shall conform to the requirements of this Part. A permanent metal identification tag bearing the standard number shall be attached to the coil by the manufacturer. Replacement coils shall be likewise identified. All other requirements shall also be met except where they relate to special features of construction made necessary in boilers of this type, and to accessories that are manifestly not needed or used in connection with such boilers. This type of boiler is exempt from the requirements of sections 14-9.16 and 14-9.18 and subdivision (b) of section 14-9.36 of this Part.

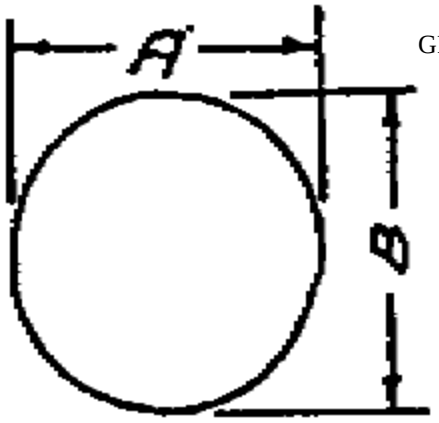
SUBPART 14-8

STANDARD TOLERANCE OF TUBE BENDS

§ 14-8.1 General.

(a) All tube bends must be reasonably smooth and free from injurious dinges, folds, or crimps, and the section outside the bend must be free from any injurious deformations of the tube due to the bending operation.

(b) No tube to show an out-of-roundness at any point of the bend in excess of 5/32 inch as determined by calipering the outside of the tube, on a circumferential radial to the arc of the bend, and deducting the least diameter so found from the greater diameter,



GREATEST DIAMETER

LEAST DIAMETER

out of roundness A and B measured at any point in the bend.

(c) At no point of the bend shall the diameter of the tube be more than one-eighth inch less than the minimum allowable diameter of the tube.

(d) Tolerance given apply to tubes with angle of bend less than 180 degrees and tubes bent in one plane.

(e) After coiling, the tubing in coil boilers shall be free from injurious dinges, folds, or crimps and the outside of the coils shall be free from any injurious deformation.

SUBPART 14-9
POWER BOILERS: NEW INSTALLATIONS

Tubes

§ 14-9.1 Tube ends of fire-tube boilers.

(a) Figure 14-9.1 illustrates some of the acceptable types of tube attachments. Such connections shall be:

(1) expanded and beaded as in sketches (a), (b), and (d);

(2) expanded and beaded and seal welded as in sketch (c);

(3) expanded and seal welded as in sketch (e);

(4) welded, as in sketches (f) and (g).

Tube ends attached by expanding and welding are subject to the following provisions:

Where no bevel or recess is employed, the tube shall extend beyond the tubesheet not less than a distance equal to the tube thickness or 1/8 inch, whichever is the greater, nor more than twice the tube thickness of 1/4 inch, whichever is the lesser (see sketch [e]).

(b) The tubesheet hole may be beveled or recessed, the depth of any bevel or recess shall not be less than the tube thickness or 1/8 inch, whichever is greater, nor more than one-third of the tubesheet thickness, except that when tube thicknesses are equal to or greater than 0.150 inch, the bevel or recess may exceed T/3. Where the hole is beveled or recessed, the projection of the tube beyond the tubesheet shall not exceed a distance equal to the tube wall thickness, see Figure 14-9.1, sketches (f) and (g).

(c) On types of welded attachment shown in sketches (c) and (e), the tubes shall be expanded before and after welding. On types shown in sketches (f) and (g), the tubes may be expanded.

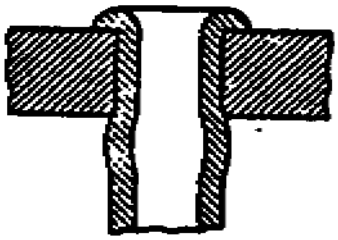
(d) Expanding of tubes by the Prosser method may be employed in combination with any beaded or seal welded attachment method (see sketch [b]).

(e) After seal welding as shown by sketches (c) and (e), a single hydrostatic test of the boiler shall suffice.

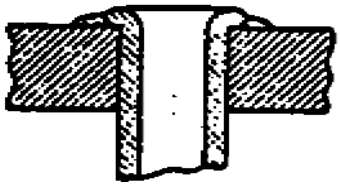
(f) The inner surface of the tube hole in any form of attachment may be grooved or chamfered.

(g) The sharp edges of tube holes shall be taken off on both sides of the plate with a file or other tool.

(a)



(b)



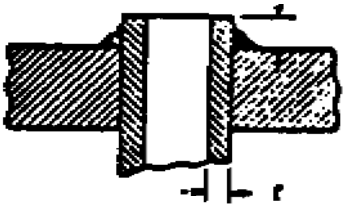
(c)

Not less than t or 1/8 in. (3.2 mm), whichever Is the greater, nor more then 2t or 1/4 in. (6 mm), whichever is the lesser

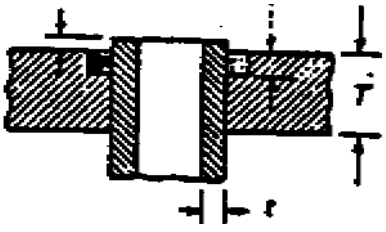
(d)

Not less than t or 1/8 in. (3.2 mm), whichever is the greater, nor more than T/3

Not more than t



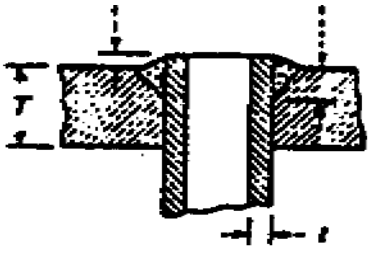
(e)



(f)

Not less than t or 1/8 in. (3.2 mm). whichever is the greater, nor more than T/3

Not more than t



(g)

§ 14-9.2 Tube ends of water, tube boilers and superheaters.

(a) The ends of all tubes, suspension tubes, and nipples shall be expanded and flared not less than one-eighth inch over the diameter of the tube hole on all water-tube boilers and superheaters, or they may be flared not less than one-eight inch, rolled and beaded, or flared, rolled and welded; or rolled and seal welded without flaring, provided the throat of the seal weld is not less than three-sixteenths inch, nor more than three-eighths inch, and the tubes are re-expanded after welding.

(b) Tube ends or weld necks may be fusion welded to the drums of water-tube boilers without expanding or flaring.

(c) Where pipe is used for tubes in water tube boilers, it may be screwed instead of rolled and flared. The ends of stub tubes may be closed by either forge or fusion welding.

(d) Tubes may be seal welded into fittings or headers for both boilers and superheaters after they have been expanded and flared, provided the material in the fittings or headers, does not contain carbon in excess of 0.35 percent.

(e) The ends of all tubes, suspension tubes, and nipples of watertube boilers and superheaters shall project through the tube sheets or headers not less than one-quarter inch nor more than one-half inch before flaring. Where the tubes enter at an angle, the maximum limit of one-half inch shall apply only at the point of least projection.

ACCESS IN INSPECTION OPENINGS

§ 14-9.3 Required openings.

(a) All boilers or parts thereof must be provided with suitable manhole, handhole, or other inspection openings for examination or cleaning, except special types of boilers where such openings are manifestly not needed or used. Specific requirements for access openings in certain types of boilers appear in the ASME Code.

(b) An elliptical manhole opening shall be not less than 11 by 15 inches, or 10 by 16 inches in size. A circular manhole opening shall be not less than 15 inches in diameter. A manhole opening in a boiler drum or shell shall be not less than 15 inches in diameter. A handhole opening in a boiler drum or shell shall be not less than two and three-fourths by three and one-half inches, but it is recommended that, where possible, larger sizes be used.

(c) Manhole, handhole, inspection, and washout openings in a shell or unstayed head shall be designed in accordance with the ASME Code.

(d) When a threaded opening is to be used for inspection or washout purposes, it shall be not less than one-inch pipe size. The closing plug or cap shall be of nonferrous material (except for pressures over 250 pounds). The thread shall be a standard tapered pipe thread, except that a straight thread of equal strength may be used to prevent leakage.

SAFETY VALVES AND SAFETY RELIEF VALVES

§ 14-9.4 Safety valve requirements.

(a) Each boiler shall have at least one safety valve and if it has more than 500 square feet of bare tube water heating surface, or if an electric boiler has a power input more than l,100 kw, it shall have two or more safety valves or safety relief valves. For a boiler with combined bare tube and extended water-heating surface exceeding 500 square feet, two or more safety valves or safety relief valves are required only if the design steam generating capacity of the boiler exceeds 4000 lb/hr. The method of computing the steam-generating capacity of the boiler is given as follows:

The maximum quantity of fuel C that can be burned per hour at the time of maximum forcing is determined by a test. The maximum number of heat units per hour, or CH, is then determined, using the values of H given in the Table below. The weight of steam generated per hour is found by the formula:

$$W = \frac{C \times H}{1100 \times 0.75}$$

where

W = weight of steam generated/hr, lb

C = total weight or volume of fuel burned/hr at time of maximum forcing, lb or cu ft

H = heat of combustion of fuel, Btu/lb or Btu/cu ft (See Table below)

The sum of the safety valve capacities marked on the valves shall be equal to or greater than W.

For the purpose of checking the safety valve capacity, the following values of heats of combustion of various fuels may

be used:

	H = Btu/lb
Semibituminous coal	14,500
Anthracite	13,700
Screenings	12,500
Coke	13,500
Wood, hard or soft, kiln dried	7,700
Wood, hard or soft, air dried	6,200
Wood shavings	6,400
Peat, air dried, 25% moisture	7,500
Lignite	10,000
Kerosene	20,000
Petroleum, crude oil, Pennsylvania	20,700
Petroleum, crude oil, Texas	18,500
Municipal solid waste	7,800
	H = Btu/cu ft
Natural gas	960
Blast-furnace gas	100
Producer gas	150
Water gas, uncarbureted	290

(b) Organic fluid vaporizer generators require special consideration as given in the ASME Code.

§ 14-9.5 Power actuated pressure relieving devices.

For a forced-flow steam generator with no fixed steam and waterline, equipped with automatic controls and protective interlocks responsive to steam pressure, safety valves may be provided in accordance with section 14-9.9 of this Subpart or the following protection against over-pressure shall be provided:

(a) One or more power-actuated pressure relieving valves [3] shall be provided in direct communication with the boiler when the boiler is under pressure and shall receive a control impulse to open when the maximum allowable working pressure at the superheater outlet, as shown in the master stamping, is exceeded. The total combined relieving capacity of the power-actuated relieving valves shall be not less than 10 percent of the maximum design steaming capacity of the boiler under any operating condition as determined by the manufacturer. The valve or valves shall be located in the pressure part system where they will relieve the overpressure. An isolating stop valve of the outside-screw-and-yoke type may be installed between the power-actuated pressure relieving valve and the boiler to permit repairs provided an alternate power-actuated pressure relieving valve of the same capacity is so installed as to be in direct communication with the boiler in accordance with the requirements of this paragraph. Power-actuated pressure relieving valves discharging to intermediate pressure and incorporated into bypass and/or startup circuits by the boiler manufacturer need not be capacity certified. Instead, they shall be marked by the valve manufacturer with a capacity rating at a set of specified inlet pressure and temperature conditions. Power-actuated pressure relieving valves discharging directly to atmosphere shall be capacity certified and ASME Code stamped.

[3] The power-actuated pressure relieving valve is one whose movements to open or close are fully controlled by a source of power (electricity, air, stem, or hydraulic). The valve may discharge to atmosphere or to a container at lower pressure. The discharge capacity may be affected by the downstream conditions, and such effects shall be taken into account. If the power-actuated pressure relieving valves are also positioned in response to other control signals, the control impulse to prevent overpressure shall be responsive only to pressure and shall override any other control function.

(b) Spring-loaded safety valves shall be provided, having a total combined relieving capacity, including that of the power-actuated pressure relieving capacity installed under subdivision (a) of this section, of not less than 100 percent of the

maximum designed steaming capacity of the boiler, as determined by the manufacturer, except when the alternate provisions of subdivision (c) of this section are satisfied. In this total, no credit in excess of 30 percent of the total required relieving capacity shall be allowed for the power-actuated pressure relieving valves actually installed. Any or all of the spring-loaded safety valves may be set above the maximum allowable working pressure of the parts to which they are connected, but the set pressures shall be such that when all of these valves (together with the power-actuated pressure relieving valves) are in operation the pressure will not rise more than 20 percent above the maximum allowable working pressure of any part of the boiler, except for the steam piping between the boiler and the prime mover.

(c) The total installed capacity of spring-loaded safety valves may be less than the requirements of subdivision (b) of this section provided all of the following conditions are met:

(1) The boiler shall be of no less steaming capacity than 1,000,000 lb/hr and installed in a unit system for power generation (i e., a single boiler supplying a single turbine-generator unit).

(2) The boiler shall be provided with automatic devices, responsive to variations in steam pressure, which include no less than all the following:

(i) a control capable of maintaining steam pressure at the desired operating level and of modulating tiring rates and feedwater flow--in proportion to a variable steam output; and

(ii) a control which overrides subparagraph (i) of this paragraph by reducing the fuel rate and feedwater flow when the steam pressure exceeds the maximum allowable working pressure by 10 percent; and

(iii) a direct-acting overpressure-trip-actuating mechanism, using an independent pressure sensing device, that will stop the flow of fuel and feedwater to the boiler, at a pressure higher than the set pressure of subparagraph (ii) of this paragraph, but less than 20 percent above the maximum allowable working pressure.

(3) There shall be not less than two spring-loaded safety valves and the total rated relieving capacity of the spring-loaded safety valves shall be not less than 10 percent of the maximum designed steaming capacity of the boiler as determined by the manufacturer. These spring-loaded safety valves may be set above the maximum allowable working pressure of the parts to which they are connected but shall be set such that the valves will lift at a pressure no higher than 20 percent above the maximum allowable working pressure.

(4) At least two of these spring-loaded safety valves shall be equipped with a device that directly transmits the valve stem lift action to controls that will stop the flow of fuel and feedwater to the boiler. The control circuitry to accomplish this shall be arranged in a "fail-safe" manner (see *Note).*

Note: "Fall-safe" shall mean a circuitry arranged as either of the following:

(1) Energize to trip: There shall be at least two separate and independent trip circuits served by two power sources, to initiate and perform the trip action. One power source shall be a continuously charged DC battery. The second source shall be an AC-to-DC converter connected to the DC system to charge the battery and capable of performing the trip action. The trip circuits shall be continuously monitored for availability. It is not mandatory to duplicate the mechanism that actually stops the flow of fuel and feedwater.

(2) De-energize to trip: If the circuits are arranged in such a way that a continuous supply of power is required to keep the circuits closed and operating and such that any interruption of power supply will actuate the trip mechanism, then a single trip circuit and single power supply will be enough to meet the requirements of this subparagraph.

(5) The power supply for all controls and devices required by this subdivision shall include at least one source contained within the same plant as the boiler and which is arranged to actuate the controls and devices continuously in the event of failure or interruption of any other power sources.

(d) When stop valves are installed in the water-steam flow path between any two sections of a forced-flow steam generator with no fixed steam and waterline:

(1) the power-actuated pressure relieving valve(s) required by subdivision (a) of this section shall also receive a control impulse to open when the maximum allowable working pressure of the component, having the lowest pressure level upstream to the stop valve, is exceeded; and

(2) the spring-loaded safety valves shall be located to provide the pressure protection requirements in subdivision (b) or (c) of this section.

(e) A reliable pressure-recording device shall always be in service and records kept to provide evidence of conformity to the above requirements.

§ 14-9.6 Setting of safety valves and safety relief valves.

(a) One or more safety valves or safety relief valves on the boiler proper shall be set at or below the maximum allowable working pressure. If additional valves are used the highest pressure setting shall not exceed the maximum allowable working pressure by more than three percent. The complete range of pressure settings of all the saturated steam safety valves on a boiler shall not exceed 10 percent of the highest pressure to which any valve is set. Pressure setting of safety relief valves on high-temperature water boilers may exceed this 10 percent range.

(b) When two or more boilers which are allowed different pressures are connected to a common steam main, all safety valves shall be set at a pressure not exceeding the lowest pressure allowed.

Exception: When two or more boilers which are allowed different pressures, are connected to a common steam main, and all safety valves are not set at a pressure not exceeding the lowest pressure allowed, the boiler or boilers allowed the lower pressure shall each be protected by a safety valve or valves placed on the connecting pipe to the steam main; the area or combined area of the safety valve or valves placed on the connecting pipe to the steam main shall not be less than the area of the connecting pipe, except when the steam main is smaller than the connecting pipe, when the area or combined area of safety valve or valves placed in the connecting pipe shall not be less than the area of the steam main. Each safety valve placed on the connecting pipe shall be set at a pressure not exceeding the pressure allowed on the boiler it protects.

When two or more boilers are allowed to operate at different steam pressures and are connected to a common steam main and their respective safety valves are not set to blow off at the lowest pressure allowed, the headers or outlets from the lower pressure boilers shall be equipped with safety valves, the aggregate capacity of which shall be sufficient to pass the total amount of steam that can be generated in the higher pressure boilers.

When one or more boilers are used for reserve purposes only and such boilers are not operated in common with the other boilers, nonreturn valves of an approved type may be used in lieu of required safety valves. The nonreturn valves shall be located as close as practicable to the boiler with ample drain between valves.

(c) Where no mechanical feed is attached to a boiler, the safety valve shall be set at a pressure of six percent or more under the pressure of the main source of supply feeding the boiler. A return trap shall not be considered as a mechanical feeding device.

§ 14-9.7 Safety valve and safety relief valve testing and repairs.

(a) *Testing frequency.* The testing of frequencies of safety and safety relief valves will vary from plant to plant due to operating conditions. However, under normal conditions, the following schedule is required and a log must be kept of these tests:

(1) Power boilers where the maximum allowable working pressure is up to 400 psi:

(i) manually tested not less than once each month; and

(ii) pressure tested once each year.

(2) Power boilers where the maximum allowable working pressure is over 400 psi must be pressure tested at least once each year.

(b) *Repairs of safety valves and safety relief valves.* Repairs performed on safety valves and safety relief valves by other than the manufacturer must be performed by an organization in possession of a current National Board VR Certificate of Authorization.

§ 14-9.8 Stamping of valves.

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

(a) The name or identifying trademark of the manufacturer.

(b) Manufacturer's design or type number.

(c) Size ……in. Seat diameter ……in.

(The pipe size of the valve inlet.)

(d) Pressure …….lb.

(The steam pressure at which it is to blow.)

(e) Year built, or alternatively, a coding may be marked on the valve such that the valve manufacturer can identify the year built.

(f) Capacity …….lb. per hr.

(In accordance with sections 14-9.9 and 14-9.12 of this Subpart.)

(g) Capacity lift ……in.

(Capacity lift-distance the valve disk rises under the action of the steam when the valve is blowing under a pressure of three percent above the set pressure.)

(h) ASME symbol.

§ 14-9.9 Valve capacity.

(a) The minimum safety valve or safety relief valve relieving capacity for other than electric boilers, waste heat boilers, organic fluid vaporizer generators, and forced-flow steam generators with no fixed steam and waterline, when provided in accordance with section 14-9.5(c) of this Subpart shall be determined on the basis of the pounds of steam generated per hour per square foot of boiler heating surface and waterwall heating surface, as given in the following table:

Minimum pounds of steam per hour per square foot of surface

	Boiler heating surface			*Waterwall surfacee*		
	Hand-fired	Stoker-fired	Oil, gas, or pulverized-fuel -fired	Hand-fired	Oil, gas, or Stoker-fired	pulverized-fuel-fired
Fire-tube boilers	5	7	8	8	10	14
Water-tube boilers	6	8	l0	8	12	16

Note.: When a boiler is fired only by a gas having a heat value not in excess of 200 Btu per cubic foot, the minimum safety valve relieving capacity may be based on the values given for hand-fired boilers above.

(1) The required steam relieving capacity is lb/hr of the safety relief valves on a high-temperature water boiler shall be determined by dividing the maximum output in Btu/hr at the boiler nozzle obtained by the firing of any fuel for which the unit is designed, by 1000.

(2) Any economizer which may be shut off from the boiler, thereby permitting the economizer to become a fired pressure vessel, shall have one or more safety relief valves with a total discharge capacity, calculated from the maximum expected heat absorption in Btu/hr, as determined by the manufacturer, divided by 1000. This absorption shall be stated in the stamping.

(3) The required relieving capacity in pounds per hour of the safety or safety relief valves on a waste heat boiler shall be determined by the manufacturer. When auxiliary firing is to be used in combination with waste heat recovery, the maximum output shall include the effect of such firing in the total required capacity. When auxiliary firing is to be used in place of waste heat recovery, the required relieving capacity shall be based on auxiliary firing or waste heat recovery, whichever is higher.

(4) The minimum safety valve or safety relief valve relieving capacity for electric boilers shall be 3 1/2 lb/hr/kw input.

(5) Organic fluid vaporizer generators require special consideration as given in the ASME Code.

(b) In many cases a greater relieving capacity of safety valves will have to be provided than the minimum specified by this Subpart and in every case the requirements of this section shall be met.

(c) The heating surface shall be computed as follows: Heating surface, as part of a circulating system in contact on one side with water or wet steam being heated and on the other side with gas or refractory being cooled, shall be measured on

the side receiving heat. Boiler heating surface and other equivalent surface outside the furnace shall be measured circumferentially plus any extended surface. Waterwall heating surface and other equivalent surface within the furnace shall be measured as the projected tube area (diameter x length) plus any extended surface on the furnace side. In computing the heating surface for this purpose, only the tubes, fireboxes, shells, tubesheets, and the projected area headers need be considered, except that for vertical firetube steam boilers, only that portion of the tube surface up to the middle gage cock is to be computed. The minimum number and size of safety valves required shall be determined on the basis of the aggregate relieving capacity and the relieving capacity marked on the valves by the manufacturer. Where the operating conditions are changed, or additional heating surface such as water screens or waterwalls is connected to the boiler circulation, the safety valve capacity shall be increased, if necessary, to meet the new conditions. The additional valves required on account of changed conditions may be installed at the boiler outlet or on the steam line between the boiler and the main stop valve except when the boiler is equipped with a superheater or other piece of apparatus, in which case they may be installed on the steam pipes between the boiler drum and the inlet to the superheater or other apparatus, provided that the steam main between the boiler and points where a safety valve or valves may be attached has a cross-sectional area at least three times the combined areas of the inlet connections to the safety valves applied to it.

(d) If the valve capacity cannot be computed or if it is desirable to prove the computations, it may be checked in any one of the three following ways, and if found insufficient, additional capacity shall be provided:

(1) By making an accumulation test, that is, by shutting off all other steam-discharge outlets from the boiler and forcing the fires to the maximum. The safety valve equipment shall be sufficient to prevent an excess pressure beyond that specified in section 14-9.9(e) of this Subpart. This method should not be used on a boiler with a superheater or reheater or on a high-temperature water boiler.

(2) By measuring the maximum amount of fuel that can be burned and computing the corresponding evaporative capacity upon the basis of the heating value of the fuel (see section 14-9.9[a] of this Subpart).

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

(e) The valve capacity for each boiler shall be such that the valve or valves will discharge all the pressure that can be generated by the boiler without allowing the pressure to rise more than six percent above the highest pressure at which any valve is set and in no case to more than six percent above the maximum allowable working pressure. The maximum capacity of a boiler shall be determined by the manufacturer and shall be based on the capacity of the fuel-burning equipment, on the air supply, draft, etc.

§ 14-9.10 Safety valve connections.

(a) When two or more safety valves are used on a boiler, they may be mounted either separately or as twin valves made by placing individual valves on Y bases, or duplex valves having two valves in the same body casing. Twin valves made by placing individual valves on Y bases, or duplex valves having two valves in the same body, shall be of approximately equal capacity. When not more than two valves of different sizes are mounted singly, the relieving capacity of the smaller valve shall be not less than 50 percent of that of the larger valve. When a boiler is fitted with two or more safety valves or safety relief valves on one connection, this connection to the boiler shall have a cross sectional area not less than the combined areas of inlet connections of all the safety valves with which it connects and shall also meet the requirements of section 14-9.10(b) of this Subpart.

(b) The safety valve or safety relief valve or valves shall be connected to the boiler independent of any other steam connection, and attached as close as possible to the boiler or normal steam flow path, without any unnecessary intervening pipe or fitting. Such intervening pipe or fitting shall be not longer than the face-to-face dimension of the corresponding tee fitting of the same diameter and pressure under the corresponding American National Standard. Every safety valve shall be connected so as to stand in an upright position, with spindle vertical. On high temperature water boilers of the watertube forced circulation type, the valve shall be located at the boiler outlet. Safety valves may be attached to drums or headers by welding provided the welding is done in accordance with Code requirements. Safety valves may be attached to drums or headers provided the welding is done in accordance with the requirements of this Part.

(c) (1) The opening or connection between the boiler and the safety valve shall have at least the area of the valve inlet. No valve of any description shall be placed between the required safety valve or safety relief valve or valves and the boiler, nor on the discharge pipe between the safety valve or safety relief valve and the atmosphere. When a discharge pipe is used, the cross-sectional area shall be not less than the full area of the valve outlet or of the total of the areas of the valve outlets discharging thereinto and shall be as short and straight as possible and so arranged as to avoid undue stresses on the valve or valves.

(2) All safety valve or safety relief valve discharges shall be so located or piped as to be carried clear from running boards or platforms. Ample provision for gravity drain shall be made in the discharge pipe at or near each safety valve, and where water of condensation may collect. Each valve shall have an open gravity drain through the casing below

the level of the valve seat. For iron and steel-bodied valves exceeding 2 ½ inch size the drain hole shall be tapped not less than three-eighths inch pipe size.

(3) Discharge piping from safety relief valves on high temperature water boilers shall be provided with adequate provisions for water drainage as well as the steam venting. The installation of cast iron bodied safety relief valves for high temperature water boilers is prohibited.

(4) The discharge of safety valves or safety relief valves shall be located so as to prevent scalding.

§ 14-9.11 Muffler on safety valve or safety relief valve.

(a) If a muffler is used on a safety valve or safety relief valve it shall have sufficient outlet area to prevent back pressure from interfering with the proper operation and discharge capacity of the valve. The muffler plates or other devices shall be so constructed as to avoid any possibility of restriction of the steam passages due to deposit.

(b) Mufflers shall not be used on high-temperature water boiler safety relief valves.

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

§ 14-9.12 Blowdown adjustment.

(a) Safety valves shall be designed and constructed to operate without chattering and to attain full lift at a pressure no greater than 3 percent above their set pressure. After blowing down, all valves shall close at a pressure not lower than 96 percent of their set pressure, except that all drum valves installed on a single boiler may be set to reseat at a pressure not lower than 96 percent of the set pressure of the lowest set drum valve. The minimum blowdown for spring-loaded safety or safety relief valves shall be 2 percent of the set pressure. Safety valves used on forced-flow steam generators with no fixed steam and waterline, and safety relief valves used on high-temperature water boilers, may be set and adjusted to close after blowing down not more than 10 percent of the set pressure. The valves for these special uses must be so adjusted and marked by the manufacturer.

(b) The blowdown adjustment shall be made and sealed by the manufacturer.

(c) The popping point tolerance plus or minus shall not exceed the following: two pounds for pressures up to and including 70 pounds, three percent for pressures from 71 to 300 pounds and 10 pounds for pressures from 301 to 1000 pounds, and one percent for pressures over 1000 pounds.

§ 14-9.13 Safety valve construction and rating.

(a) To insure the valve being free, each safety valve shall have a substantial lifting device by which the valve disk may be positively lifted from its seat when there is at least 75 percent of fall working pressure on the boiler. The lifting device shall be such that it cannot lock or hold the valve disk in lifted position when the exterior lifting force is released. Disks of safety relief valves used on high-temperature water boilers shall not be lifted while the temperature of the water exceeds 200° Fahrenheit. If it is desired to lift the valve disk to assure that it is free, this shall be done when the valve is subject to a pressure of at least 75 percent of the set pressure. For high-temperature water boilers, the lifting mechanism shall be sealed against leakage.

(b) The seats and disks of safety valves shall be of suitable material to resist corrosion. The seat of a safety valve shall be fastened to the body of the valve in such a way that there is no possibility of the seat lifting.

(c) The spring shall be designed so that the full lift spring compression shall be no greater than 80 percent of the nominal solid deflection. The permanent set of the spring (defined as the difference between the free height and height measured 10 minutes after the spring has been compressed solid three additional times after presetting at room temperature) shall not exceed 0.5 percent of the free height.

(d) (1) The spring in a safety valve or safety relief valve shall not be reset for any pressure more than five percent above or below that for which the valve is marked unless the new setting is within the spring design range established by the manufacturer or is determined to be acceptable to the manufacturer. If the set pressure is to be adjusted within the limits specified above, the adjustment shall be performed by the manufacturer, its authorized representative, or an assembler. An additional valve data tag identifying the new set pressure, capacity, and date shall be furnished and installed, and the valve shall be resealed.

(2) If the set pressure of a valve is changed so as to require a new spring, the spring shall be acceptable to the manufacturer. The spring installation and valve adjustment shall be performed by the manufacturer, its authorized representative, or an assembler. A new nameplate shall be furnished and installed, and the valve shall be resealed.

(e) A safety valve over three inches in size, used for pressures greater than 15 psi gage, shall have a flanged inlet connection or a welding end inlet connection. The dimensions of flanges subjected to boiler pressure shall conform to the American National Standards.

(f) When the valve casing is marked as required by section 14-9.8 of this Subpart, it shall be the guarantee by the manufacturer that the valve also conforms to the details of construction herein specified.

(g) All safety valves shall be so constructed that the failure of any part cannot obstruct the free and full discharge of steam from the valve. Safety valves shall be of the direct spring loaded pop type, with seat inclined at any angle between 45 and 90 degrees, inclusive, to the center line of the spindle. The maximum rated capacity of a safety valve shall be determined by actual steam flow at a pressure of three percent in excess of that at which the valve is set to blow, and with a blowdown in accordance with section 14-9.12 of this Subpart and credited with 90 percent of the flow developed.

(h) Safety valves may be used which give any opening up to the full discharge capacity of the area of the opening of the inlet of the valve, provided the movement of the valve is such as not to induce lifting of water in the boiler.

(i) Dead-weight or weighted-lever safety valves shall not be used.

(j) For high-temperature water boilers safety relief valves shall be used. Such valves shall have a closed bonnet. For purposes of selection the capacity rating of such safety relief valves shall be expressed in terms of actual steam flow determined on the same basis as for safety valves. In addition, the safety relief valves shall be capable of satisfactory operation when relieving water at the saturation temperature corresponding to the pressure at which the valve is set to blow.

§ 14-9.14 Superheater safety valves.

(a) Every attached superheater shall have one or more safety valves near the outlet. If the superheater outlet header has a full, free, steam passage from end to end and is so constructed that steam is supplied to it at practically equal intervals throughout its length so that there is a uniform flow of steam through the superheater tubes and the header, the safety valve, or valves, may be located anywhere in the length of the header.

(b) The discharge capacity of the safety valve, or valves, on an attached superheater may be included in determining the number and size of the safety valves for the boiler, provided there are no intervening valves between the superheater safety valve and the boiler, and provided the discharge capacity of the safety valve, or valves, on the boiler, as distinct from the superheater, is at least 75 percent of the aggregate valve capacity required.

(c) Every independently fired superheater which may be shut off from the boiler and permit the superheater to become a fired pressure vessel shall have one or more safety valves having a discharge capacity equal to six pounds of steam per square foot of superheater surface measured on the side exposed to the hot gases. In the case of electrically heated superheaters, the safety valve capacity shall be based upon 3 1/2 lb/hr/kw input. The number of safety valves installed shall be such that the total capacity is at least equal to that required.

(d) A soot-blower connection may be attached to the same outlet from the superheater that is used for the safety-valve connection.

(e) (1) Every safety valve used on a superheater discharging superheated steam at a temperature over 450 Fahrenheit shall have a casing, including the base, body, bonnet and spindle, of steel, steel alloy- or equivalent heat-resisting material.

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

(f) Every reheater shall have one or more safety valves, such that the total relieving capacity is at least equal to the maximum steam flow for which the reheater is designed. At least one valve shall be located in the steam flow path between the reheater outlet and the first stop valve. The location shall be suitable for the service intended and shall provide the overpressure protection required. The pressure drop upstream of each safety valve shall be considered in the determination of set pressure and relieving capacity of that valve. The relieving capacity of that valve shall be not less than 15 percent of the required total. The capacity of reheater safety valves shall not be included in the required relieving capacity for the boiler and superheater.

§ 14-9.15 Outlet connections.

(a) Every boiler shall have proper outlet connections for the required safety valve, or valves, independent of any other outside steam connection, the area of opening to be at least equal to the aggregate areas of inlet connections of all of the safety valves to be attached thereto. An internal collecting pipe, splash plate, or pan may be used, provided the total area for inlet of steam thereto is not less than twice the aggregate areas of the inlet connections of the attached safety valves. The holes in such collecting pipes shall be at least one-quarter inch in diameter and the least dimension in any other form of opening for inlet of steam shall be one-quarter inch. Such dimensional limitations to operation for steam need not apply to steam scrubbers or driers provided the net free steam inlet area of the scrubber or drier is at least 10 times the total area of

the boiler outlets for the safety valves.

(b) If safety valves are attached to a separate steam drum or dome, the opening between the boiler proper and the steam drum or dome shall be not less than required by subdivision (a) of this section.

WATER LEVEL INDICATORS

§ 14-9.16 Water gage glasses.

(a) Each boiler, except forced-flow steam generators with no fixed steam and waterline, and high-temperature water boilers of the forced circulation type that have no steam and waterline, shall have at least one water gage glass. Boilers operated at pressures over 400 p si shall be provided with two water gage glasses which may be connected to a single water column or connected directly to the drum. Two independent remote level indicators may be provided instead of one of the two required gage glasses for boiler drum water level indication in the case of power boilers with all drum safety valves set at or above 900 psi. When both remote level indicators are in reliable operation, the remaining gage glass may be shut off, but shall be maintained in serviceable condition. When the direct reading of gage glass water level is not readily visible to the operator in his working area, two dependable indirect indications shall be provided, either by transmission of the gage glass image or by remote level indicators.

(b) The lowest visible part of the water gage glass shall be at least two inches above the lowest permissible water level, at which level there will be no danger of overheating any part of the boiler when in operation at that level. When remote level indication is provided for the operator in lieu of the gage glass, the same minimum level reference shall be clearly marked.

(c) Connections from the boiler to the remote level indicator shall be at least 3/4 inch pipe size to and including the isolation valve and from there to the remote level indicator at least I/2 inch outside diameter tubing. These connections shall be completely independent of other connections for any function other than water level indication. For pressures of 400 psi or over, lower connections to drums shall be provided with shields, sleeves, or other suitable means to reduce temperature differentials in the shells or heads.

(d) Forced-flow steam generators with no fixed steam and waterline and the high-temperature water boiler of the forced circulation type require no water gage glass or gage cocks.

(e) Boilers of the horizontal firetube type shall be so set that when the water is at the lowest reading in the water gage glass there shall be at least three inches of water over the highest point of the tubes, flues, or crown sheets.

(f) The bottom mounting for water glass and for water column, if used, must extend not less than 1 1/2 inch inside the boiler and beyond any obstacle immediately above it, and the passage therein must be straight and horizontal.

(g) Tubular water glasses must be equipped with a protecting shield.

§ 14-9.17 Shutoff valves.

(a) (l) Each water-gage glass shall be equipped with a top and a bottom shutoff valve of such through-flow construction as to prevent stoppage by deposits of sediments. If the lowest valve is more than seven feet above the floor or platform from which it is operated, the operating mechanism shall indicate by its position whether the valve is open or closed. The pressure-temperature rating shall be at least equal to that of the lowest set pressure of any safety valve on the boiler drum and the corresponding saturated steam temperature.

(2) Straight-run globe valves of the ordinary type as shown in Figure P-43(a) shall not be used on such connections.

(3) Automatic shutoff valves on water gages, shall conform to the following requirements:

(i) check valves in upper and lower fittings shall be of solid noncorrosive metal ball type to avoid need for guides;

(ii) ball check valves in upper and lower fittings must open by gravity and the lower ball check valve must rise vertically to its seat;

(iii) the check balls must be not smaller than 1/2 inch in diameter, and the diameter of the circle of contact with the seat must be not greater than two-thirds of the diameter of the check ball. The space around each ball must be not less than 1/8 inch, and the travel movement from the normal resting place to the seat must be not less than 1/4 inch;

(iv) the ball seat in the upper fitting must be a flat seat with either a square or a hexagonal opening, or otherwise arranged so that the steam passage can never be completely closed by this valve;

(v) the shutoff valve in the upper fitting must have a projection which holds the ball at least 1/4 inch away from its seat when the shutoff valve is closed; and

(vi) the balls must be accessible for inspection. Means must be provided for removal and inspection of the

lower ball check valve while the boiler is under steam pressure. These restrictions do not apply to closing the valves by external methods.

(b) When shutoffs are used on the connections to a water column, they shall be either outside-screw-and-yoke or lever-lifting type gate valves or stopcocks with levers permanently fastened thereto and marked in line with their passage, or of such other through-blow construction as to prevent stoppage by deposits of sediment, and to indicate by the position of the operating mechanism whether they are in open or closed position; and such valves or cocks shall be locked or sealed open. Where stopcocks are used they shall be of a type with the plug held in place by a guard or gland.

§ 14-9.18 Gage cocks.

(a) Each boiler shall have three or more gage cocks located within the visible length of the water glass, except when the boiler has two water glasses located on the same horizontal lines.

(b) Boilers not over 36 inches in diameter in which the heating surface does not exceed 100 square feet need have but two gage cocks.

(c) The gage cock connections shall not be less than one-half inch pipe size.

§ 14-9.19 Pressure and temperature gages.

(a) Each boiler shall have a pressure gage so located that it is easily readable. The pressure gage shall be installed so that it shall at all times indicate the pressure in the boiler. Each steam boiler shall have the pressure gage connected to the steam space or to the water column or its steam connection. The steam gage shall be connected to a siphon or equivalent device of sufficient capacity to keep the gage tube filled with water and so arranged that the gage cannot be shut off from the boiler except by a cock placed near the gage and provided with a tee or lever handle arranged to be parallel to the pipe in which it is located when the cock is open. For boilers carrying 500 pounds pressure or over, valves may be used in place of cocks. Steam gage connections which are filled with water or steam shall be suitable for the maximum allowable working pressure and steam temperature but if the temperature exceeds 406° Fahrenheit, brass or copper pipe or tubing shall not be used. The connections to the boiler, except the syphon, shall not be less than one-quarter inch standard pipe size but where steel or wrought-iron pipe or tubing is used, they shall be not less than one-half inch inside diameter. That portion of the connection used as a syphon next to the steam gage shall be not less than one-quarter inch inside diameter.

(b) The wall thickness of all pipe connections shall comply at least with the requirements of the ASME Code.

(c) Where the use of a pipe longer than 10 feet becomes necessary, an exception may be made to the rule that the gage must be arranged so that it cannot be shut off except by a cock placed near the gage, and a shutoff valve or cock arranged so that it can be locked or sealed open may be used near the boiler. Such a pipe shall be of ample size and arranged so that it may be cleared by blowing out.

(d) Each forced-flow steam generator with no fixed steam and waterline shall be equipped with pressure gages or other pressure measuring devices located as follows:

(1) at the boiler or superheater outlet (following the last section which involves absorption of heat);

(2) at the boiler or economizer inlet (preceding any section which involves absorption of heat); and

(3) upstream of any shutoff valve which may be used between any two sections of the heat absorbing surface.

(e) Each high-temperature water boiler shall have a temperature gage so located and connected that it shall be easily readable. The temperature gage shall be installed so that it at all times indicates the temperature in degrees Fahrenheit of the water in the boiler, at or near the outlet connection.

§ 14-9.20 Steam gage dial.

The dial of the steam gage shall be graduated to approximately double the pressure at which the safety valve is set but in no case to less than one and one-half times this pressure.

§ 14-9.21 Inspector's test gage connection.

Each boiler shall be provided with a one-quarter inch pipe size valved connection for the exclusive purpose of attaching a test gage when the boiler is in service, so that the accuracy of the boiler steam gage can be ascertained.

FITTINGS AND APPLIANCES

§ 14-9.22 Fittings.

(a) (1) The flanges of all valves and pipe fittings of cast iron or steel shall conform to the American National Standards accepted by ASME.

Note: Flange bolts or bolt studs shall conform to a standard accepted by ASME and the bolts or bolt studs shall extend completely through the nut. (Where the word "fittings" is used, it is understood that pipe fittings are meant and it does not include, other types.)

(2) All valves and fittings shall be marked as required by ASME.

(3) Rolled or forged flanges may be in accordance with the requirements of ASME.

(4) Valves and other boiler appurtenances, such as water columns, may have fusion-welded joints provided the welding procedure and welding operator are qualified under the requirements of ASME except that no stress-relieving, radiographic examination, or inspection of the joint is required. The manufacturer shall furnish, if requested, a statement certifying that these requirements have been met.

(b) The minimum pressure and temperature rating for all valves and fittings in steam, feedwater, blowoff, and miscellaneous piping shall be equal to the pressure and temperature specified by ASME for the connected piping on the side that has the higher pressure, except that in no case shall the pressure be less than 100 psi, and for pressures not exceeding 100 psi in feedwater and blowoff service, the valves and fittings shall be equal at least to the requirements of the American National Standards for class 125 cast iron or class 150 steel accepted by ASME.

(c) (1) All valves and fittings on all feedwater piping from the boiler up to and including the first stop valve and the check valve shall be equal at least to the requirements of any Standard accepted by ASME for a pressure exceeding the maximum allowable working pressure of the boiler by either 25 percent or 225 psi, whichever is the lesser.

(2) All valves and fittings for feedwater piping between the required check valve and the globe or regulating valve, when required by ASME and including any by-pass piping up to and including the shutoff valves in the by pass, shall be equal at least to the requirements of any Standard accepted by ASME for a pressure rating equal to the expected operating pressure required to feed the boiler.

(3) Valves and fittings made of any material permitted by this Part for pressure ratings of 125 pounds or more and marked as required may be used for feed line and blowoff service up to 80 percent of the rated pressure, except where certain materials are specified, and in no case shall they be used for temperatures exceeding that permitted by ASME.

(d) (1) In all cases the scheduled working pressure (primary service pressure rating) for American National Standard steel fittings or valves accepted by ASME may be used for maximum saturated steam pressures (and for feed and blowoff services at pressures not to exceed the adjusted maximum allowable working pressure) as given in Table P-15, provided that all pressure retaining parts of the valves are suitable for the pressure at which they are to be used.

(2) Valves and fittings of steel construction otherwise complying with the requirements of ASME, but having butt welding ends, may be rated at the pressure stated in Table P-15, provided also that all parts of the valves are suitable for the pressure at which they are used.

(3) When the service requirements exceed the permissible values given in Table P-15, the requirement of the Code will be met if the bolting material, flange, and/or body thicknesses are increased so that the deflection limits are no greater and the factor of safety is at least that of the nearest pressure rating class in Table P-15.

(e) Screwed fittings of cast iron or malleable iron conforming to the requirements of the Standards for 125, 150, 250, and 300 pounds pressure accepted by ASME may be used except where otherwise specifically prohibited. They shall not be used for temperatures over 450° Fahrenheit.

(f) Cast- or forged-steel screwed fittings or valves that are at least equal to the strength requirements of ASME which would otherwise be required may be used in all cases except where flanged fittings are specifically required.

(g) Brass or bronze screwed or flanged-type fittings or valves may be used provided they are least equal to the strength requirements of ASME for cast-iron fittings which would otherwise be required. The materials shall comply with ASME specifications SB-61 and SB-62 with maximum temperatures allowed of 550° Fahrenheit for SB-61 and 406° Fahrenheit for SB-62. Brass or bronze shall not be used where steel or other material is specifically required. Screwed type fittings shall not be used where flange types are specified.

Table P-15

MAXIMUM ALLOWABLE WORKING PRESSURE (MAWP) FOR THE USE OF ANSI B16.5-1981 STEEL PIPE FLANGES AND FLANGED FITTINGS AND ANSI B16.34-1981 STEEL VALVES, FLANGED AHD BUTT WELDING END (STANDARD CLASS)

	Maximum Allowable Working Pressure (MAWP), psiq, Except as Noted	
	Steam Service at Saturation Boiler Feed and Blowoff Line	
ANSI B16.5-1981 and B16.34-1981	*Temperature [Notes (1), (4)]*	*Service [Notes (1), (2), (4)]*
150	205	170
300	605	490
400	785	640
600	1135	935
900	1635	1430
1500	2675	2455
2500	3206 psi [Note (3)]	3206 psi [Note (3)]

Notes:

(1) Adjusted pressure ratings for Steel Pipe Flanges and Flanged Fitting, for steam service at saturation temperature corresponding to the pressure, derived from Tables 1A and 2, using material group 1.1 of ANSI B16.5-1981. Adjusted pressure ratings for Steel Valves (Standard Class) for steam service at saturation temperature corresponding to the pressure, derived from Tables 1 and 2-1.1A, using material group 1.1 of ANSI B16.34-1981. For other materials or design temperatures exceeding saturation temperature, see ANSI B16.5-1981 and ANSI B 16.34-1981 for pressure-temperature limitations. The pressure listed is rounded to the nearest 5 psi.

(2) Pressures shown include the factor for boiler feed and blowoff line service, corrected for line design temperature, as required by ANSI/ASME B31.1. The pressure listed is rounded to the nearest 5 psi.

(3) Rating exceeds critical pressure of water.

(4) The pressure-temperature ratings provided herein apply to the flange and do not necessarily reflect the rating of the assembled flange joint. The pressure-temperature ratings provided apply to the gasketed and bolted flange joint only when the gasket and studs conform to the recommendations of ANSI B 16.5-1981.

§ 14-9.23 Attachment of piping and external piping.

(a) Piping connected to the outlet of a boiler for any purpose, and which comes within the requirement of this Part, shall be attached by screwing, welding or other means acceptable to the ASME Code.

(b) Fusion welding for sealing purposes at the juncture of bolted joints may be used.

(c) Welding may be used to attach piping to nozzles or fittings and shall comply with ASME requirements.

(d) All welded piping external to the boiler falling within Code jurisdiction shall conform to the provisions required by ASME and shall be fabricated and/or installed by the manufacturer or contractor authorized to use one or more of the ASME Code symbols shown below and within the scope authorized for each symbol:

May fabricate and/or install boiler external piping conforming to ASME provisions.

May fabricate and/or install boiler external piping conforming to ASME provisions.

May install only boiler external piping conforming to ASME provisions, fabricated by a manufacturer authorized to use one or both of the ASME Code symbols shown above.

(e) Such piping contractors or manufacturers shall be responsible for the quality of the welding done by their organizations and for conformance to ASME requirements of procedures and welders.

(f) Fabricated and/or installed welded piping shall be inspected by an authorized inspector at such stages of the work as the inspector may elect. For main steam, feed inlet, blowoff and other connections over two inch pipe size the symbol used, together with the manufacturer's or contractor's name and serial number shall be stamped on the pipe, valve or fitting adjacent to the joint farthest from the boiler. For piping operating at temperatures above 500° Fahrenheit, the symbol may be stamped on a nameplate which is irremovably attached by welding, provided such welding is postweld heat treated, or on a circular metal band at least 1/8 inch thick. This band around the pipe shall be secured in such a manner as to prevent it from slipping off during handling and installation. Upon completion of the work a Form P-4A, partial data report, shall be executed in accordance with ASME requirements. American slip on flanges up to and including four inch pipe size may be attached to piping or boiler nozzles and shall conform to ASME requirements.

(g) The minimum number of threads that a pipe or fitting shall screw into a tapped hole shall conform to ASME requirements.

§ 14-9.24 Stop valves.

(a) (1) Each steam-discharge outlet, except safety-valve or safety relief valves, or reheater inlet or outlet connections, shall be fitted with a stop valve located at an accessible point in the steam delivery line and as near to the boiler nozzle as convenient and practicable. When such outlets are over two inch pipe size, the valve or valves used on the connection shall be of the outside-screw-and-yoke rising-stem type so as to indicate from a distance by the position of its stem whether it is closed or open and the wheel may be carried either on the yoke or attached to the stem. A plug cock type valve may be used provided the plug is held in place by a guard or gland, the valve is equipped to indicate from a distance whether it is closed or open, and the valve is equipped with a slow-opening mechanism.

(2) If a shutoff valve is used between the boiler and its superheater, the safety valve capacity on the boiler proper must comply with ASME requirements. In a separately fired superheater installation, a stop valve is not required at the inlet or the outlet of the superheater.

(b) (1) All stop valves and the fittings between them and the boiler shall be equal at least to the requirements of the American National Standards given in the ASME Code except where heavier construction is specifically required.

(2) In all cases the valves and fittings shall be equal at least to the American National Standard for 100 psi.

(3) Valves and fittings made of any material permitted by ASME for pressure ratings of 100 pounds or more, and marked as required, may be used for saturated steam service up to the rated pressure, except that in no case shall they be used for temperatures exceeding those permitted by ASME.

(4) The nearest steam stop valve or valves to the boiler drum or superheater inlet shall have a pressure rating at least equal to the minimum set pressure of any safety valve on the boiler drum at the corresponding saturated steam temperature.

(5) The nearest stop valve or valves to the superheater outlet shall have a pressure rating at least equal to the minimum set pressure of any safety valve on the superheater and at the expected superheated steam temperature; or at least equal to 85 percent of the lowest set pressure of any safety valve on the boiler drum at the expected steam temperature of the superheater outlet, whichever is greater.

(c) (1) When boilers are connected to a common steam main, the steam connection from each boiler having a manhole opening shall be fitted with two stop valves having an ample free-blow drain between them. The discharge of this drain

shall be visible to the operator while manipulating the valve. The stop valves shall consist preferably of one automatic nonreturn valve (set next to the boiler) and a second valve of the outside-screw-and-yoke type; or, two valves of the outside-screw-and-yoke type shall be used.

(2) When a second steam stop valve or valves is required, it shall have a pressure rating at least equal to that required for the expected steam temperature and pressure at the valve, or the pressure rating shall be not less than 85 percent of the lowest set pressure of any safety valve on the boiler drum and for the expected temperature of the steam at the valve, whichever is greater.

(d) When a stop valve is so located that water can accumulate, ample drains shall be provided. All drain lines, including pipe, fittings, and valves, shall comply with the requirements for steam piping or water piping according to the service.

§ 14-9.25 Steam mains.

Provisions shall be made for the expansion and contraction of steam mains connected to boilers, by providing substantial anchorage at suitable points, so that there shall be no undue strain transmitted to the boiler. Steam reservoirs shall be used on steam mains when heavy pulsations of the steam currents cause vibration of the boiler shell plates.

§ 14-9.26 Superheater drains.

Each superheater shall be equipped with at least one drain so located as to most effectively provide for the proper operation of the apparatus.

§ 14-9.27 Blowoff piping.

(a) (1) A blowoff as required herein is defined as a pipe connection provided with valves through which the water in the boiler may be blown out under pressure, excepting drains such as are used on water columns, gage glasses, or piping to feedwater regulators, etc., used for the purpose of determining the operating condition of such equipment. Piping connections used primarily for continuous operation, such as deconcentrators on continuous blowdown systems, are not classed as blowoffs but the pipe connections and all fittings up to and including the first shutoff valve shall be equal at least to the pressure requirements for the lowest set pressure of any safety valve on the boiler drum and with the corresponding saturated steam temperature.

(2) A surface blowoff shall not exceed 2 1/2 inch pipe size, and the internal and external pipes, when used, shall form a continuous passage, but with clearance between their ends and arranged so that the removal of either will not disturb the other. A properly designed steel bushing, similar to or the equivalent of those shown in Figure P-42, or a flanged connection shall be used.

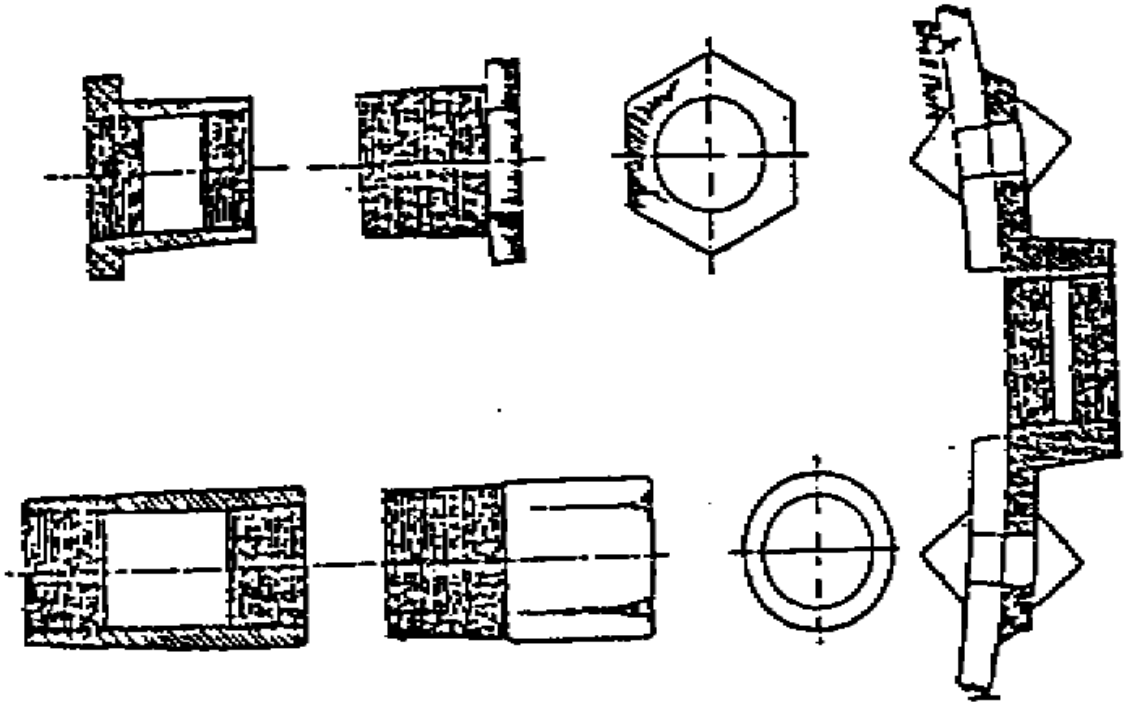


Figure P-42 Typical Boiler Bushings and Flange

(3) Blowoff piping shall conform to the requirements of ASME, except that galvanized wrought iron or steel, brass or copper pipe shall not be used.

(b) (1) Each boiler except forced-flow steam generators with no fixed steam 2nd water line and high-temperature water boilers shall have a bottom blowoff outlet in direct connection with the lowest water space practicable for external piping conforming to ASME.

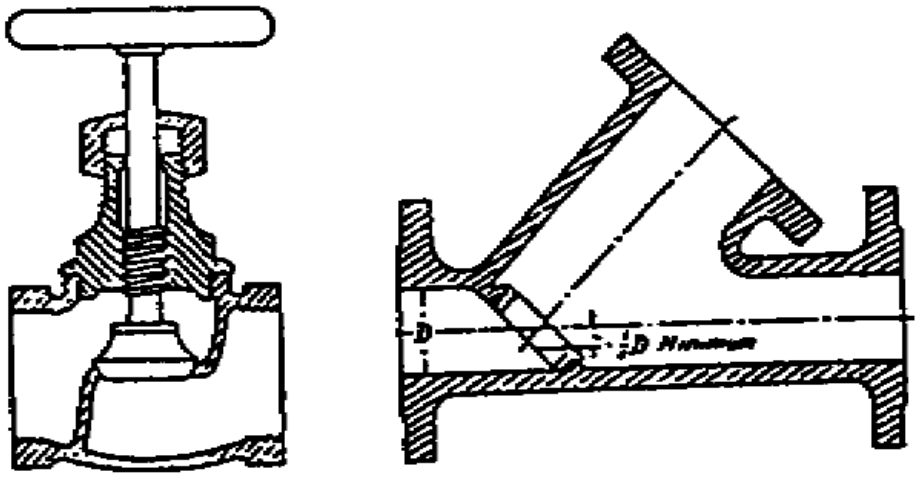
(2) Except as permitted for miniature boilers, the minimum size of pipe and fittings shall be one inch, and the maximum size shall be 2 1/2inches, except that for boilers with 100 square feet of heating surface or less, the minimum size of pipe and fittings may be ¾ inch.

(3) Straight-run globe valves of the ordinary type as shown in Figure P-43(a), or valves of such type that dams or pockets can exist for the collection of sediment, shall not be used on such connections.

(4) Straightway "Y" type globe valves as shown in Figure P-43(b), or angle valves, may be used in vertical pipes, or they may be used in horizontal runs of piping provided they are so constructed or installed that the lowest edge of the opening through the seat shall be at least 25 percent of the inside diameter below the center line of the valve.

(5) Condensate return connections of the same size or larger than the size herein specified may be used, and the blowoff may be connected to them. In such case the blowoff must not be so located that the connection may be completely drained.

(6) All integral economizers, water walls, or water screens forming parts of a steam boiler shall be equipped with drain or blowoff valves conforming to the requirements of this subdivision and subdivisions (a) and (b) of section 14-9.29 of this Subpart for boilers.



(a) **(b)**

Type of Globe Valve **Type of Straightway Globe Valve**

Figure P-43 Typical Globe Valves

§ 14.28 Blowoff cock.

(a) A bottom blowoff cock shall have the plug held in place by a guard or gland. The end of the plug shall be distinctly marked in line with the passage.

(b) (1) The blowoff valve or valves and the pipe between them and the boiler shall be of the same size except where a larger pipe for the return of condensation is used.

(2) All fittings between the boiler and valves shall be of steel for pressures over 100 psi and the thickness of pipe and fittings shall not be less than that of schedule 80 pipe.

(3) In all cases the valves and fittings from the boiler to and including the required stop valves shall be equal at least to the requirements of the applicable standards given in ASME for a pressure 1.25 times the maximum allowable working pressure of the boiler or 225 psi more than the maximum allowable working pressure of the boiler, whichever is less, but shall not be less than 100 psi.

(4) When the pressure does not exceed 200 psi, the valves or cocks shall be bronze, cast iron, ductile iron, or steel. The valves or cocks if of cast iron, shall meet the requirements of the applicable American National Standard for class 250 as given by ASME and if of bronze, steel, or ductile iron, construction shall meet the requirements of the applicable standards given by ASME.

(5) For pressures over 200 psi, the valves or cocks shall be of steel construction equal at least to the requirements of the American National Standard for 300 psi as given in the ASME Code.

§ 14-9.29 Blowoff pipe and fittings.

(a) (1) On all boilers, except electric steam boilers having a normal water content not exceeding 100 gallons, and those used for traction and/or portable purposes, when the allowable working pressure exceeds 100 psi, each bottom blowoff pipe shall have two slow-opening valves, or one quick-opening valve or cock at the boiler nozzle followed by a slow-opening valve. All valves shall comply with section 14-9.28(b)(4) and (5) of this Subpart.

(2) By "slow-opening valve" is meant one which requires at least five 360-degree turns of the operating mechanism to change from full-closed to full-opening, and vice versa.

(3) On a boiler having multiple blowoff pipes, a single master valve may be placed on the common blowoff pipe from the boiler, in which case only one valve on each individual blowoff is required. In this case either the master valve or the individual valve or cocks must be of the slow-opening type.

(4) Two independent slow-opening valves, or a slow opening valve and a quick-opening valve, or a cock may be combined in one body provided the combined fitting is the equivalent of two independent slow-opening valves, or a slow-opening valve and a quick-opening valve or a cock so that the failure of one to operate could not affect the

operation of the other.

(5) All water walls and water screens which do not drain back into the boiler and all integral economizers shall be equipped with drain or blowoff valves conforming with the requirements of subdivisions (a) and (b) of this section and also of sections 14-9.27(b) and 14-9.28(a) of this Subpart.

(b) (1) The bottom blowoff pipes of every traction and/or portable boiler shall have at least one slow- or quick-opening blowoff valve or cock conforming to the requirements of ASME.

(2) Only one blowoff valve, which shall be of a slow-opening type, is required on forced circulation and electric steam boilers having a normal water content not exceeding 100 gallons.

(c) A bottom blowoff pipe when exposed to direct furnace heat shall be protected by firebrick, or other heat-resisting material, so arranged that the pipe may be inspected.

(d) An opening in the boiler setting for a blowoff pipe shall be arranged to provide free expansion and contraction.

(e) Blowoff pipes shall be located so as to prevent scalding.

(f) Bottom blowoff valves shall be tested daily when the boiler is in operation.

§ 14-9.30 Requirements for drains.

(a) Ample drains shall be provided where required to permit complete drainage of all piping, superheaters, water walls, water screens, integral economizers, high temperature water boilers, and all other boiler components in which water may collect. Piping shall conform to the requirements of ASME.

(b) Each superheater shall be equipped with at least one drain so located as to most effectively provide for the proper operation of the apparatus.

(c) Each high-temperature water boiler shall have a one inch minimum pipe size bottom drain connection in direct connection with the lowest water space practical for external piping conforming to the requirements of ASME.

§ 14-9.31 Feed piping.

(a) The feedwater shall be introduced into a boiler in such a manner that the water will not be discharged directly against surfaces exposed to gases of high temperature or to direct radiation from the fire, or close to any riveted joints of the furnace sheets or of the shell. For pressures of 400 pounds or over, the feedwater inlet through the drum shall be fitted with shields, sleeves, or other suitable means to reduce the effects of temperature differentials in the shell or head. If necessary, the discharge end of a feed pipe shall be fitted with a baffle to divert the flow from the riveted joint. Feedwater, other than condensate returned as provided for in section 14-9.27(b) of this Subpart, shall not be introduced through the blowoff.

(b) When a horizontal-return tubular boiler exceeds 40 inches in diameter, the feedwater shall discharge at about three fifths the length from that end of the boiler which is subjected to the hottest gases of the furnace (except a horizontal-return tubular boiler equipped with an auxiliary feedwater heating and circulating device), above the central rows of tubes. The feed pipe shall be carried through the head or shell farthest from the point of discharge of the feedwater in the manner specified for a surface blowoff in section 14-9.27(a) of this Subpart, and be securely fastened inside the shell above the tubes.

(c) In vertical tubular boilers having tubes four feet or less in length, the feedwater shall be introduced at a point not less than one fourth the length of the tube above the lower tube sheet or crown sheet. For tubes more than four feet in length, the feedwater shall be introduced at a point not less than 12 inches above the crown sheet. When the boiler is under pressure feedwater shall not be introduced through the openings or connections used for the water column, the water gage glass, or the gage cocks. In closed systems the water may be introduced through any opening when the boiler is not under pressure.

§ 14-9.32 Boiler bushing, flange, for feed pipe connections.

(a) Figure P-42 illustrates a typical form of flange for use on boiler shells for passing through piping such as feed, surface blowoff connections, etc., and which permits of the pipes being screwed in solid from both sides in addition to the reinforcing of the opening in the shell. The pipes shall be attached as provided in section 14-9.23 of this Subpart.

(b) In these and other types of boilers where both internal and external pipes making a continuous passage are employed, the boiler bushing or its equivalent shall be used.

§ 14-9.33 Feedwater valves.

(a) The feedwater piping for all boilers, except for high temperature water boilers complying with the requirements of subdivision (h) of this section, and for forced flow steam generators with no fixed steam and water line complying with the requirements of subdivision (i) of this section, shall be provided with a check valve and a stop valve or cock between the check valve and the boiler. The stop valve or cock shall comply with the requirements of ASME.

(b) The relative locations of the check and stop (or cock) valves, as required in subdivision (a) of this section, may be reversed on a single boiler-turbine unit installation.

(c) If a boiler is equipped with a duplicate feed arrangement, each such arrangement shall be equipped as required by these rules.

(d) When the supply line to a boiler is divided into branch feed connections and all such connections are equipped with stop and check valves, the stop and check valves in the common source may be omitted.

(e) When two or more boilers are fed from a common source, there shall also be a globe or regulating valve in the branch to each boiler located between the check valve and the source of supply. A typical arrangement is shown in Figure P-44(a). Wherever globe style valves are used on feed piping, the inlet shall be under the disk of the valve.

(f) A combination stop and check valve in which there is only one seat and disk, and in which a valve stem is provided to close the valve, shall be considered only as a stop valve, and a check valve shall be installed as otherwise provided.

(g) Where an economizer or other feedwater heating device is connected directly to the boiler without intervening valves, the feed valves and check valves required shall be placed on the inlet of the economizer or feedwater heating device.

(h) The recirculating return line for a high temperature water boiler shall be provided with the same stop valve, or valves, required by subdivisions (a) and (c) of this section. The use of a check valve in the recirculating return line is optional. A check valve shall not be a substitute for a stop valve.

(i) The feedwater boiler external piping for a forced flow steam generator with no fixed steam and water line may terminate up to and including the stop valve(s) and omitting the check valve(s) provided that a check valve having a pressure rating no less than the boiler inlet design pressure is installed at the discharge of each boiler feed pump or elsewhere in the feedline between the feed pump and the stop valve(s).

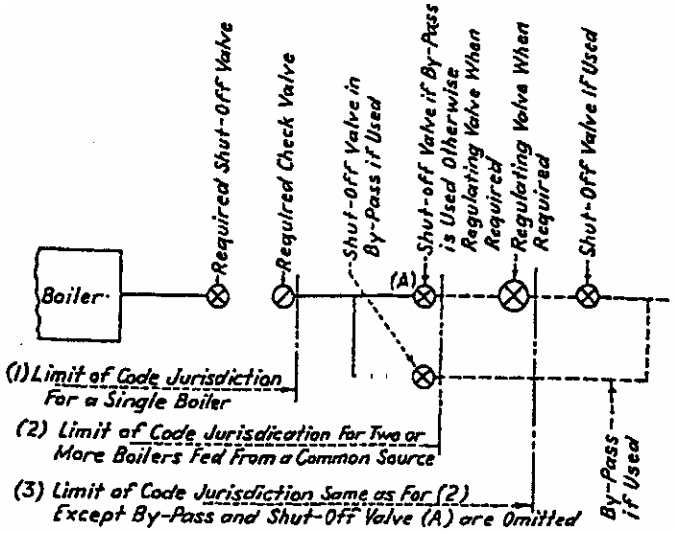


Figure P-44 (a) Code Jurisdictional Limits for Piping

§ 14-9.34 Feedwater supply apparatus.

(a) Except as provided for in subdivisions (b) and (d) below, boilers having more than 500 square feet of water-heating surface shall have at least two means of feeding water. Except as provided for in subdivisions (c), (d) and (e) of this section, each source of feeding shall be capable of supplying water to the boiler at a pressure of three percent higher than the highest setting of any safety valve on the boiler. For boilers that are fired with solid fuel not in suspension, and for boilers whose

setting or heat source can continue to supply sufficient heat to cause damage to the boiler if the feed supply is interrupted, one such means of feeding shall not be susceptible to the same interruption as the other and shall provide sufficient water to prevent damage to the boiler.

(b) Except as provided for in subdivision (a) of this section, a boiler fired by gaseous, liquid or solid fuel in suspension may be equipped with a single means of feeding water provided means are furnished for the shutting off of its heat input prior to the water level reaching the lowest permissible level established by ASME.

(c) For boilers having a water-heating surface of not more than 100 square feet, the feed connection to the boiler shall not be smaller than 1/2 inch pipe size. For boilers having a water heating surface of more than 100 square feet, the feed connection to the boiler shall not be smaller than 3/4 inch pipe size.

(d) High-temperature water boilers shall be provided with means of adding water to the boiler or system while under pressure.

(e) A forced-flow steam generator with no fixed steam and waterline shall be provided with a source of feeding capable of supplying water to the boiler at a pressure not less than the expected maximum sustained pressure at the boiler inlet, as determined by the boiler manufacturer, corresponding to operating at maximum designed steaming capacity with maximum allowable working pressure at the superheater outlet.

§ 14-9.35 Water fronts.

Each boiler fitted with a water-jacketed boiler-furnace mouth protector, or similar appliance, having valves on the pipes connecting them to the boiler, shall have these valves locked or sealed open. Such valves, when used, shall be of the straightway type.

§ 14-9.36 Water-column pipes.

(a) The minimum size of pipes connecting the water column to a boiler shall be one inch. For pressures of 400 pounds or over, lower water column connections to drums shall be provided with shields, sleeves, or other suitable means to reduce the effect of temperature differentials in the shells or heads. Water-glass fittings or gage cocks may be connected directly to the boiler.

(b) (1) The design and material of a water column shall comply with the requirements of the ASME Code. Water columns made of cast iron in accordance with specification SA-278 may be used for maximum boiler pressures not exceeding 250 psi. Water columns made of malleable iron in accordance with specification SA-395 may be used for maximum boiler pressures not exceeding 350 psi. For higher pressures, steel construction shall be used.

(2) The steam and water connections to a water column or a water gage glass, including all pipe, fittings, ,valves, and drains, shall comply with the requirements of ASME and section 14-9.23 of this Subpart. These connections shall be such that they are readily accessible for internal inspection and cleaning. Some acceptable methods of meeting this requirement would be by providing a cross or fitting with a back outlet at each right angle turn to permit inspection and cleaning in both directions, or by using pipe bends or fittings of a type which does not leave an internal shoulder or pocket in the pipe connection and with a radius of curvature which will permit the passage of a rotary cleaner. The water column shall be fitted with a drain cock or drain valve with a suitable connection to the ashpit, or other safe point of waste, and if the water connection thereto has a rising bend or pocket which cannot be drained by means of the water-column drain, an additional drain shall be placed on this connection in order that it may be blown off to clear any sediment from the pipe. The water-column blowoff pipe shall be at least three-quarters inch pipe size.

(c) (1) When the gage glasses and gage cocks required by sections 14-9.16 and 14-9.18 of this Subpart are not connected substantially directly to the shell or drum of a boiler, a water column shall be used into which the gage glass and gage cocks shall be connected, excepted as modified by the ASME Code.

(2) The lower edge of the steam connections to a water column and the boiler shall not be below the highest visible water level in the water gage glass. There shall be no sag or offset in the piping which will permit the accumulation of water.

(3) The upper edge of the water connection to a water column and the boiler shall not be above the lowest visible water level in the gage glass. No part of this pipe connection shall be above the point of connection at the water column.

(4) An acceptable arrangement is indicated in Figure P-45.

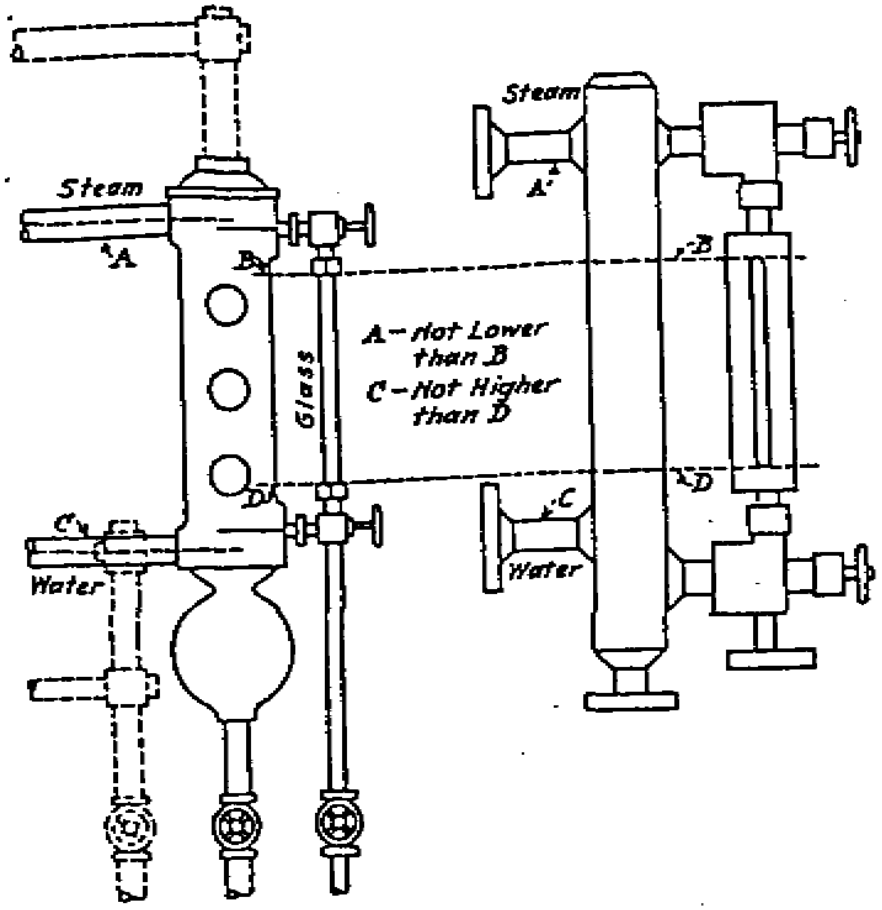


Figure P-45 Typical Arrangement of Steam and Water Connections for a Water Column

(5) No outlet connections, except for damper regulator, feedwater regulator, drains, steam gages, or apparatus of such form as does not permit the escape of an appreciable amount of steam or water therefrom, shall be placed on the pipes connecting a water column to a boiler.

(6) Where valves are installed between the water column and boiler, at least one steam gage shall be connected directly to the steam space of the boiler with one cock between the gage and boiler.

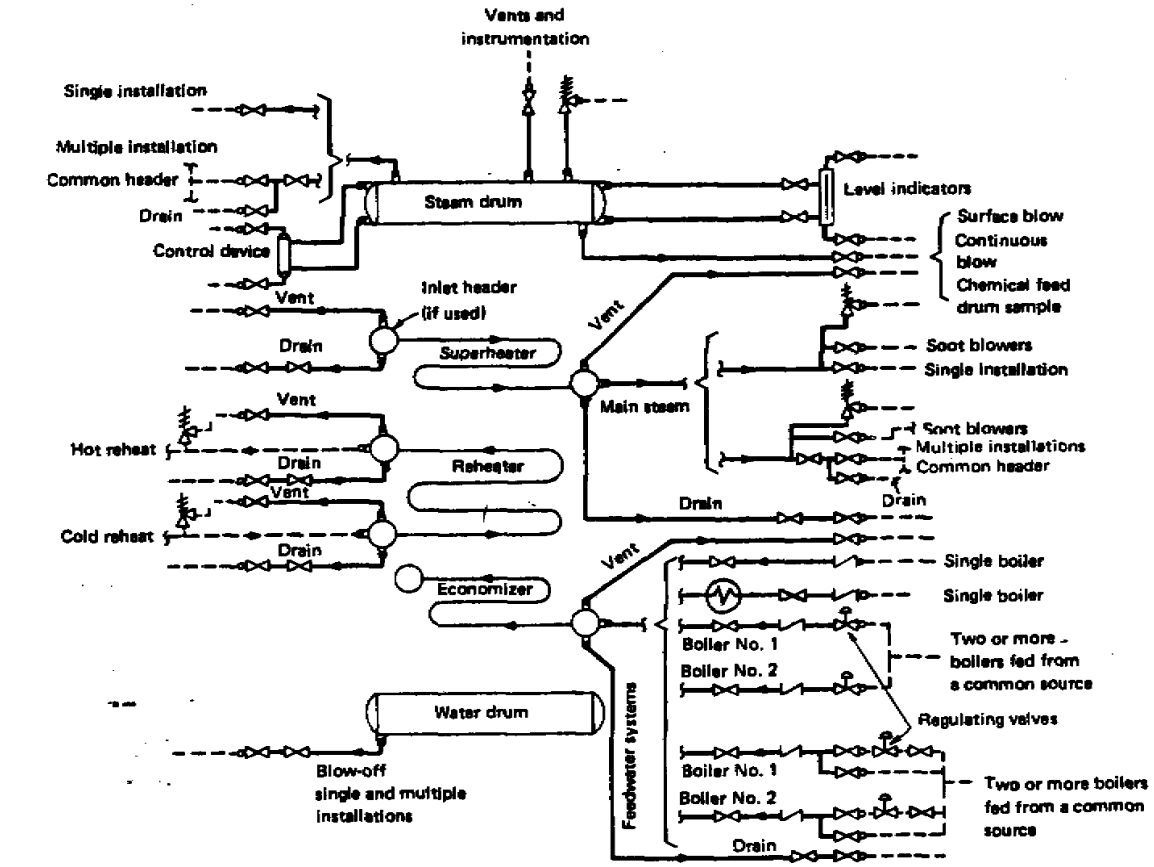
Exception: Where a pipe in excess of l0 feet is used, a shutoff valve or cock arranged so that it can be locked or sealed open shall be installed and the pipe shall be of a size to permit blowing out.

(7) Water column drains shall be tested daily when the boiler is in operation.

§ 14-9.37 Gravity return feed.

In all cases where the returns are fed back to a boiler by gravity, there shall be a check valve and stop valve on the return line, the stop valve shall be placed between the boiler and the check valve and both shall be as close to the boiler as practicable.

FIGURE P-44 (b)



ADMINISTRATIVE JURISDICTION AND TECHNICAL RESPONSIBILITY

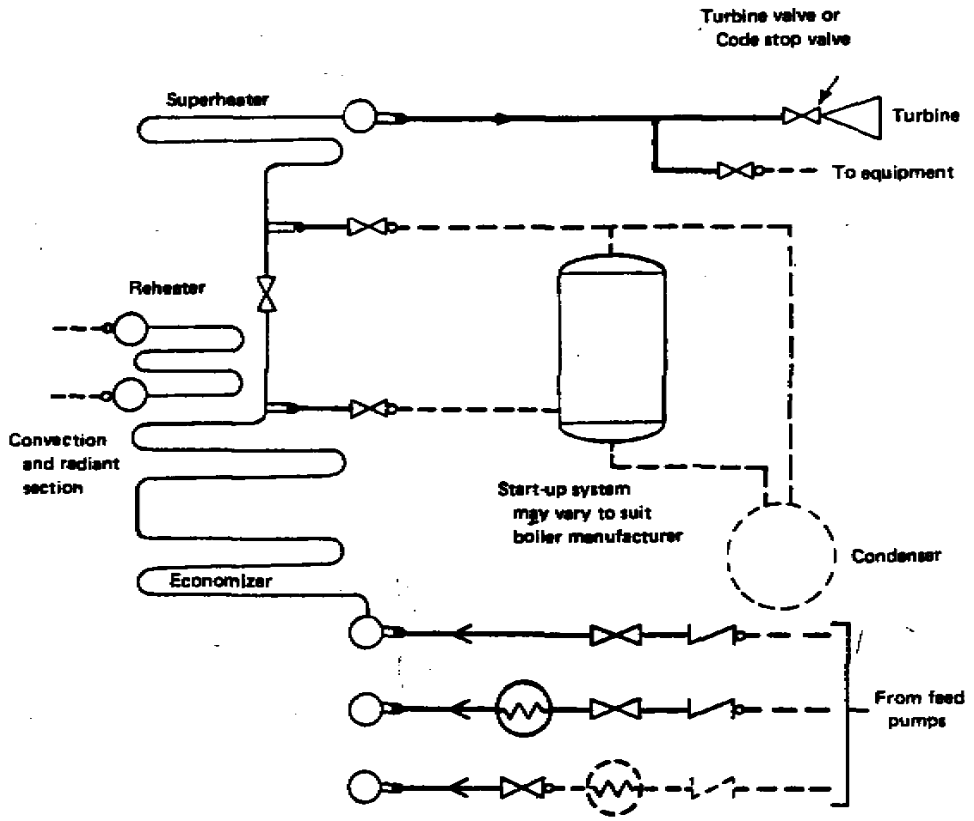
——— Boiler Proper

●——— Boiler External Piping and Joint

○— — — Nonboiler External Piping and Joint (NBEP) – The ASME Code Committee for Pressure Piping, B31, has total administrative and technical responsibility. See applicable ANSI/ASME B31 Code.

CODE JURISDICTIONAL LIMITS FOR PIPING – DRUM TYPE BOILERS

FIGURE P-44 (c)



ADMINISTRATIVE JURISDICTION AND TECHNICAL RESPONSIBILITY

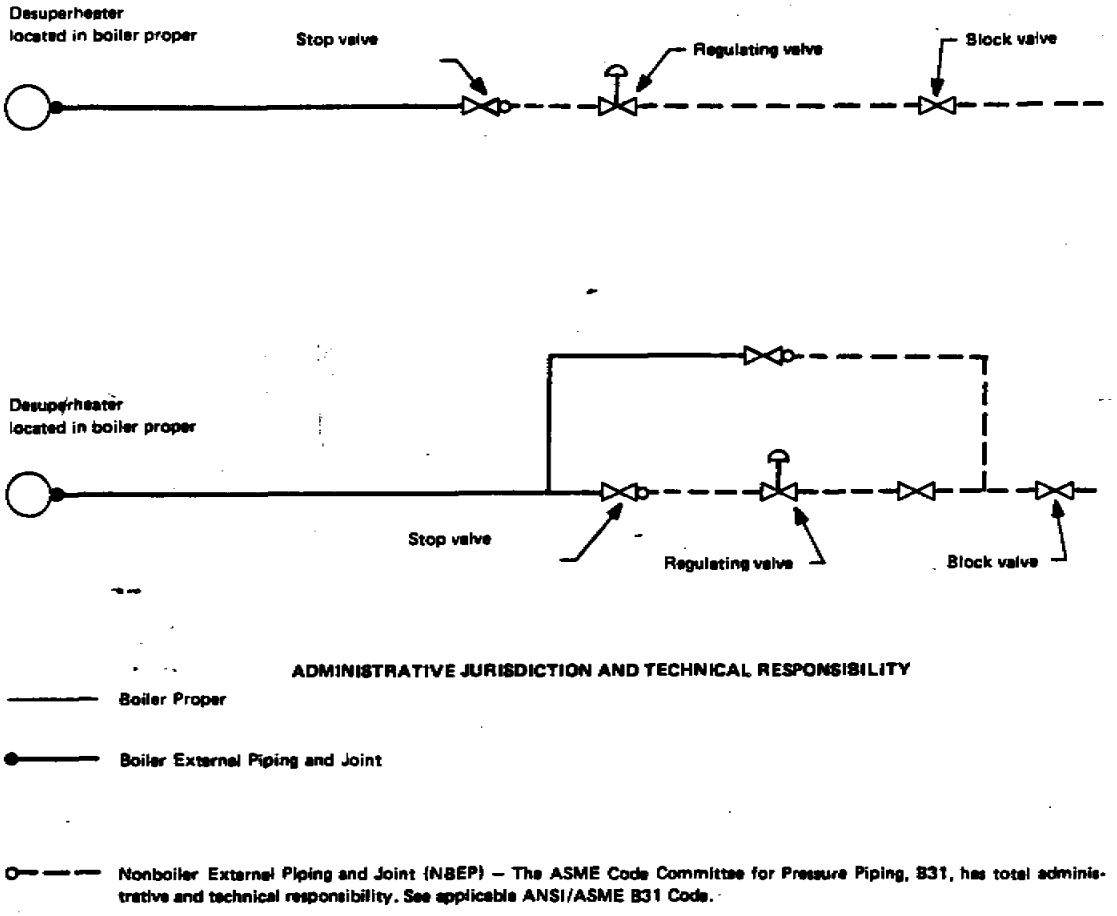
Boiler Proper

Boiler External Piping and Joint

Nonboiler External Piping and Joint (NBEP) — The ASME Code Committee for Pressure Piping, B31, has total administrative and technical responsibility. See applicable ANSI/ASME B31 Code.

CODE JURISDICTIONAL. UNITS FOR PIPING -- FORCED FLOW STEAM GENERATOR WITH NO FIXED STEAM AND WATER LINE

FIGURE P-44 (d)



CODE JURISDICTIONAL LIMITS FOR PIPING -- SPRAY TYPE DESUPERHEATER SETTING

§ 14-9.38 Method of support.

(a) A horizontal-return tubular boiler over 72 inches in diameter shall be supported from steel hangers by the outside-suspension type of setting, independent of the boiler side walls. The hangers shall be so designed that the load is properly distributed between the rivets attaching them to the shell and so that no more than two of these rivets come in the same longitudinal line on each hanger. The distance girthwise of the boiler from the centers of the bottom rivets to the centers of the top rivets attaching the hangers shall be not less than 12 inches. The other rivets used shall be spaced evenly between these points:

(b) A horizontal-return tubular boiler, 14 feet or-more in length, or over 54 inches and up to and including 72 inches in diameter, shall be supported by the outside-suspension type of setting as specified in subdivision (a) of this section, or at four points by not less than eight steel or cast-iron lugs set in pairs. A horizontal return tubular boiler up to and including 54 inches in diameter shall be supported by the outside-suspension type of setting as specified in subdivision (a) of this section, or by not less than two steel or cast-iron lugs on each side. The distance girthwise of the boiler from the centers of the bottom rivets to the centers of the top rivets attaching the hangers shall be not less than the square of the shell diameter divided by 675. If more than four lugs are used they shall be set in four pairs, the lugs of each pair to be spaced not over two inches apart and the load to be equalized between them (see Figure P-46). If the boiler is supported on structural steel work, the steel supporting members must be so located or insulated that heat from the furnace cannot impair their strength.

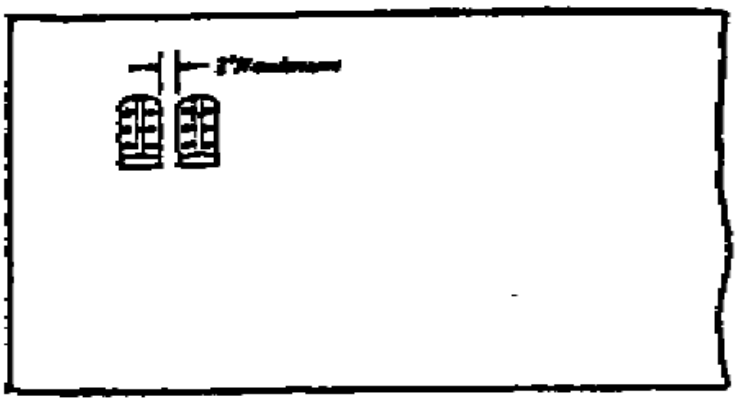


Figure P-46 Spacing of Supporting Lugs in Pairs on Horizontal. Return Tubular Boilers

§ 14-9.39 Access and firing doors.

(a) (1) The minimum size of an access door to be placed in a boiler setting shall be l2 by l6 inches, or equivalent area, 11 inches to be the least dimension in any case. The minimum size of firedoor opening in an internally fired boiler in which the minimum furnace dimension is 24 inches or over shall be not less than 11 by 15 inches, or 10 by 16 inches in size. A circular opening shall be not less than 15 inches in diameter.

(2) The bonnet or smoke hood of a vertical flue or tubular boiler shall be provided with an access opening at least six by eight inches for the purpose of inspection and cleaning the top head of the boiler.

(b) (1) A water-tube boiler shall have the firing doors of the inward-opening type, unless such doors are provided with substantial and effective latching or fastening devices or otherwise so constructed as to prevent them, when closed, from being blown open by pressure on the furnace side.

(2) These latches or fastenings shall be of the positive self-locking type. Friction contacts, latches, or bolts actuated by springs shall not be used. The foregoing requirements for latches or fastenings shall not apply to coal openings of downdraft or similar furnaces.

(3) All other doors, except explosion doors, not used in the firing of the boiler, may be provided -- with bolts or fastenings in lieu of self-locking latching devices.

(4) Explosion doors, if used and if located in the setting walls within seven feet of the firing floor or operating platform, shall be provided with substantial deflectors to divert the blast.

HYDROSTATIC TESTS

§ 14-9.40 Hydrostatic pressure tests.

(a) After a boiler has been completed, it shall be subjected to a hydrostatic test of one and one-half times the maximum allowable working pressure. The pressure shall be under proper control so that in no case shall the required test pressure be exceeded by more than six percent. When a completed boiler is ready for hydrostatic test, it shall be tested with water of a temperature not less than the temperature of the surrounding atmosphere and in no case less than 70° Fahrenheit.

(b) During a hydrostatic test, the safety valve or valves shall be removed or each valve disk shall be held by its seat by means of a testing clamp and not by screwing down the compression screw upon the spring.

STAMPING OF HIGH PRESSURE BOILERS

§ 14-9.41 Identification of plates.

(a) When the boiler is completed, there shall remain visible on shell plates, furnace sheets, and heads, one group of the plate manufacturer's stamps consisting of the manufacturer's name, manufacturer's test identification number, class, and tensile strength; except that heads containing tube holes and buttstraps shall have visible at least a sufficient portion of such stamps for identification.

(b) It is permissible for an authorized representative of the boiler manufacturer to transfer the markings on the plate provided a record is made of such transfer. The procedure for making such transfer shall be acceptable to the authorized inspector.

(c) An authorized representative of the plate manufacturer may duplicate the required stamping on any material wherever located.

§ 14-9.42 Qualification of inspectors.

The inspection required by this Part shall be performed by an inspector employed by New York State or any other State or municipality of the United States, a Canadian province, or an inspector regularly employed by an insurance company authorized to write boiler insurance. These inspectors shall have been qualified by written examination under the rules of any State of the United States or province of Canada which has adopted the ASME Code.

§ 14-9.43 Stamping of high pressure boilers.

(a) The manufacturer of any complete boiler unit to be stamped with the American Society of Mechanical Engineers symbol has the responsibility of assuring through proper ASME Code certification that all work performed by it or others responsible to it complies with all requirements of the ASME Code, including design, construction, materials and workmanship. When some portions of a complete boiler unit are supplied by, or ASME Code work is performed by others not responsible to the manufacturer, the manufacturer has the duty of obtaining from these other organizations their proper ASME Code certification, covering all parts of a field-assembled boiler and of preparing the appropriate Manufacturers' Data Report Forms comprising such certification.

(b) Each boiler, superheater and waterwall to which an ASME Code symbol is to be applied shall be fabricated by a manufacturer who is in possession of the appropriate ASME Code Symbol Stamp, and a valid Certificate of Authorization. Six ASME Code Symbol Stamps are defined as follows:

S	power boiler symbol stamp
M	miniature boiler symbol stamp
E	electric boiler symbol stamp
A	boiler assembly symbol stamp
PP	pressure piping symbol stamp
V	safety valve symbol stamp

Any manufacturer or assembler holding an official "S", "M", "E", "A", "PP", or "V" stamp of the American Society of Mechanical Engineers and the Certificate of Authorization shall have, and demonstrate, a quality control system to establish that all Code requirements including material, design, fabrication, examination (by the manufacturer), and inspection for boilers and boiler parts (by the authorized inspector) will be met.

(c) The manufacturer shall stamp each boiler, superheater or waterwall, constructed in compliance with this Part in the presence of the authorized inspector, after the hydrostatic test, in the shop of the manufacturer, except that in cases where boilers, superheaters, waterwalls, or steel economizers are not completed and hydrostatically tested before shipment, proper stamping shall be applied at the shop and the data reports required by the ASME Code shall be signed by the same or different inspectors who shall indicate the portions of the inspections made by the shop and in the field. The stamping shall consist of the appropriate Code symbol which shall be put on each piece of equipment listed above in the locations specified in the ASME Code.

(d) Each boiler shall be stamped with the appropriate American Society of Mechanical Engineers symbol and stamped in accordance with the National Board of Boiler and Pressure Vessel Inspectors requirements. In addition to the symbol, the following items shall also be stamped with letters and figures at least 5/16 inch high (5/32 inch on miniature boilers if necessary), arranged as shown below:

Items on Boilers

(1) Manufacturer's serial number

(2) Certified by (Name of Manufacturer)

(3) Maximum allowable working pressure when built

(4) Heating surface (or kilowatt power input for electric boilers)

(5) Year built

(6) Rated steaming capacity (required only for waste heat boilers not equipped for, direct firing)

Items on Waterwalls and Superheaters

(1) Manufacturer's serial number

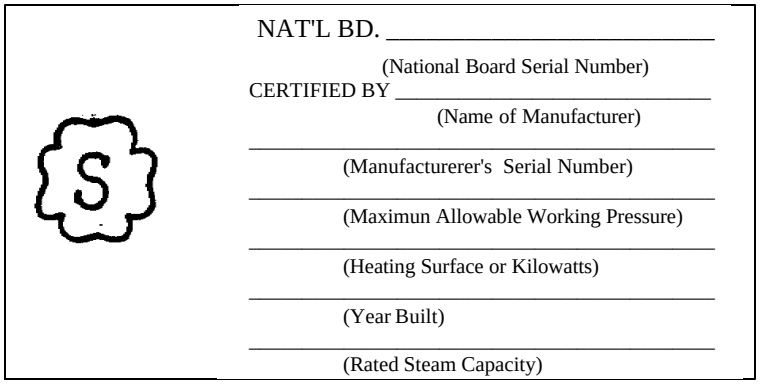
(2) Certified by (Name of Manufacturer)

(3) Maximum allowable working pressure when built

(4) Heating surface in square feet (not required for integral superheaters) (rated BTU per hour absorption for an isolated economizer)

(5) Design temperature (required only for separately fired superheaters)

Facsimile of Approved Stamping for Boilers



§ 14-9.44 Location of stamps.

The location of the American Society of Mechanical Engineers stamps shall be as follows and same shall not be covered by insulating or other material:

(a) On horizontal-return tubular boilers -- on the front head, above the central rows of tubes.

(b) On horizontal flue boilers -- on the front head, above the flues.

(c) On traction, portable or stationary boilers of the locomotive type or Star water-tube boilers -- on the furnace end above the handhole. Or on traction boilers of the locomotive type -- on the left wrapper sheet forward of the driving wheel.

(d) On vertical tire-tube and vertical submerged-tube boilers -- on the shell above the tire door and handhole opening.

(e) On water-tube boilers -- on a head of the steam outlet drum near and above the manhole opening.

(f) On Scotch marine boilers -- on the front head, above the center or right-hand furnace:

(g) On economic boilers -- on the front head, above the central row tubes:

(h) On any of the above types where there is not sufficient space in the place designated, and for other types and new designs -- in a conspicuous place:

§ 14-9.45 Stamping required for installation.

(a) No boiler shall hereafter be installed in this State unless it has been constructed in accordance with the requirements of the American Society of Mechanical Engineers and the National Board of Boiler and Pressure Vessel inspectors and is so stamped and registered.

(b) A hydrostatic pressure test shall be made after installation. If deemed advisable by the inspector, this test need not be made on boilers which are shipped as complete units.

(c) Hobby boilers and locomotive boilers are not acceptable for use where same have not been built as set forth herein, but may, however, be used if a Certificate of Inspection had been previously issued within the State.

SUBPART 14-10

POWER BOILERS: EXISTING INSTALLATIONS.

MAXIMUM ALLOWABLE WORKING PRESSURE

§ 14-10.1 Formula for maximum allowable working pressure.

The maximum allowable working pressure on the shell or drum of a boiler shall be determined by the strength of the weakest course computed from the thickness of the plate, the tensile strength of the plate, the efficiency of the longitudinal joint, or of the ligament between the tube holes in shell or drum (whichever is the least), the inside diameter of the course and the factor of safety allowed by this Subpart.

$$\frac{TS \times t \times E}{R \times FS} = \text{maximum allowable working pressure, pounds per square inch,}$$

where

TS = ultimate tensile strength of shell plates, pounds per square inch,

t = thickness of shell plate, in weakest course, inch,

E = efficiency of longitudinal joint, or of ligaments between tube holes (whichever is the least),

R = inside radius of the weakest course of the shell or drum, inches,

FS = factor of safety allowed by this Subpart.

§ 14-10.2 Factor of safety: butt- and double-strap construction.

(a) The factor of safety for boilers of nonstandard construction installed prior to January 1, 1918, the longitudinal joints of which are of butt-and double-strap construction, shall be not less than 5.5 for boilers over 30 years old.

(1) At the beginning of each five-year period thereafter, the factor of safety shall be increased by not less than five tenths except that after a thorough internal and external inspection and a hydrostatic pressure test of one and one-half times the pressure allowed and held for a period of at least 30 minutes, during which no distress or leakage develops, the pressure may be continued at a factor of 5.5.

(2) In no case shall the maximum allowable pressure on old boilers be increased, unless they are being operated at a lesser pressure than would be allowable for new boilers in which case the changed pressure shall not exceed that allowable for new boilers of the same construction.

(b) The factor of safety for all standard boilers shall not be less than the requirements of section 14-1.4 of this Part.

§ 14-10.3 Factor of safety: lap riveted construction.

(a) The lowest factor of safety for boilers of the water-tube type of nonstandard construction installed prior to January 1, 1918, the longitudinal joints of which are of lap riveted construction shall be not less than the following:

(l) 5 for boilers not over 20 years old;

(2) 5.5 for boilers over 20 and not over 25 years old;

(3) 6 for boilers over 25 and not over 30 years old; and

(4) at the beginning of each five-year period thereafter, the factor of safety shall be increased by not less than five tenths.

(b) The lowest factor of safety for all fire-tube, flue and cylinder boilers of nonstandard construction installed prior to January 1, 1918, the longitudinal joints of which are of lap riveted construction, except as provided for in subdivision (c) of this section, shall be not less than the following:

(l) 5 for boilers not over 10 years old;

(2) 5.5 for boilers over 10 and not over 15 years old;

(3) 5.75 for boilers over 15 and not over 20 years old;

(4) 6 for boilers over 20 years old; and

(5) at the beginning of each five-year period thereafter, the factor of safety shall be increased by not less than five tenths.

(c) (1) The lowest factor of safety for all fire-tube, flue and cylinder boilers of non-standard construction installed prior

to January I, 1918, the shells of which are exposed to the products of combustion and which have continuous longitudinal joints of lap riveted construction exceeding 12 feet in length, shall be not less than the following:

(i) 6 for boilers not over 10 years old;

(ii) 6.5 for boilers over 10 and not over 15 years old;

(iii) 7 for boilers for 15 and not over 20 years old; and

(iv) at the beginning of each five-year period thereafter, the factor of safety shall be increased by not less than five tenths.

(2) This type of boiler when removed from an existing setting shall not be reinstalled for a pressure in excess of 15 pounds.

§ 14-10.4 Secondhand boilers.

(a) Secondhand boilers, when of the stationary type and used for stationary purposes only, shall be deemed secondhand only when both ownership and location are changed, and shall have a factor of safety of at least 5.5 when of buttstrap construction and a factor of safety of not less than six where of lap seam construction. These factors shall be increased by the inspector as the condition and safety of the boiler demand, and in no case shall the factor of safety be less than provided for in sections 14-10.1 to 14-10.4 of this Subpart, inclusive, unless constructed in accordance with the rules in Subpart 14-9 of this Part when the factor of safety shall be not less than the requirements of section 14-1.4 of this Part.

(b) Portable boilers, such as used by contractors, agriculturists, sawmills, etc., used for purely portable purposes and transported from place to place, shall be deemed secondhand in the event of change of ownership, irrespective of change of location, and shall have a factor of safety of at least 5.5 where of buttstrap construction and a factor of safety of not less than six where of lap seam construction.

§ 14-10.5 Cast-iron headers and mud drums.

The maximum allowable working pressure on water-tube boilers, the tubes of which are secured to cast-iron of malleable-iron headers, or which have cast-iron mud drums, shall not exceed 160 pounds per square inch.

§ 14-10.6 Steam heating boilers.

Where a pressure of more than 15 pounds is found on a boiler for which exemption is claimed under the provisions of section 204 of the Labor Law or where a low pressure insurance policy is in force on such a boiler, the commissioner may order a safety valve or valves of the low pressure spring pop type, which cannot be adjusted for a greater pressure than 15 pounds attached to the boiler and shall also order a low pressure steam gage graduated to not over 30 pounds.

§ 14-10.7 Lap seam crack.

The shell or drum of a boiler in which a typical "lap seam crack" is discovered along a longitudinal riveted joint for either butt seam or lap joints shall be permanently discontinued for use under steam 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.

STRENGTH OF MATERIALS

§ 14-10.8 Tensile strength.

When the tensile strength of steel or wrought-iron shell plates is not known, it shall be taken at 55,000 pounds per square inch for steel and 45,000 pounds for wrought iron.

§ 14-10.9 Strength of rivets in shear.

(a) In computing the ultimate strength of rivets in shear the following values in pounds per square inch of the cross-sectional area of the rivet shank shall be used:

Iron rivets in single shear	38,000
Iron rivets in double shear	76,000
Steel rivets in single shear	44,000
Steel rivets in double shear	88,000

(b) The cross-sectional area shall be that of the rivet shank after driving.

§ 14-10.10 Crushing strength of mild steel.

The resistance to crushing of mild steel shall be taken at 95,000 pounds per square inch of the cross-sectional area.

§ 14-10.11 Rivets.

When the diameter of the rivet holes in the longitudinal joints of a boiler is not known, the diameter and cross-sectional area of rivets, after driving, may be ascertained from Table X - 1, or by cutting out one or more rivets in the body of the joint.

Table X - 1

Sizes of Rivets Based on Plate Thickness

Thickness of plate	1/4"	9/32"	5/16"	11/32"	3/8"	13/32"
Diameter of rivet after driving	11/16"	11/16"	3/4"	3/4"	13/16"	13/16"
Thickness of plate	7/16"	15/32"	1/2"	9/16"	5/8"	...
Diameter of rivet after driving	15/16"	15/16"	15/16"	1-1/16"	1-1/16"	...

SAFETY VALVES FOR POWER BOILERS

§ 14-10.12 Required safety valves.

The safety valve capacity of each boiler shall be such that the safety valve or valves will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than six percent above the maximum allowable working pressure, or more than six percent above the highest pressure to which any valve is set.

§ 14-10.13 Setting of safety valves.

One or more safety valves on every boiler shall be set at or below the maximum allowable working pressure. The remaining valves may be set within a range of three percent above the maximum allowable working pressure, but the range of setting of all of the valves on a boiler shall not exceed 10 percent of the highest pressure to which any valve is set.

§ 14-10.14 Checking safety valve capacity.

(a) Safety-valve capacity may be checked in any one of three different ways:

(1) By making an accumulation test, that is, by shutting off all other steam-discharge outlets from the boiler and forcing the fires to the maximum. The safety-valve equipment shall be sufficient to prevent an excess pressure beyond that specified in section 14-9.9 of this Part.

(2) By measuring the maximum amount of fuel that can be burned and computing the corresponding evaporative capacity upon the basis of the heating value of the fuel.

(3) By determining the maximum evaporative capacity by measuring the feedwater. The sum of the safety-valve capacities shall be equal to or greater than the maximum evaporative capacity of the boiler.

(b) If the safety valve capacity is found sufficient, additional capacity need not be provided.

§ 14-10.15 Additional safety valves.

When additional valve capacity is required, any valves added shall conform to the requirements in sections 14-9.4 through 14-9.15 of this Part.

§ 14-10.16 Position of safety valves.

Safety valve or valves shall be placed as close to the boiler as possible. No valve of any description shall be placed between the safety valve and the boiler, nor on the discharge pipe between the safety valve and the atmosphere. When a discharge pipe is used, it shall be not less than the full size of the valve, and the discharge pipe shall be fitted with an open drain to prevent water lodging in the upper part of the safety valve or in the pipe. If a muffler is used on a safety valve it shall have sufficient outlet area to prevent back pressure from interfering with the proper operation and discharge capacity of the valve. The muffler plates or other devices shall be so constructed as to avoid any possibility of restriction of the steam passages due to deposit. When an elbow is placed on a safety-valve discharge pipe, it shall be located close to the safety-valve outlet or the pipe shall be securely anchored and supported. All safety-valve discharges shall be so located or piped as to be carried clear from running boards or working platforms used in controlling the main stop valves of boilers or steam headers.

FITTINGS AND APPLIANCES

§ 14-10.17 Water glasses and gage cocks.

(a) Each steam boiler shall have at least one water glass, the lowest visible part of which shall be not less than two inches above the lowest permissible water level.

(b) Internally fired steam boilers having more than 100 square feet of heating surface, except boilers of the vertical fire-tube type and boilers using gas or electricity as fuel, shall be fitted with one or more fusible plugs, which shall be renewed annually. Fusible plugs shall not be required in boilers having a working pressure in excess of 200 pounds.

(c) Each boiler shall have three or more gage cocks, located within the range of the visible length of the water glass, when the maximum allowable working pressure exceeds 15 pounds per square inch, except when such boiler has two water glasses with independent connections to the boiler, located on the same horizontal line and not less than two feet apart. This shall not apply to boilers of the locomotive fire-tube type less than 36 inches in diameter, which boilers shall have at least two try cocks.

§ 14-10.18 Outlet connections prohibited.

No outlet connections, except for damper regulator, feedwater regulator, drains or steam gages, shall be placed on the pipes connecting a water column to a power boiler.

§ 14-10.19 Steam gages.

(a) Each boiler shall have a steam gage connected to the steam space or to the water column or to its steam connection. The steam gage shall be connected to a siphon or equivalent device of sufficient capacity to keep the gage tube filled with water and so arranged that the gage cannot be shut off from the boiler except by a cock placed near the gage and provided with a tee or lever handle arranged to be parallel to the pipe in which it is located when the cock is open. Connections to gages shall be of brass, copper, or bronze composition.

(b) Where a pipe exceeding 10 feet in length becomes necessary, an exception may be made to the rule that the gage must be arranged so that it cannot be shut off except by a cock placed near the gage and a shutoff valve or cock arranged so that it can be locked or sealed open may be used near the boiler. Such a pipe shall be of ample size and arranged so that it may be cleared by blowing out.

(c) Each boiler shall be provided with one-quarter inch pipe-sized valve connection for attaching a test gage when the boiler is in service, so that the accuracy of the boiler steam gage can be ascertained.

§ 14-10.20 Stop valves.

(a) Each steam outlet from a power boiler (except safety-valve connections) shall be fitted with a stop valve located as close as practicable to the boiler.

(b) When two or more boilers having manhole openings are connected to a common steam main, two stop valves with ample freeblow drain between them shall be placed in steam connection between each boiler and the steam main. The discharge of this drain valve shall be visible by the operator while manipulating the valve.

(c) When a stop valve is so located that water can accumulate, ample drains shall be provided.

§ 14-10.21 Bottom blowoff pipes.

(a) Each boiler shall have a blowoff pipe fitted with a valve or cock, in direct connection with the lowest water space practicable.

(b) When the maximum allowable working pressure exceeds 100 pounds per square inch, the blowoff pipe shall be extra heavy from boiler to valve or valves, and shall run full size without reducers or bushings. All fittings between the boiler and valve shall be steel or extra heavy fittings of bronze, brass, malleable iron or cast iron. In case of replacement of pipe or fittings in the blowoff lines, as specified in this subdivision, they shall be installed in accordance with the rules for new installations. (See sections 14-9.27 -- 14-9.29 of this Part.)

(c) When the maximum allowable working pressure exceeds 100 pounds per square inch, each bottom blowoff pipe shall be fitted with an extra-heavy valve or cock. Preferably two valves, or a valve and a cock should be used on each blowoff, in which case such valves, or a valve and a cock, shall be extra heavy.

(d) A bottom blowoff pipe when exposed to direct furnace heat, shall be protected from the products of combustion by firebrick, a substantial cast-iron removable sleeve, or a covering of nonconducting material.

(e) An opening in the boiler setting for a blowoff pipe shall be arranged to provide for free expansion and contraction.

§ 14-10.22 Feed-piping.

(a) The feed pipe on a steam boiler shall be provided with a stop valve or cock near the boiler and a check valve between the stop valve and source of supply and when two or more boilers are fed from a common source, there shall also be a valve on the branch to each boiler, between the check valve and source of supply. When a globe valve is used on a feed pipe, the inlet shall be under the disk of the valve.

(b) The feedwater shall be introduced into a boiler in such a manner that the water will not be discharged directly against surfaces exposed to gases of high temperature, or to direct radiation from the fire, or close to riveted joints of shell or furnace sheets. Feedwater, other than condensate, shall not be introduced through the blowoff.

(c) A boiler having more than 500 square feet of water-heating surface shall be fed in accordance with section 14-9.34 of this Part.

(d) All boilers shall have a waterfeed system which will permit the boilers being fed while they are under pressure.

(e) In all cases where the returns are fed back to a boiler by gravity, there shall be a check valve and stop valve on the return line, the stop valve shall be placed between the boiler and the check valve and both shall be as close to the boiler as practicable.

§ 14-10.23 Lamphrey fronts.

Each boiler fitted with a Lamphrey boiler furnace mouth protector, or similar appliance, having valves on the pipes connecting them to the boiler, shall have these valves locked or sealed open. Such valves, when used, shall be of the straightway type.

§ 14-10.24 Test pressure.

(a) When a hydrostatic test is applied the required test pressure shall be one and one-half times the maximum allowable working pressure. The pressure shall be under proper control so that in no case shall the required test pressure be exceeded by more than two percent.

(b) During a hydrostatic test of a boiler, the safety valve or valves shall be removed or each valve disk shall be held to its seat by means of a testing clamp and not by screwing down the compression screw upon the spring.

SUBPART 14-11

MINIATURE BOILERS

CONSTRUCTION AND EQUIPMENT [4]

[4] Reference herein to specifications SA (ferrous) or SB (nonferrous) shall be understood to mean SA or SB specifications as published by ASME with the latest addenda.

§ 14-11.1 Definition.

(a) Boilers to which the classification "miniature" applies are those which do not exceed the following limits:

(1) 16 inches inside diameter of shell;

(2) 5 cubic feet gross volume, exclusive of casing and insulation;

(3) 20 square feet water heating surface;

(4) 100 psi maximum allowable working pressure.

(b) Where any of the above limits is exceeded, the rules for power boilers shall apply.

(c) For forced-circulation boilers and boilers with no fixed steam or water line, the materials used shall comply with this Part. All other requirements of this Part shall be met except where they relate to special features of constructions made necessary in boilers of this type and to accessories that are manifestly not needed or used in connection with such boilers, such as water gages, water columns, and gage cocks.

§ 14-11.2 Construction materials.

Specifications are given in Section II of the ASME Boiler and Pressure Vessel Code for the important materials used in the construction of boilers, and the materials for miniature boilers, for which specifications exist, shall conform thereto, except that steel pipe for sizes over three inches in diameter shall be of open hearth steel. Owing to the small size of the parts of miniature boilers, stamping as required by Section II of the ASME Boiler and Pressure Vessel Code need not be visible after completing the boiler, provided the manufacturer certifies on the data report accompanying the boiler that the

material is in accordance with the requirements of the New York State Miniature Boiler Code. Provisions shall be made by the manufacturer whereby it shall be able to supply complete information regarding the material and details of construction of any boiler built under the rules of this Part.

§ 14-11.3 Specifications for shells, heads.

(a) Steel plates subject to pressure in any part of a miniature boiler shall be of firebox or flange grade. The plates for shells or heads shall be of not less than one-quarter inch in thickness, except that seamless shells shall be not less than three-sixteenths inch in thickness. Heads used as tube sheets, with tubes rolled in, shall be at least five-sixteenths inch in thickness.

(b) Steam boiler parts of not over 600 cubic inches in volume may be made of cast copper or bronze having a copper content of not less than 90 percent and wall thickness of not less than one-quarter inch. Such steam boiler parts shall be equipped with at least one brass washout plug of not less than one-half inch iron-pipe size and shall be tested to a hydrostatic pressure of 600 psi.

§ 14-11.4 Construction of miniature boilers under power boiler rates.

(a) The construction of miniature boilers, except where otherwise specified, shall conform to that required for power boilers. The factor of safety and method of computing the maximum allowable working pressure shall be the same as for power boilers.

(b) Miniature boilers constructed by fusion welding in accordance with all the requirements of the ASME Code are not required to have the welded joints radiographed or post weld heat treated.

(c) Electric boilers shall be constructed and stamped in accordance with the ASME Code.

§ 14-11.5 Brass washout plugs.

Every miniature boiler shall be fitted with not less than three brass washout plugs of one-inch iron-pipe size, which shall be screwed into openings in the shell near the bottom. In miniature boilers of the closed-system type heated by removable internal electric heating elements, the openings for these elements when suitable for cleaning purposes may be substituted for washout openings. Boilers not exceeding 12 inches internal diameter and having less than 10 square feet of heating surface, need have not more than two one-inch openings for cleanouts, one of which may be used for the attachment of the blowoff valve; these openings shall be opposite to each other where possible. All threaded openings in the boiler shall be provided with a riveted or welded reinforcement, if necessary, to give four full threads therein.

§ 14-11.6 Pump or feeding device.

Every miniature boiler shall be provided with at least one feed pump or other feeding device, except where it is connected to a water main carrying sufficient pressure to feed the boiler or where the steam generator is operated with no extraction of steam (closed system). In the latter case, and on electric miniature boilers with an input of 9 kw or less, in lieu of a feeding device, a suitable connection or opening shall be provided to fill the generator when cold. Such connection shall be not less than one-half inch pipe size.

§ 14-11.7 Feedwater and blowoff connections.

(a) All valves, pipe fittings, and appliances connected to a miniature boiler shall be equal at least to the requirements of the American Standards for 125 psi.

(b) Each miniature boiler shall be fitted with feedwater and blowoff connections, which shall not be less than one-half inch iron-pipe size unless operated on a closed system as provided in section 14-11.6 of this Subpart. The feed pipe shall be provided with a check valve and a stop valve. The feedwater may be delivered to the boiler through the blowoff connection, if desired. The blowoff shall be fitted with a valve or cock in direct connection with the lowest water space practicable. When the boiler is under pressure, feedwater shall not be introduced through the openings or connections used for the water column, the watergage glass, or the gage cocks. In closed systems the water may be introduced through any opening when the boiler is not under pressure.

§ 14-11.8 Water gage, water level.

Each miniature boiler for operation with a definite water level shall be equipped with a glass water gage for determining the water level. The lowest permissible water level shall be at a point one-third of the height of the shell, except where the boiler is equipped with internal furnace, when it shall be not less than one-third of the length of the tubes above the top of the furnace. In the case of small steam generating units operated on the closed system where there is insufficient space for the usual glass water gage, water level indicators of the glass bulls-eye type may be used.

§ 14-11.9 Steam gage.

Each miniature boiler shall be equipped with a steam gage having its dial graduated to not less than one and one-half times the maximum allowable working pressure. The gage shall be connected to the steam space or to the steam connection to the water column by a brass or bronze composition siphon tube or equivalent device that will keep the gage tube filled with water.

§ 14-11.10 Safety valves.

(a) Each miniature boiler shall be equipped with a sealed spring-loaded pop safety valve not less than one-half inch in diameter. Where there is no extraction of steam (closed system), a safety fracturing disk may be used in addition to the spring-loaded pop safety valve.

(b) Each safety valve shall be plainly marked by the manufacturer in such a way that the markings will not be obliterated in service. The markings may be stamped on the casing, or stamped or cast on a plate or plates securely fastened to the casing, and shall comply with sections 14-9.4 to 14-9.15, inclusive, of this Part.

(c) The safety valve or valves shall be connected to the boiler independently of any other steam connection, without any unnecessary intervening pipe or fitting. Such intervening pipe or fitting, if unavoidable, shall be not longer than the corresponding face-to-face dimension of a tee fitting of the same diameter, and the minimum opening therethrough shall be at least equal to the area of the valve inlet. No valve of any description shall be placed between the safety valve or valves and the boiler, nor on the discharge pipe from the safety valve to the atmosphere.

(d) To insure the safety valve being free, each valve shall have a substantial lifting device by which the valve disk may be lifted from its seat when there is at least 75 percent of full working pressure in the boiler. All safety valves shall be mounted with their spindles vertical in an upright position and freely accessible.

§ 14-11.11 Stop valve on steam line.

Each steam line from a miniature boiler shall be provided with a stop valve located as close to the boiler shell or drum as is practicable, except when the boiler and steam receiver are operated as a closed system.

§ 14-11.12 Fuel regulating governor.

It is recommended that all boilers operated with gas, oil, or mechanical firing be provided with an automatic low water fuel cutout and/or with an automatic fuel regulating governor controlled by the steam pressure. Such a governor used on gas fuel shall be so constructed that in the event of its failure there can be no possibility of steam from the boiler entering the gas chamber or supply pipe.