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Steam Boiler Rules and Regulations 1941

Maine Department of Labor and Industry

Maine Division of Boiler Inspections

STATE OF MAINE
DEPARTMENT OF LABOR AND INDUSTRY
DIVISION OF BOILER INSPECTIONS

STEAM BOILER
RULES AND REGULATIONS

FORMULATED BY THE

BOARD OF APPEALS
1941

ENFORCED BY INSPECTORS
FROM
THE DIVISION OF BOILER INSPECTIONS

STATE HOUSE
AUGUSTA

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RULES AND REGULATIONS GOVERNING CONSTRUCTION, INSTALLATION AND OPERATION OF STEAM BOILERS IN AND FOR THE STATE OF MAINE

Section 1—NEW INSTALLATIONS. This section applies to boilers installed after January 9, 1936.

Section 2—EXISTING INSTALLATIONS. These rules apply to boilers installed on or before July 6, 1935, and became effective October 9, 1935.

Section 3—NEW INSTALLATIONS, MINIATURE BOILERS. This section applies to boilers installed after January 9, 1936.

Section 4—EXISTING INSTALLATIONS, MINIATURE BOILERS. These rules apply to miniature boilers installed on or before July 6, 1935, and became effective October 9, 1935.

Section 5—APPLIES TO BOILERS OF ALL TYPES except those exempt under Section 13, Chapter 85, P. L. 1935.

Section 6—RULES AND REGULATIONS FOR ALL REPAIRS BY FUSION WELDING.

CAUTION !

Kindly observe the following briefs and avoid any unnecessary expense and inconvenience.

DO NOT buy a boiler for use in this State without first making application to this Department and securing permission for operation of same. Also have the boiler inspected by a State inspector from this Department or by a duly authorized insurance company. File report of insurance inspection with your application.

DO NOT operate any boiler until same has been inspected by a State Boiler Inspector from this Department or a duly authorized insurance company, and a certificate of inspection has been received permitting the operation of same, unless exempt under Section 13, Chapter 85, P. L. 1935.

DO NOT fail to post certificate of inspection under glass in the boiler room or if boiler is of portable type, on inside of cab or in a metal container and kept in tool box attached.

DO NOT permit repairs by **WELDING** until you have received instructions either from the Department or your insurance carrier.

In case of accident to a boiler in the form of explosion, secure permission from either the insurance company, if the boiler is insured, or from the State if uninsured, before any changes are made or before any parts are removed, unless removing a part of the structure is necessary toward the saving of life.

Refer all communications to the Division of Boiler Inspections, Department of Labor and Industry, State House, Augusta, Maine.

Always give State boiler number, where known, in your communication.

CHAPTER 158, P. L. 1931

An Act relating to registration and use of steam boilers and unfired steam pressure vessels.

Chapter 54 of the Revised Statutes is hereby amended by adding the following sections at the end thereof.

Sec. 50. Condemned vessels shall not be operated; penalty. No steam boiler or unfired steam pressure vessel that has been condemned for further use in this or any other state by an authorized boiler inspector employed by an insurance company or by an inspector authorized to inspect boilers by a state or the federal government shall be operated in this state.

Whoever operates a boiler in violation of this section shall be punished by a fine of not less than one hundred dollars.

Sec. 51. Condemned vessels to be stamped; penalty. Every steam boiler or unfired steam pressure vessel so condemned in this state shall be stamped in the following manner, "XXX Me." and the department of labor and industry shall immediately be notified of such condemnation.

The stamp "XXX Me." placed on condemned boilers shall be made across the registration mark or number of the boiler, or if the boiler has no registration mark or number, a stamp shall be placed in the location of this mark as determined by the rules of the American Society of Mechanical Engineers' boiler code.

The stamping shall be done with individual letters, driven into the plate so far as to thoroughly cancel any previous registration and shall be made with letters at least three-eighths of an inch high.

Any person who obliterates such condemnation mark shall be punished by a fine of not less than one hundred dollars.

The laws and regulations of the American Society of Mechanical Engineers' boiler code shall be used in all mathematical computations necessary to determine the safety of a boiler.

Sec. 52. Registration of certain steam boiler or unfired steam pressure vessels; exceptions. On and after September first, nineteen hundred thirty-one, no steam boiler or unfired steam pressure vessel subjected to a pressure of over fifteen pounds to the square inch shall be operated in this state unless such boiler or unfired steam pressure vessel shall have been registered in the office of the state department of labor and industry, upon blanks to be furnished by said department, upon request, such blanks to contain information regarding maker's name, type of construction, date of construction, age, location and when last inspected, and such other information as may be required by said department.

Whoever fails to so register any steam boiler or unfired steam pressure vessel shall be punished by a fine of ten dollars.

In case a boiler or unfired steam pressure vessel, subject to the provisions of this section, is moved from one location to another, notice shall be given the department of labor of such removal and of the new location in which the boiler is to be set up.

The provisions of this section shall not apply to boilers subject to federal inspection and control, or to boilers used in steamboats, or those under the control of the public utilities commission, or boilers used in automotive vehicles.

Sec. 53. Filing of inspection reports. In case a boiler is insured and inspected by a duly accredited insurance company licensed to do business in this state, a copy of the record of each internal inspection of such boiler shall be filed with the department of labor and industry.

CHAPTER 123, P. L. 1933

An Act relating to stamping of registered boilers.

Registered boilers to be stamped. After a steam boiler has been registered in the department of labor and industry, said department shall furnish, and the owner or user shall stamp, or have stamped, a number as given, on the shell of the boiler in the space commonly used for such purposes, with letters and figures not less than $\frac{3}{8}$ of an inch high. Any per-

son, firm or corporation who fails to so stamp or obliterates or covers such numbers shall be punished by a fine of not more than $100.

CHAPTER 110, P. L. 1935

An Act relating to the insurance of steam boilers.

In case an insurance company cancels insurance upon any steam boiler carrying over 15 pounds gauge pressure or the policy expires and is not renewed, notice shall immediately be given the department of labor and industry. They shall likewise notify said department immediately upon the placing of insurance on such boiler.

PUBLIC LAWS 1935

CHAPTER 85

An Act relating to the use of steam boilers.

Be it enacted by the People of the State of Maine, as follows:

Sec. 1. Board of appeals created. There is hereby created the board of appeals consisting of 5 members of whom 4 shall be appointed to the board by the commissioner of labor and industry, subject to the approval of the governor and council, 1 for a term of 1 year, 1 for a term of 2 years, 1 for a term of 3 years and 1 for a term of 4 years, to hold office until their respective successors have been duly appointed and qualified. At the expiration of their respective terms of office their successors shall likewise be appointed for terms of 4 years each. In the event of a vacancy by reason of the death, or resignation of any of said 4 appointed members, or otherwise, the commissioner of labor and industry shall fill such vacancy for the remainder of the term with a representative of the same class. Of these said 4 appointed members, 1 shall be a representative of the owners and users of steam boilers within the State of Maine, 1 a representative

of the boiler manufacturers within the State of Maine, 1 a representative of the operating steam engineers in the State of Maine, and 1 a representative of a boiler inspection and insurance company licensed to do business within the State of Maine. The 5th member shall be the commissioner of labor and industry, who shall be chairman of the board. The board shall meet at least twice yearly at the state capitol or other place designated by the board.

Sec. 2. To serve without salary; expenses allowed. The 4 appointed members of the board of appeals shall serve without salary, and shall receive their actual expenses not to exceed their actual railroad fares and hotel bills, for not to exceed 20 days in any year while in the performance of their duties as members of the board, to be paid in the same manner as in the case of other state officers. The chairman of the board of appeals shall countersign all vouchers for expenditures under this section.

Sec. 3. Rules and regulations. The board shall formulate rules for the safe and proper construction, installation, repair, use and operation of steam boilers in this state. The rules so formulated shall conform as nearly as practicable to the boiler code of the American Society of Mechanical Engineers and amendments and interpretations thereto made and approved by the council of the society.

Rules formulated by the board of appeals shall become effective 90 days after the date they are adopted, except that rules applying to the construction of new steam boilers shall not become effective to prevent the installation of such new steam boilers until 6 months after the passage of this act. Any change in the rules which would raise the standards governing the methods of construction of new steam boilers or the quality of material used in them shall not become effective until 6 months after the date of adoption of such change in the rules, provided, however, that before any rules or regulations are adopted, a public hearing shall be held, suitable notification to be published in at least 3 newspapers throughout the state.

Sec. 4. Chief and deputy inspectors; how appointed. On or before 90 days after the passage of this act, and at any time thereafter that the office may become vacant, the commissioner of labor and industry shall appoint, with the approval of the governor and council, and may remove for cause when so appointed, a citizen of this state who shall have had, at the time of such appointment, not less than 5 years practical experience with steam boilers as a steam engineer, mechanical engineer, boiler maker or boiler inspector, and who has passed the same kind of an examination as that prescribed for deputy and special inspectors in section 7 of this act to be chief inspector.

The commissioner of labor and industry may likewise appoint such deputy inspectors as are necessary to carry out the provisions of the act from among applicants who have successfully passed the examination and hold certificates of competency provided for in section 7 of this act.

Sec. 5. Powers of chief inspector. The chief inspector is empowered:

(1) to have free access for himself and his deputy or deputies during reasonable hours, to any premises in the state where a steam boiler is built or where a steam boiler or power plant apparatus is being installed or operated, for the purpose of ascertaining whether such boiler is built, installed and operated in accordance with the provisions of this act.

(2) to issue, suspend and revoke inspection certificates allowing steam boilers to be operated, as provided in this act.

(3) to enforce the laws of the state governing the use of steam boilers and to enforce the rules of the board of appeals.

(4) to keep a complete record of the type, dimensions, age, condition, pressure allowed upon, location and date of last inspection of all boilers to which this act applies.

(5) to publish and distribute among boiler manufacturers and others requesting them, copies of the rules adopted by the board of appeals.

(6) to hold examinations, and issue certificates of competency to inspectors who have successfully passed such examinations.

Sec. 6. Special inspectors; how appointed; duties. In addition to any deputy boiler inspectors authorized and appointed under section 4 of this act, the commissioner of labor shall, upon the request of any company authorized to insure against loss from explosion of steam boilers in this state, issue to the boiler inspectors of such company certificates of authority as special inspectors, provided that each inspector before receiving his certificate of authority shall pass satisfactorily the examination provided for in section 7 of this act, or, in lieu of such examination, shall hold a certificate as an inspector of steam boilers for a state that has a standard of examination equal to that of the state of Maine, or a certificate from the national board of boiler and pressure vessel inspectors. Such special inspectors shall receive no salary from, nor shall any of their expenses be paid by the state, and the continuance of a special inspector's certificate shall be conditioned upon his continuing in the employ of a boiler inspection and insurance company duly authorized as aforesaid, and upon his maintenance of the standards imposed by this act. Such special inspectors shall inspect all steam boilers insured by their respective companies, and the owners or users of such insured boilers shall be exempt from the payment of the fees provided for in section 11 of this act. Each company employing such special inspectors shall within 30 days following each annual internal inspection made by such inspectors, file a report of such inspection with the chief inspector.

Sec. 7. Deputy and special inspectors to be examined. Examination for deputy and special inspectors shall be given by the chief inspector, or by at least 2 examiners to be appointed by said chief inspector. The person to be examined must pay an examination fee of $5. Such examination must be written or part written and part oral, recorded in writing, and must be confined to questions the answers to which will aid in determining the fitness and competency of the applicant for the intended service and must be of uniform grade throughout the state. In case an applicant for an inspector's certificate of competency fails to pass this examination, he may

appeal to the board of appeals for a 2nd examination, which shall be given by said board, or, by examiners other than those by whom the 1st examination was given and these examiners shall be appointed forthwith to give said 2nd examination. Upon the result of this examination on appeal, the board shall determine whether the applicant be qualified. The record of an applicant's examination, whether original or on appeal, shall be accessible to him and to his employer.

A certificate of competency may be revoked by the chief inspector of steam boilers for the incompetence or untrustworthiness of the holder thereof or for wilful falsification of any matter or statement contained in his application or in a report of any inspection. A person whose certificate is revoked may appeal from the revocation to the board of appeals which shall hear the appeal and either set aside or affirm the revocation and its decision shall be final. The person whose certificate has been revoked shall be entitled to be present in person and by counsel on the hearing of the appeal. If a certificate is lost or destroyed a new certificate shall be issued in its place without another examination. A person who has failed to pass the examination or whose certificate of competency has been revoked, shall be entitled to apply for a new examination and certificate after 90 days from such failure or revocation.

Sec. 8. Inspection of boilers; certificates issued. After 90 days from the passage of this act each steam boiler used or proposed to be used within this state, except boilers exempt under section 13, of this act, shall be thoroughly inspected internally and externally while not under pressure by the chief inspector or by 1 of the deputy inspectors or special inspectors provided for herein, as to its design, construction, installation, condition and operation; and if it shall be found to be suitable and to conform to the rules of the board of appeals, upon payment by the owner or user of such a boiler of the sum of $1 to the chief inspector, the latter shall issue to such owner or user an inspection certificate for each such boiler; and the owner or user of a miniature boiler required to be inspected shall pay to the chief inspector the sum of

25c for each inspection certificate issued. Inspection certificates shall specify the maximum pressure that the boiler inspected may be allowed to carry. Such inspection certificate shall be valid for not more than 14 months from its date and it shall be posted under glass in the engine or boiler room containing such boiler or an engine operated by it, or, in the case of portable boiler, in the office of the plant where it is located for the time being. The chief inspector or any deputy inspector may at any time suspend an inspection certificate when, in his opinion, the boiler for which it was issued may not continue to be operated without menace to the public safety or when the boiler is found not to comply with the rules herein provided for, and a special inspector shall have corresponding powers with respect to inspection certificates for boilers insured by the company employing him. Such suspension of an inspection certificate shall continue in effect until said boiler shall have been made to conform to the rules of the board of appeals and until said inspection certificate shall have been reinstated by a state inspector, if the inspection certificate was suspended by a state inspector, or by a special inspector if it was suspended by a special inspector. Not more than 14 months shall elapse between such inspections and there shall be at least 4 such inspections in 37 consecutive months. Each such boiler shall also be inspected externally while under pressure with at least the same frequency and at no greater intervals.

Sec. 9. Inspection certificate required; penalty. On and after 6 months from adoption of the rules formulated by the board of appeals it shall be unlawful for any person, firm, partnership or corporation to operate under pressure in this state a steam boiler to which this act applies without a valid inspection certificate as provided for in this act. The operation of a steam boiler without an inspection certificate shall constitute a misdemeanor on the part of the owner or user thereof and be punishable by a fine of not more than $100, or by imprisonment for not more than 30 days, or by both such fine and imprisonment.

Sec. 10. Rule governing installation of new boilers. No new steam boiler which does not conform to the rules formulated by the board of appeals governing new installations shall be installed in this state after 6 months from the date upon which the said rules shall become effective.

All new boilers to be installed after 6 months from the date upon which the rules of the board of appeals shall become effective shall be inspected during construction by an inspector authorized to inspect boilers in this state, or, if constructed outside the state, by an inspector holding a certificate of authority from the chief inspector of this state, or an inspector who holds a certificate of inspection issued by the national board of boiler and pressure vessel inspectors.

All steam boilers installed and ready for use, or being used, before the said 6 months shall have elapsed shall be made to conform to the rules of the board of appeals governing existing installations and the formula therein prescribed shall be used in determining the maximum allowable working pressure for such boilers.

Sec. 11. Inspection charge; by whom paid; disposition of. The owner or user of a steam boiler required by this act to be inspected by the chief inspector, or his deputy inspectors, shall pay the inspector upon inspection $5. For the internal and external inspection of a boiler while not under pressure having a grate area of more than 10 square feet or equivalent, the fee shall be $5 and, in addition, 10c for every square foot of grate area in excess of 10 square feet or equivalent. For the external inspection of a boiler while under operation conditions, the fee shall be $2.50. For the inspection of a miniature boiler, the fee shall be $2. For a hydrostatic test of any boiler except miniature boilers, a fee of $5 shall be charged in addition to the inspection fees hereinbefore provided for, provided that not more than $12.50 shall be collected for such inspection of any one boiler made for any 1 year exclusive of the fee for hydrostatic test unless additional inspections are required by the owners or users of the same or unless the boiler has been inspected and a certificate has been refused, withheld or withdrawn, or unless an

additional inspection is required because of the change of location of a stationary boiler. The type and size of the miniature boiler to be inspected shall be determined by the board of appeals. The inspector shall give receipts for said fees and shall pay all sums so received to the chief boiler inspector who shall pay the same to the commissioner of labor and industry, who shall turn same over to the treasurer of state to be credited to the general fund of the department.

Sec. 12. Application of this act to boilers now in use. This act shall not be construed as in any way preventing the use or sale of steam boilers in this state which shall have been installed or in use in this state prior to the taking effect of this act and which shall have been made to conform to the rules of the board of appeals governing existing installations and which shall have been inspected as provided for in section 8 of this act.

Sec. 13. Exemptions. This act shall not apply to boilers which are under Federal control; or those under the control of the public utilities commission; or to boilers used solely for propelling motor road vehicles; or to boilers of steam fire engines brought into the state for temporary use in times of emergency to check conflagrations; or to boilers used for agricultural purposes only; or to steam heating boilers which carry pressures not exceeding 15 pounds per square inch, constructed and installed in accordance with the rules adopted by board of appeals; or to miniature boilers exempt by the provisions of section 11 of this act.

Sec. 14. Chief and deputy inspectors to furnish bond. The chief inspector shall furnish a bond in the sum of $2000 and each deputy inspector shall furnish a bond in the sum of $1000 conditioned upon the faithful performance of their respective duties and upon a true accounting of all moneys handled by them respectively and the payment over thereof to an officer of the state having authority to accept same and issue a receipt therefor. The cost of said bonds shall be paid by the department.

Sec. 15. Repealing clause; constitutionality of act; words defined. All acts and parts of acts inconsistent with any provisions of this act are hereby repealed or amended in conformity hereto, and if any section, subsection, sentence, clause or phrase of this act is, for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this act.

Definitions:

"Department" shall mean the state department of labor and industry.

The title "deputy inspector" or "special inspector" shall mean a person holding a certificate of authority to inspect boilers within the state of Maine.

The term "approved" shall mean approved by the department of labor and industry.

The word "code" as used in this act shall mean the power boiler code of the American Society of Mechanical Engineers.

"Miniature Boiler:" A boiler as defined by the American Society of Mechanical Engineers' Code.

Approved March 30, 1935

The following rules and regulations are hereby adopted by the Board of Appeals created under Section 1, Chapter 85, of the Public Laws of 1935.

SECTION 1

NEW INSTALLATIONS

All new steam boilers installed in this state after Jan. 9, 1936, except boilers exempt under Section 13, Chapter 85, Public Laws 1935, shall be constructed and installed in accordance with the rules and regulations of the Power Boiler Code of the American Society of Mechanical Engineers, together with the Appendix and any amendments thereto. Also said boilers must be inspected and stamped as provided in Paragraph 332 of the Power Boiler Code of the American Society of Mechanical Engineers, or National Board symbol and

registration number, together with the serial number of the state of Maine followed by the letters ME., said letters and figures to be not less than $\frac{3}{8}$ of an inch in height to comply with Chapter 123, Public Laws 1933.

All manufacturers of said steam boilers are required to furnish the Department with shop data sheets for such new boilers.

Boilers shall be so located and egresses so arranged as to provide a safe and quick escape for operator or operators in event of emergency. This is understood to include suitable and sufficient ladders from boiler tops, similar elevated appurtenances, and blow-off valves.

SECTION 2

EXISTING INSTALLATIONS

The following rules and regulations are hereby adopted by the Board of Appeals created under Section 1, Chapter 85, of the Public Laws of 1935, and apply to boilers installed previous to January 9, 1936, as provided in Section 10, third paragraph, Chapter 85, Public Laws 1935.

Rule 1. The maximum allowable working pressure on the shell of a boiler or drum shall be determined by the strength of the weakest section of the boiler, computed from the thickness of the plate, the tensile strength of the plate, the efficiency of the longitudinal joint, or the tube ligament, the inside diameter of the course and the factor of safety allowed by these rules.

$$\frac{TS \times t \times E}{R \times FS} = \text{maximum allowable working pressure, lbs. per sq. in.}$$

Where

TS = ultimate tensile strength of shell plates, lbs. per sq. in.

t = minimum thickness of shell plate, in weakest course, in.

E = efficiency of longitudinal joint, method of determining which is given in Par. P-181, ASME Code Book. See note.

E for seamless boilers shall be 100%.

E for tube ligaments between openings shall be calculated by the rules given in Par. P-192 and P-193, ASME Boiler Code.

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

FS = factor of safety allowed by these rules.

Note: To be used as given above for longitudinal joints, riveted construction or if for fusion welded joints, E shall be taken as per efficiency specified in Par. P-102, ASME Boiler Code.

In any case wherein there are both riveted joints and tube ligaments to consider, the weaker of these shall be used for E.

Interpretation

In figuring the allowable working pressure on drums of water tube boilers of the lap seam construction wherein the efficiency of the tube ligament or longitudinal joint, whichever is the least shall be used. Our Rules call for a factor of safety of not less than 5 on shells or drums which are of the lap seam construction. The efficiency, however, for the tube ligament, if the shell or drum was of the double butt strap construction, could be taken as 4.5. In a case as described above, a factor of 4.5 may be used when the efficiency of the tube ligament is taken provided, however, that the safe working pressure shall not be greater than that arrived at when the efficiency of the longitudinal joint is used with a factor of 5.

Rule 2. Boilers of butt strap longitudinal seam construction in service when these rules become effective shall be operated with a factor of safety of at least 4.5.

Ten years after these rules become effective the factor of safety shall be at least 5.

Boilers of lap seam longitudinal construction in service when these rules become effective shall be operated with a factor of safety of at least 5.

Five years after these rules become effective the factor of safety shall be 5.5. After ten years it shall be 5.75, and after fifteen years it shall be not less than 6.

In no case shall the maximum allowable working 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.

Rule 3. Tensile strength. When the tensile strength of steel or wrought-iron shell plates is not known, it shall be taken as 55,000 lbs. per sq. in. for steel and 45,000 lbs. per sq. in. for wrought-iron.

Rule 4. Strength of rivets in shear. 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

The cross-sectional area used in the computations shall be that of the rivet shank after driving.

Rule 5. Crushing strength of mild steel. The resistance to crushing of mild steel shall be taken at 95,000 lbs. per sq. in. of cross-sectional area.

Rule 6. 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 taken from the following Table or ascertained by cutting out one rivet in the body of the joint.

Table—Sizes of Rivets Based on Plate Thickness

Thickness of plate	$\frac{1}{4}''$	$\frac{9}{32}''$	$\frac{5}{16}''$	$\frac{11}{32}''$	$\frac{3}{8}''$	$\frac{13}{32}''$
Diameter of rivet after driving	$\frac{11}{16}''$	$\frac{11}{16}''$	$\frac{3}{4}''$	$\frac{3}{4}''$	$\frac{13}{16}''$	$\frac{13}{16}''$
Thickness of plate	$\frac{7}{16}''$	$\frac{15}{32}''$	$\frac{1}{2}''$	$\frac{9}{16}''$	$\frac{5}{8}''$	
Diameter of rivet after driving	$\frac{15}{16}''$	$\frac{15}{16}''$	$\frac{15}{16}''$	$1\frac{1}{16}''$	$1\frac{1}{16}''$	

Rule 7. 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 6 per cent above the maximum allowable working pressure, or more than 6 per cent above the highest pressure to which any valve is set.

Rule 8. 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 3 per cent above the maximum allowable working pressure, but the range of setting of all of the valves on a boiler shall not exceed 10 per cent of the highest pressure to which any valve is set. No valve of any description shall be placed between the safety valve and the boiler nor on the escape pipe between the safety valve and the atmosphere. When an elbow is placed on a safety valve escape pipe, it shall be located close to the safety valve outlet, or the escape pipe shall be securely anchored and supported. When an escape pipe is used, it shall be full sized and fitted with an open drain to prevent water lodging in the upper part of the safety valve or escape pipe. Safety valves having either the seat or disc of cast iron shall not be used. Dead weight or lever weighted safety valves are prohibited after July 1, 1936.

Rule 9. All stationary reinstalled boilers with ownership not changed shall be inspected and subjected to hydrostatic test before being placed in operation and shall be equipped with appurtenances conforming to the ASME Boiler Code applying to new installations.

The chief inspector is granted the power to waive hydrostatic tests in certain instances where in his judgment the tests are not necessary, until such time as the Board decides to revoke this decision.

Whenever a question arises as to the difference between a stationary and a portable boiler, the chief inspector is granted the power to define the difference between a stationary and a portable boiler.

Rule 10. The factor of safety for reinstallation shall be in accordance with the requirements of Rule 2 except that a factor of safety of not less than 5.5 shall be used when the boiler is of the lap seam type and a factor of safety of not less than 5 shall be used when the boiler is of butt and double strap construction.

Rule 11. Second-hand boilers, by which are meant boilers where both the ownership and location are changed, which are not constructed in accordance with the Code, and which have been installed or in use in this state previous to Jan. 9, 1936, shall be inspected and subjected to a hydrostatic test; shall have a factor of safety for reinstallation in accordance with Rule 2, except that a factor of safety of not less than 5.5 shall be used; and shall be equipped with appurtenances conforming to the ASME Boiler Code applying to new installations.

Rule 12. The age limit of a fire tube boiler having a longitudinal lap joint and carrying over 50 lbs. pressure shall be 30 years, except that no lap joint boiler shall be discontinued from service solely on account of age until 7 years after these rules become effective, providing that before Oct. 9, 1940, the lap joints are investigated by slotting the seams, and the boiler tested hydrostatically not less than $1\frac{1}{4}$ or not over $1\frac{1}{2}$ times the maximum allowable working pressure by an authorized inspector, and its condition found to warrant its further use. After Oct. 9, 1940, no major repairs shall be made to a lap seam fire tube boiler over 30 years of age.

Rule 13. Any boiler having a continuous lap seam more than 12 feet in length and a diameter over 36 inches when removed from an existing setting shall not be reinstalled to operate at a pressure in excess of fifteen pounds per sq. in.

Rule 14. Cast-Iron Headers and Mud Drums. The maximum allowable working pressure on a water-tube boiler, the tubes of which are secured to cast-iron or malleable-iron headers, or which have cast-iron mud drums, shall not exceed 160 lbs. per sq. in.

Rule 15. Fire-actuated fusible plugs, when used shall conform to the rules and regulations of the Boiler Code Committee of the American Society of Mechanical Engineers, and shall be renewed when requested by the Chief Inspector, Deputy Inspector or Special Inspectors.

Rule 16. The least diameter of fusible metal in a fire-actuated plug shall be not less than $\frac{1}{2}''$, except for maximum allowable working pressures of over 175 lbs. per sq. in. or when it is necessary to place a fire-actuated fusible plug in a tube, in which case the least diameter of fusible metal shall be not less than $\frac{3}{8}''$. (For dimensions refer to Figure A-10 ASME Code Book.) If a fire-actuated fusible plug is inserted in a tube, the tube wall shall be not less than 0.22 in. thick or sufficient to give four threads.

Rule 17. Steam-actuated fusible plugs, if used, shall be so located that they will operate when the water level is at the point where a fire-actuated fusible plug would be located if installed under these rules. Fire-actuated fusible plugs, if used, shall be located at the lowest permissible water level for different types of boilers as follows:

a. In Horizontal-Return Tubular Boilers—in the rear head, not less than 1 in. above row of tubes, the measurement to be taken from the line of upper surface of tubes to the center of the plug, and projecting through the sheet not less than 1 in. When the distance between the uppermost line of tubes and the top of the steam space is 13″ or less, the bottom of the fusible plug may come at a lesser distance than 1 in. above the upper row of tubes, but in no case shall the plug be located below the level of the top of the uppermost row of tubes.

b. In Horizontal Flue Boilers—in the rear head, on a line with the highest part of the boiler exposed to the products of combustion, and projecting through the sheet not less than 1 in.

c. In Traction, Portable or Stationary Boilers of the Locomotive Type or Star Water Tube Boilers—in the highest

part of the crown sheet, and projecting through the sheet not less than 1 in.

d. In Vertical Fire-tube Boilers—in an outside tube, not less than one-third the length of the tube above the lower tube sheet.

e. In Vertical Fire-tube Boilers, Corliss Type—in a tube, not less than one-third the length of the tube above the lower tube sheet.

f. In Vertical Submerged-Tube Boilers—in the upper tube sheet, and projecting through the sheet not less than 1 in.

g. In Water-tube Boilers, Horizontal Drums, Babcock & Wilcox Type—in the upper drum, not less than 6 in. above the bottom of the drum, over the first pass of the products of combustion, and projecting through the sheet not less than 1 inch.

h. In Stirling Boilers, Standard Type—in the front side of the middle drum, not less than 4 in. above the bottom of the drum, and projecting through the sheet not less than 1 in.

i. In Stirling Boilers, Superheater Type—in the front drum, not less than 6 in. above the bottom of the drum, exposed to the products of combustion, and projecting through the sheet not less than 1 in.

j. In Water-tube Boilers, Heine Type—in the front course of the drum, not less than 6 in. above the bottom of the drum, and projecting through the sheet not less than 1 in.

k. In Edge Moor Boilers, Standard Type—in the bottom of the steam and water drum not less than 6 in. above the bottom of the drum, over the first pass of the products of combustion, and projecting through the sheet not less than 1 in.

l. In Water-tube Boilers, Almy Type—in a tube or fitting exposed to the products of combustion.

m. In Vertical Boilers, Climax or Hazelton Type—in a tube or center drum not less than one-half the height of the shell, measuring from the lowest circumferential seam.

n. In Cahall Vertical Water-tube Boilers—in the inner sheet of the top drum, not less than 6 in. above the upper tube sheet, and projecting through the sheet not less than 1 in.

o. In Wickes Vertical Water-tube Boilers—in the shell of the top drum and not less than 6 in. above the upper tube sheet, and projecting through the sheet not less than 1 in.; so located as to be at the front of the boiler and exposed to the first pass of the products of combustion.

p. In Scotch Marine Type Boilers—in the combustion chamber top, and projecting through the sheet not less than 1 in.

q. In Dry-Back Scotch Type Boilers—in the rear head, not less than 2 in. above the upper row of tubes, and projecting through the sheet not less than 1 in. When the distance between the uppermost line of tubes and the top of the steam space is 13 in. or less, the bottom of the fusible plug may come at a lesser distance than 2 in. above the upper row of tubes; but in no case shall the plug be located below the level of the top of the uppermost row of tubes.

r. In Economic-Type Boilers—in the rear head not less than 2 in. above the upper row of tubes. When the distance between the uppermost line of tubes and the top of the steam space is 13 in. or less, the bottom of the fusible plug may come at a lesser distance than 2 in. above the upper row of tubes but in no case shall the plug be located below the level of the top of the uppermost row of tubes.

s. In Water-Tube Boilers, Worthington Type—in the front side of the steam and water drum, not less than 4 in. above the bottom of the drum, and projecting through the sheet not less than 1 in.

t. Fire Engine Boilers are not usually supplied with fusible plugs. Unless special provision is made to keep the water above the firebox crown sheet other than by the natural level, the lowest permissible water level shall be at least 3 in. above the top of the firebox crown sheet.

u. For other types and new designs, fusible plugs shall be placed at the lowest permissible water level, subject to the direct radiant heat of the fire or in the direct path of the products of combustion, as near the primary combustion chamber as possible.

Rule 18. Water glasses and gage cocks. Each steam boiler shall have at least one water glass, the lowest visible part of which shall be not less than 2 in. above the lowest permissible water level.

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 lbs. per sq. 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 2 ft. apart.

Locomotive-type boilers not over 36 in. in diameter, or any firebox or waterleg boiler in which the heating surface does not exceed 50 sq. ft., need have but two gage cocks.

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 blow-off pipe shall be at least $\frac{1}{2}$ inch pipe size.

Rule 19. No outlet connections, except for damper regulator, feed-water regulator, low water cut-outs, drains or steam gages, shall be placed on the pipes connecting a water column to a power boiler.

Rule 20. Steam gages. Each boiler shall have a steam gage connected to the steam space or to the water column or to its steam connection graduated to not less than one and one-half times the safe working pressure of the boiler. 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. Where this pipe may be subject to freezing, a shut off cock may be placed close to boiler to provide for removal or draining. Connections to gages shall be of brass, copper or bronze composition. One-fourth inch Inspector's test gage connection shall be fitted so that the gage can be tested while the boiler is in operation.

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. A shut-off 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.

Rule 21. Stop valves. 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.

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

Rule 22. Bottom blow-off pipes. Each boiler shall have a blow-off pipe fitted with valve or cock in direct connection with the lowest water space practicable. When cocks are used they shall be of the gland or guard type and suitable for the pressure allowed. Straight run globe valves of the ordinary type, or valves of such types that drains or pockets can exist for the collection of sediment, shall not be used on blow-offs. Boiler carrying over 100 lbs. steam pressure shall have two valves or a valve and cock on the blow-off line.

The bottom blow-off pipe of every traction and/or portable boiler shall have at least one blow-off valve, conforming to the requirements of the ASME Code for the pressure allowed.

Rule 23. When any changes or repairs are made in the blow-off pipe for existing installations:

The blow-off 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 condensate is used.

All fittings between the boiler and valves shall be steel for pressures over 100 lbs.

When the pressure does not exceed 100 lbs. per sq. inch the valves and fittings shall be equal at least to the requirements of the American standards for 125 lbs. per sq. inch.

For pressures exceeding 100 lbs. per sq. inch the valves, pipe and fittings shall be equal at least to the requirement of the American Standards for 250 lbs. per square inch.

For pressures over 250 lbs. per sq. inch the valves or cocks shall be of steel construction equal at least to the requirements of the ASME Code.

Interpretaion for Rule 22 and 23

It is the interpretation of the Board that the requirements called for in Rules 22 and 23 shall apply only when repairs become necessary unless apparatus or fittings in present use are dangerous in the opinion of the inspector.

Rule 24. A bottom blow-off pipe when exposed to direct furnace heat, shall be protected by fire brick or other heat resisting material so arranged that the pipe may be inspected.

An opening in the boiler setting for a blow-off pipe shall be arranged to provide for free expansion and contraction.

Rule 25. Feed Piping. The feed pipe of a steam boiler operated at more than 15 lbs. per sq. in. maximum allowable working pressure, shall be provided with a check valve near the boiler and a valve or cock between the check valve and boiler, and when two or more boilers are fed from a common source, there shall also be a stop valve on the branch to each boiler, between the check valve and the source of supply. When a globe valve is used on a feed pipe, the inlet shall be under the disk of the valve.

Rule 26. 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. Suitable means should be provided for blowing out this equipment.

Rule 27. Test pressure. When a hydrostatic test is applied the required test pressure shall be not more than $1\frac{1}{2}$ times the maximum allowable working pressure.

During a hydrostatic test of a boiler, suitable provisions shall be made so that it will not be necessary to screw down the compression screw upon the spring of the safety valve. The temperature of water used during hydrostatic test shall not exceed 150 degrees Fahrenheit.

Rule 28. Where repairs are necessary which in any way affect the working pressure or safety of a boiler, a certified inspector shall be called for consultation and advice as to the best method of making such repairs; after such repairs are made they shall be subject to the approval of a certified inspector. All tubes in fire tube boilers shall have the ends of the tubes firmly rolled and beaded, or rolled, beaded and welded around the edge of the bead. Repairs to all boilers and their appurtenances shall conform to the requirements of the ASME Boiler Code.

Rule 29. Insurance companies shall furnish the chief inspector with a copy of external inspection reports, or reports of accidents, when any defect is found which affects the safety of the boiler.

Rule 29

Formulated by Board of Appeals and passed at Public Hearing May 7, 1941.

SECTION 3

MINIATURE BOILERS
NEW INSTALLATIONS

Miniature boilers and appurtenances installed after January 9, 1936, shall conform to the ASME Boiler Construction Code covering Miniature Boilers. Also said boilers must be inspected and stamped as provided in Paragraph M-20 of the Boiler Construction Code of the American Society of Mechanical Engineers covering miniature boilers, or National Board symbol and registration number, together with the serial number of the State of Maine followed by the letters ME., said letters and figures to be not less than $\frac{3}{8}$ of an inch in height to comply with Chapter 123, P. L. 1933.

SECTION 4

MINIATURE BOILERS
EXISTING INSTALLATIONS

Rules and regulations as adopted for power boilers as applied to strength of material, mathematical calculations to determine the safety of a boiler shall be used in all computations pertaining to the safe working pressure of a miniature boiler unless a special rule is hereafter given.

Rule 1. The maximum allowable working pressure on the shell of a boiler or drum shall be determined by the strength of the weakest section of the boiler, computed from the thickness of the plate, the tensile strength of the plate, the efficiency of the longitudinal joint, or the tube ligament, the inside diameter of the course and the factor of safety allowed by these rules.

$$\frac{TS \times t \times E}{R \times FS} = \text{maximum allowable working pressure, lbs. per sq. in.}$$

Where

TS = ultimate tensile strength of shell plates, lbs. per sq. in.

t = minimum thickness of shell plate, in weakest course, in.

E = efficiency of longitudinal joint, method of determining which is given in Par. P-181, ASME Code Book. See note.

E for seamless boilers shall be 100%.

E for tube ligaments between openings shall be calculated by the rules given in Par. P-192 and P-193, ASME Boiler Code.

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

FS = factor of safety allowed by these rules.

Note: To be used as given above for longitudinal joints, riveted construction or if for fusion welded joints, E shall be taken as per efficiency specified in Par. P-102, ASME Boiler Code.

In any case wherein there are both riveted joints and tube ligaments to consider, the weaker of these shall be used for E.

Rule 2. The construction of miniature boilers, except where otherwise specified, shall conform to that required for power boilers. The flat surfaces of boilers or pressure parts shall be stayed in accordance with Par. P-204 of Section 1 of the ASME Code.

Rule 3. The temperature of the heating element for electrically-heated steam boilers (closed system) shall be so controlled that it will not exceed 1200 deg. Fahr. All electrical equipment shall be installed and grounded in accordance with the requirements of the National Electrical Safety Code.

Rule 4. Every miniature boiler shall be fitted with suitable washout plugs of 1 in. 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 electrical heating elements, the openings for these elements when suitable for cleaning purposes, may be sub-

stituted for washout openings. All threaded openings in the boiler shall be provided with a riveted or welded reinforcement if necessary to give four full threads therein.

Rule 5. 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, in lieu of a feeding device a suitable connection or opening shall be provided to fill the generator when cold. Such connection shall not be less than $\frac{1}{2}''$ pipe size.

In all cases where no mechanical feed is attached to a boiler the safety valve shall be set at not less than 6% below the pressure of the main source of supply feeding the boiler. A return trap shall not be considered as a mechanical feeding device.

Rule 6. Each miniature boiler shall be fitted with feedwater and blow-off connections, which shall not be less than $\frac{1}{2}$ in. iron-pipe size unless operated on a closed system as provided in Rule 5. The feed pipe shall be provided with a check valve and a stop valve. The feedwater may be delivered to the boiler through the blow-off connection, if desired. The blow-off shall be fitted with a valve or cock in direct connection with the lowest water space practicable.

Rule 7. 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 generating units operated on the closed system where there is insufficient space for the usual glass water gage, water level indicators of the glass bull's-eye type may be used.

Rule 8. Each miniature boiler shall be equipped with a steam gage having its dial graduated to not less than $1\frac{1}{2}$ 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.

Rule 9. Each miniature boiler shall be equipped with a sealed spring-loaded pop safety valve, not less than $\frac{1}{2}$ in. in diameter, connected directly to the boiler. Where there is no extraction of steam (closed system) a fracturing disk safety valve may be used in addition to the spring-loaded pop safety valve. The safety valve shall be plainly marked by the manufacturer with a name or an identifying trade-mark, the nominal diameter, the steam pressure at which it is set to blow. 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 6 per cent above the maximum allowable working pressure, or more than 6 per cent above the highest pressure to which any valve is set.

Rule 10. 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.

Rule 11. Where miniature boilers are gas-fired, the burners used shall conform to the requirements of the American Gas Association, as given in Par. MA-5 of the Appendix of the ASME Code. The burners shall in such cases be equipped with a fuel-regulating governor, which shall be automatic and regulated by the steam pressure. This governor 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.

Rule 11 became effective July 1, 1936.

SECTION 5

BOILERS OF ALL TYPES

Rule 1. After an inspection certificate has expired or become void, said boiler shall be subject to inspection by the Chief Inspector or his deputies.

Rule 2. No used steam boiler or boilers for use under pressure shall be brought into this state after Jan. 9, 1936, except boilers exempt under Sec. 13, Chap. 85, P. L. 1935, unless the same has been constructed in accordance with the requirements of the State of Maine Rules for Boilers and is so stamped or is stamped in accordance with the requirements of the National Board of Boiler and Pressure Vessel Inspectors. A boiler having a standard stamping of another state that has adopted a standard of construction equivalent to the standard of the State of Maine, or a boiler bearing the standard stamping of the American Society of Mechanical Engineers, may be accepted, provided, however, that the person desiring to install the same shall, after the same has been internally and externally inspected by a certified inspector holding a Certificate of Competency for the State of Maine or a National Board Commission, make application for the installation of same to the Chief Inspector and shall file with the application a full inspection report and a manufacturer's data report covering the construction of the boiler in question. If such standard boiler be found to comply with the requirements of this State, it may be operated after an internal and external inspection, providing it is not over 15 years of age.

Rule 3. All boilers used for generating steam which carry a pressure of more than fifteen pounds per square inch and subject to regular inspections as provided in Chap. 85, Sections 8, 9, 10 and 11, P. L. 1935, shall be prepared for such inspections when the owners or users are notified by either the Department of Labor and Industry, Division of Boiler Inspections, or any authorized insurance company for such inspections or hydrostatic test if necessary.

Rule 4. The owner or user of the boiler or boilers herein required to be inspected annually on a date specified by the Chief Inspector, Deputy Inspector, or Special Inspectors of any authorized insurance company, which date shall be not less than seven days after date of such notice, unless by consent of the owner, shall prepare the boiler for internal inspection, or hydrostatic pressure test when necessary.

Rule 5. To prepare a boiler for internal inspection, the water shall be drawn off and the boiler thoroughly washed. All manhole and handhole plates and washout plugs in boilers and plugs in water column connection, if any, shall be removed, and the furnace and combustion chambers thoroughly cooled and cleaned. All grates of internally fired boilers shall be removed. Also enough of the brick work or insulating material of any type of boiler shall be removed to determine the condition of the boiler, furnace, mud drum heads, or other parts at each annual inspection when necessary. The steam gage shall be removed for testing.

Rule 6. If a boiler has not been properly prepared for internal inspection as provided for in this rule, the inspector may decline to make such inspection and certificate shall be withheld until the boiler has been properly prepared and inspected.

If it is found that steam or hot water is leaking into the boiler, the source of such leakage shall be disconnected, if necessary, so as to cut out such steam or hot water from the boiler to be inspected.

Rule 7. The fees for inspections as provided for in Sec. 11, Chap. 85, P. L. 1935, shall be paid to the chief or deputy inspector and a receipt stating the amounts collected by said inspector shall be given to the owner or user of such boiler or boilers. If the owner or user of any boiler required to be inspected under this Act by the Department of Labor and Industry, Division of Boiler Inspections, refuses to allow a boiler to be inspected or refuses to pay the fee as provided for in Sec. 11, Chap. 85, P. L. 1935, then such boiler or boilers

shall not be operated until after a valid inspection has been made by either the chief inspector or any deputy inspector or by a special inspector as provided in the before mentioned act.

Rule 8. If, upon inspection, a boiler or boilers are found to be in such condition that they are unsafe to operate, they shall be condemned. However, the owner or user may immediately appeal to the Chief Inspector or Board of Appeals, if he so desires, before the boiler is stamped as provided in Sec. 51, Chap. 158, P. L. 1931, and the owner or user of such boiler who causes the same to be operated with the condemnation mark thereon, shall be subject to the penalty as provided in Sec. 50, Chap. 158, P. L. 1931. Refer to Chap. 110, P. L. 1933. If appeal is made, the boiler shall not be operated pending the decision of the Chief Inspector or the Board of Appeals.

Rule 9. 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 joint 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.

Rule 10. When the boiler is stamped with the condemnation mark, the inspector shall put underneath such mark the identification mark furnished his company, if an insurance company, or that provided for the Chief Inspector or his deputies if condemned by the State, it being understood that identification marks shall be provided to all companies insuring boilers within the state by the Department of Labor and Industry, Division of Boiler Inspections.

Rule 11. When insulating a boiler, provision shall be made so that the insulation covering the longitudinal seam may be removed, or a space not less than ten inches wide shall be provided with removable insulation for taking measurements

or inspection of the joint and shell. This also applies to portable boilers which are jacketed with steel over the insulation.

If the boiler is jacketed so that the longitudinal seams of shells, drums or domes cannot be seen, and if it cannot otherwise be determined, enough of the jacketing, setting wall or other covering shall be removed so that the size and pitch of the rivets and such other data as may be necessary can be determined when, in the opinion of the inspector, it is necessary to determine the safety of the boiler or appliance.

Rule 12. All appliances required for electric steam generators shall be attached in accordance with the following rules:

A cable at least as large as one of the incoming power lines to the generator shall be provided for grounding the generator shell. This cable shall be permanently fastened on some part of the generator and shall be grounded in an approved manner.

A suitable screen or guard shall be provided around high tension bushings and a sign posted warning of high voltage. This screen or guard shall be so located that it will be impossible for anyone working around the generator to accidentally come in contact with the high tension circuits. When adjusting safety valves, the power circuit to the generator shall be open. The generator may be under steam pressure but the power line shall be open while the operator is making the necessary adjustments. A switch or circuit breaker of suitable rupturing capacity shall be installed in the power circuit together with disconnecting switches so that the power circuit may be opened and prevented from being accidentally closed during repairs to the boiler. One switch to be located near the boiler.

Rule 13. In all cases where no mechanical feed is attached to a boiler the safety valve shall be set at not less than 6% below the pressure of the main source of supply feeding the boiler. A return trap shall not be considered as a mechanical feeding device. A boiler having more than 500 sq. ft. of water heating surface shall have at least two means of feeding, one of which shall be a pump, inspirator or injector.

Where a source of feed is available at a sufficient pressure to feed the boiler against a pressure 6% higher than that at which the safety valve is set to blow, this may be considered one of the means. Where possible feed water should have a temperature of not less than 120 degrees Fahrenheit.

Rule 14. If a special inspector, upon the first inspection of a new risk finds that the boiler or any of the appurtenances are in such condition that his company refuses insurance on the same, the company shall immediately notify the Department of Labor and Industry, Division of Boiler Inspections, of that fact together with a list of the defects.

Rule 15. If upon an external inspection there is evidence of a leak or crack, enough of the covering of the boiler shall be removed to satisfy the inspector in order that he may determine as to the safety of the boiler, or if the covering cannot be removed at that time, he may order the operation of the boiler stopped until such time as the covering can be removed and proper examination made.

Rule 16. Leakage at riveted joints or connections must be carefully investigated to determine the cause of such leakage.

Rule 17. Where boilers are patched and the patch affects the structure of the boiler, requiring a reduction of pressure in same, the inspector shall forward to the Department a new long form data report together with a sketch of the patch on the back of the report.

Rule 18. Steam heating boilers. The maximum allowable working pressure shall not exceed 15 lbs. per sq. in. on a boiler built or used exclusively for low-pressure steam heating.

In any case where a hot water tank or anything of a similar nature, that is not made to be used as a steam boiler, but is used as such, is found, it shall have a safety valve of sufficient size set and sealed at not over 15 pounds pressure.

The maximum steam pressure on any boiler in which steam is generated, if constructed of cast-iron, shall be 15 lbs. per sq. in. This rule not to be effective until July 1, 1936.

Rule 19. The Chief Inspector or Deputy Inspector or Inspectors may at any time call for an accumulative test to determine if a steam heating boiler is subject to or operated at a pressure in excess of 15 lbs.

Rule 20. Shop inspections made during the construction of a boiler at the request of the manufacturer, and done by the Chief Inspector or any deputy inspector, shall be charged for at the rate of $15.00 for one-half day and $20.00 for one day plus all expenses to include traveling, hotel and incidentals.

Rule 21. Definitions:

"Department" shall mean the State Department of Labor and Industry.

The word "inspector" shall mean the chief inspector, deputy inspector or any special inspectors employed by an authorized insurance company or the State of Maine and holding a Certificate of Competency as provided for in Chapter 85, P. L. 1935.

The term "approved" shall mean rules, regulations and appliances as approved by the Board of Appeals as provided in Chapter 85, P. L. 1935.

The word "code" shall mean the power boiler code of the American Society of Mechanical Engineers.

The word "certificate" as used in Sections 6 and 10 of Chapter 85, P. L. 1935, applying to the National Board shall mean a commission issued by the authority of the National Board of Boiler and Pressure Vessel Inspectors.

A boiler is a closed vessel in which steam or vapor is generated by the application of heat.

The word "pressure" shall mean gage pressure.

Boilers to which the classification "miniature" applies, embrace fired pressure vessels which do not exceed the following limits:

16 in. inside diameter of shell
42 in. length of shell
20 sq. ft. water heating surface
100 lbs. per sq. in. maximum allowable working pressure

Where any one of the above limits is exceeded the rules for Power Boilers shall apply.

SECTION 6

REQUIREMENTS FOR REPAIRS BY FUSION WELDING ON BOILERS

Defined No. 1--2

1. By "fusion welding" is meant a process of welding metals in a molten, or molten and vaporous, state without the application of mechanical pressure or blows. Such welding may be accomplished by the oxy-acetylene or oxy-hydrogen flame or by the electric arc. Thermit welding is also classed as fusion welding.

2. A major repair by fusion welding, such as the repair or making of a new seam, the insertion of nozzles, or any repair involving the safety of a boiler shall be made in accordance with the section of ASME Code governing the particular kind of vessel or kind of work to be done. The individual welders employed on such work must have passed satisfactory qualification tests as required by the ASME Boiler or Unfired Pressure Vessel Code, and particular attention must be given the requirement that the position (flat, vertical or overhead) in which the welding is done on the test piece shall be the same as will be encountered in making the repair.

A. **No repairs by welding shall be made without the approval of an authorized inspector. When, in the opinion of the inspector, a hydrostatic test is necessary, such test shall be applied when the repair is completed.**

B. **Qualified welding operator:** The term "Qualified Welding Operator" means a person who has passed the qualification tests required by Par. P-112 of the ASME Power Boiler Code or as outlined in Appendix I of these rules. Reports of such tests should be kept by his employer and shall be available for review by an authorized inspector. The form for this purpose may be as provided in the ASME Power Boiler Code or as shown in Appendix II. The welding on any repairs outlined in these rules may be made by a qualified welding operator.

C. **Unqualified welding operator:** The term "Unqualified Welding Operator" means a person who has not passed the qualification test referred to in Paragraph 2 above. An unqualified welding operator shall not make any welding repairs that are required by these rules to be made by a qualified welding operator.

D. **Record of welded repair:** The concern or individual making welded repairs shall furnish to any authorized inspector, upon demand, a Record of Welded Repairs on a form as outlined in Appendix III of these Rules, covering every welded repair.

Rules for Welding

1. An authorized inspector may at any time call for and witness a qualification test of any welding operator.

2. No welding shall be done by a qualified welding operator on a plate thickness in excess of that for which he is qualified.

3. All welds shall be reinforced at the center by at least $\frac{1}{16}$ in. If the joint is welded from both sides the weld shall be reinforced on both sides. The reinforcement may be chipped, ground or machined off flush with the base metal after the welding operation has been completed if so desired.

4. Stress relieving of a repaired part by heating, when considered necessary, shall be carried out by the application of heat over an area including the welded joints and not less than 6 in. on each side of such joints. Care must be exercised in applying heat in the vicinity of riveted joints to avoid loosening the rivets. The heat may be applied by any means that will raise the temperature of all parts uniformly to approximately 1200 deg. F., which temperature may be judged by the metal showing a dull red heat in ordinary daylight. The parts should be maintained at this temperature for a period of approximately one hour per inch of thickness of the plate in which the weld has been made. The heated parts should then be properly insulated to insure slow cooling.

5. The repairs that may be made under these rules are limited to low carbon steels of known weldable quality and

having a carbon content of not more than .35. The welding of alloy material shall be done in accordance with the requirements of the ASME Code.

6. The welding rods or electrodes shall be of a grade that the deposited weld metal will have a tensile strength and ductility approximately equal to that of the plate or base material being welded. When the metallic arc welding process is used the electrodes shall be of the heavily coated type.

7. The material used for patches shall be of the same general quality and have at least the minimum physical properties of the plate to be patched. The thickness of any patch shall be equal to but not more than $\frac{1}{8}$ in. thicker than the plate being patched.

8. The parts to be welded may be cut to size and shape by machining or shearing, or by flame-cutting if the carbon content does not exceed 0.35 per cent. After cutting the edges may be prepared by machining, chipping, flame cutting or grinding, to form a welding groove of such shape that complete penetration may be obtained. When shaped by flame-cutting the edges must be uniform and smooth and must be chipped or ground to bright metal before welding.

9. When the reverse side is accessible, the root of the weld shall be chipped or cleaned out to clean metal and the resulting groove welded to obtain a sound weld through the entire thickness of the plate. When the reverse side of the weld is not accessible for welding a backing strip or ring should be used where practical.

10. All slag or flux adhering to the surface of any bead of welding shall be removed before another bead of welding is deposited.

11. The welding shall be done in such a way that there is no undercutting either on the side walls of the welding groove, or on the surface of the plate.

12. The area adjacent to the welding groove should be heated to not less than 200F before the welding is done and such temperature shall be maintained while welding. If the

welding is interrupted and the parts become cool they shall be reheated to the temperature specified before the welding is again resumed. Before reheating, the weld and adjacent plate shall be carefully examined for cracks.

13. If at any time during the process of repair by welding, cracks are found in the weld metal or adjacent plate, the cracks shall be completely chipped out and the plate rewelded.

Permissible Welded Repairs

14. **Cracks:** Cracks that may be repaired by an unqualified welding operator are limited to the following:

(a) Fire cracks at the girth seams, extending from the edge of the outer plate but not beyond the edge of the lap of the inner plate.

(b) Fire cracks from rivet hole to rivet hole in girth seams provided there are not more than three consecutive cracked ligaments nor more than a total of six cracked ligaments in any one girth seam.

(c) Fire cracks at riveted door openings, extending from the edge of the plate but not more than 2 in. beyond the center line of the rivet holes, except as provided in Par. (e) below.

(d) Fire cracks at riveted door openings extending from rivet hole to rivet hole.

(e) Cracks in staybolted sheets provided they lie entirely within the staybolt zone and the total length of any crack or series of consecutive cracks does not exceed two staybolt pitches.

(f) Cracks between tube holes in **fire-tube** Boilers.

(g) Cracks not to exceed 2″ in length in wrought or cast steel (but not cast iron) sectional headers of water-tube boilers except that no more than four such cracks in any one header may be welded.

15. Cracks that may be repaired by a qualified welding operator include in addition to Par. 14 the following:

(a) Cracks between tube holes in water-tube boiler drums or headers, provided the plate thickness does not ex-

ceed 1 in. 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.

(b) Cracks in unstayed surfaces of plates of cylindrical shells, drums, or headers, provided the plate thickness does not exceed 1 in. and provided further that the length of any one crack is not greater than sixteen times the plate thickness with a maximum of 8 in. No such cracks may be welded if they are within 2 in. of the riveted area of the longitudinal seam.

(c) Cracks in the flat portion of the tube sheets adjacent to furnaces in Scotch boilers provided any one such crack does not exceed 12 in. in length.

(d) Cracks in plain circular, Adamson ring or similar type furnaces provided any one such crack does not exceed 12 in. in length.

(e) Cracks in corrugated furnaces provided any one such crack does not exceed 20 in. in length.

1. All cracks permitted to be repaired under this section of these rules shall be chipped or ground to form a clean welding groove with an included angle of not less than 60 deg. and extending to a depth equal to at least the plate thickness less $\frac{1}{16}''$. The welding groove shall be extended until the crack has been removed for its entire length. Whenever the reverse side is accessible, the root of the weld should be chipped or cleaned out to clean metal and the resulting groove welded.

2. Prior to repairing fire cracks by welding the rivets to which any such cracks may extend, and also the rivets on each side of them shall be removed. After the welding is completed the rivet holes shall be reamed before new rivets are driven.

3. Prior to repairing a crack between tube holes in a **fire-tube** 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.

4. 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 shall not be repaired by welding.

16. **Building up of corroded surfaces:** Corroded surfaces that may be built up by a qualified or an unqualified welding operator are limited to the following:

(a) Stayed sheets including the tube sheets of fire tube boilers, provided the remaining plates has an average thickness of not less than 50% of the original thickness and further provided that the areas so affected are not sufficiently extensive to seriously impair the safety of the object. The authorized inspector shall decide when such areas shall be repaired by other means.

(b) The plate around handholes or manholes in unstayed sheets within 3″ from the opening, provided that the remaining thickness within this distance does not average less than 50% of the original thickness of the plate.

(c) Widely scattered pit holes provided the strength of the structure is not impaired.

(d) Caulking edges of girth seams, provided the metal remaining between the rivet holes and caulking edge to be built up has at least 50% of the original plate left between the rivet holes and the original caulking edge of the plate, and further provided that the length of the portion of the caulking edge to be built up does not exceed the distance equal to the diameter of the boiler. Before any welding is done, all rivets shall be removed in the portions to be welded and for a distance of not less than 6″ beyond each such portion. The rivet holes shall be reamed before driving new rivets.

(1) 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 for in Paragraph 16 is not approved.

(2) Where corroded surfaces are built up by welding, staybolts and rivets shall extend completely through the plate and have full size normal heads. Staybolts or rivets which have been leaking or are otherwise questionable, shall be removed before welding, and after the welding is completed new staybolts or rivets of a size at least equal to and having a pitch of not more than the original construction shall be installed.

17. **Seal welding:** Seal welding that may be done by an unqualified welding operator is limited to the following:

(a) Caulking edges of riveted joints, except longitudinal seams in unstayed cylindrical shells or drums subjected to internal pressure, provided the seam is first made tight under hydrostatic pressure.

(b) Around the edges of rivet heads, except in longitudinal seams of unstayed cylindrical shells or drums subjected to internal pressure, provided that such welding is limited to normal rivet heads that have no appreciable reduction from full rivet head size.

(c) The limits described in (a) and (b) may be exceeded providing the leakage is carefully investigated before welding repairs are permitted, and further provided that the welding operator is qualified.

(d) The ends of fire tubes provided the thickness of the tube is at least 75% of the original thickness and provided the tubes are first rolled and found tight under hydrostatic test at least equal to the working pressure. In seal welding of tube ends neither the width nor thickness of the welding bead should exceed $\frac{1}{4}''$.

(e) Pipe connections, including screwed flanges and fittings provided the strength of the joint does not depend upon the weld.

18. Seal welding of tube ends that is permissible when repairs are done by a qualified welding operator include in addition to Par. 17 following.

(a) The ends of all tubes, suspension tubes and nipples of water tube boilers and superheaters provided they have been expanded and flared not less than $\frac{1}{8}''$ over the diameter of the tube holes, or expanded and flared not less than $\frac{1}{8}''$ over the diameter of the tube holes and beaded. In the seal welding of tube ends, neither the width nor the thickness of the welding bead should exceed $\frac{1}{4}''$.

(b) The tubes in water tube boilers, superheaters, economizers and water walls may also be seal welded on the outside, in which case no single pass or bead shall have a throat thickness of more than $\frac{3}{16}''$. The throat thickness of a multiple pass seal weld shall not be more than $\frac{3}{8}''$.

1. Seal welding may be applied only when the weld metal is deposited in such a manner that no single pass or bead shall have a throat thickness of more than $\frac{1}{4}''$. The throat thickness of a multiple pass seal weld shall not be more than $\frac{3}{8}''$. (See Fig. 1.)
2. Leakage at riveted joints, staybolts, tube ends or threaded connections must be carefully investigated to determine the cause before welding is permitted.
3. Seal welding may be applied either on the outside or inside. On a riveted joint, seal welding shall be applied on only one side.
4. Care shall be taken so that the heat from seal welding will not distort the plates or loosen the rivets or tubes.
5. On unstayed dished heads, seal welding shall not be applied to the flange closer than $\frac{1}{2}''$ to the point of tangency of the knuckle of the flange.

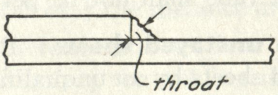


FIGURE 1

19. **Re-ending of tubes and repairs:** Repairs that may be done to tubes by an unqualified welding operator are limited to the following:

Tubes of **fire-tube** boilers may be re-ended or pieced together by fusion welding provided such tubes are well distributed, their number does not exceed 50% of the total, the remaining tube wall is not less than 75% of the original thickness and further that there are not more than two such circumferential welds in any one tube.

20. Repairs to tubes by welding when done by a qualified welding operator include in addition to Par. 19 the following:

(a) Re-ending of tubes in fire-tube boilers exceeding 50% of the total number provided the remaining tube wall is not less than 75% of the original thickness.

(b) Re-ending, piecing or replacement of sections of tubes or pipes in water tube boilers provided the remaining tube or pipe wall is not less than 75% of the original thickness.

(c) Repairing of bulges in tubes in water tube boilers when the area so repaired does not exceed 2″ in maximum dimensions and there are not more than three such repairs in any one tube. Before any such repair is made the thickness of the tube wall adjacent to the bulge shall be positively determined. A method of doing this is to draw a circle approximately 2″ in diameter on the tube at the bulge and drill at least four holes approximately $\frac{1}{8}$″ diameter and approximately 90 deg. apart through the tube wall. The tube wall thickness may then be determined by using a hooked wire through the holes or by other suitable means. If the tube wall thickness at any point is less than 75% of the normal thickness of the tube a welded repair on that tube shall not be permissible.

21. **Patches in unstayed sheets:** Patches that may be applied to unstayed sheets by an unqualified welding operator are limited to the following:

(a) An opening the longest dimension of which does not exceed sixteen times the plate thickness and not more than 8″ in any direction, and further not more than one patch in any one course.

1. The patch plate shall not be set flush with the surrounding plate but must be placed on the inside or pressure side of the sheet.

2. The patch plate shall be carefully formed to fit the contour of the sheet where it is to be applied, and shall be of such size as to provide a lap of at least $\frac{1}{2}$″ at all edges. It shall be seal welded on the outside and may be seal welded on the inside also.

22. Patches that may be applied to unstayed sheets by a qualified welding operator include in addition to Par. 21 the following:

(a) Patches in unstayed sheets not exceeding 1″ in thickness where the patch is set flush with the surrounding plate provided the longest dimension of the patch plate or opening in the shell does not exceed sixteen times the plate thickness or a maximum of 8″.

23. **Patches in stayed sheets:** Patches which may be applied to stayed sheets by a qualified or unqualified welding operator are limited to the following:

(a) On **outside** water leg sheets of vertical fire-tube boilers provided the total length of all patches (measured horizontally) does not exceed $\frac{1}{3}$ of the circumference of the boiler.

(b) On **outside** water leg sheets of flat construction (such as locomotive type boiler) provided the total length of patches (measured horizontally) does not exceed $\frac{1}{2}$ of the perimeter or $\frac{1}{2}$ the distance around the firebox.

(c) The limits described in sections (a) and (b) may be exceeded providing the welding is done by a qualified welding operator.

(d) On **outside** water leg sheets of locomotive type boilers in which the crown sheet of the firebox is not supported by stays to the wrapper sheet there must be at least three horizontal rows of staybolts in the water leg side sheets above the upper seam of the patch. However, a patch not exceeding 12″ in any dimension may be placed on any **flat** surface of the outside sheet entirely within the side sheet staybolt zone, except that not more than one such patch on each side may be installed within the staybolt zone of the top three horizontal rows of staybolts.

(e) On outside water leg sheets of locomotive type boilers of other construction where the crown sheet is supported by stays to the wrapper sheet, none of the welded patch seams (either vertical or horizontal) shall extend beyond the **flat** surface of the sheet, except that a patch may be installed that extends not to exceed 24″ in any direction beyond or outside the **flat** surface of the water leg-side sheet, providing that the patch plate is connected by stays to the crown sheet and the repair is done by a qualified welding operator.

(f) On **inner** firebox sheets of either flat or curved construction, patches of any size may be applied provided they are entirely within the zone of staybolts or braces.

(g) On tube-hole and handlehole sheets of staybolted box header type water legs of water-tube boilers provided the total length (measured horizontally) of all patches on any such water leg does not exceed the horizontal width of the water leg.

1. The welded seams of all patches shall lie entirely within the staybolt zone between two adjacent rows of staybolts, or between a row of staybolts and an adjacent riveted seam.

2. The patch plate shall be fitted accurately to the hole cut in the original sheet and the edges of both parts shall be beveled to form a welding groove as shown in Fig. 2. Wherever the reverse side is accessible, the root of the weld shall be clipped or cleaned out to clean metal and the resulting

groove welded to obtain a sound weld through the entire thickness of the plate.

3. Patch plates shall be formed at all corners with a radius of at least twice the thickness of the plate but in no case less than 1".

4. The patch plate shall be adequately stayed and the size, pitch and type of stays or staybolts shall be at least equal to the original construction. Where possible the patch should be laid out so that the welds are located about midway between the rows of staybolts.

5. Small patches shall be laid out to include a minimum of four threaded staybolts in the patch plate. The minimum number of staybolts is not a requirement for a lap type patch installed on the pressure side of the sheet, or for any type patch that includes a portion of a riveted joint such as may be applied to the lower ends, seams or corners of fireboxes.

6. When a patch is extended to include a riveted joint, new rivets shall be driven where possible; otherwise patch bolts may be installed.

7. The lower seam of a patch applied by an unqualified welding operator shall not be located between the lowest row of staybolts and the riveted joint at the base of the firebox. Such a patch shall be extended to and riveted at the base of the firebox.

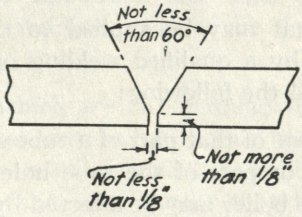


FIGURE 2

24. **Patches in the tube sheets of fire-tube boilers:** Patches that may be applied to the tube sheet of **fire-tube**

boilers by an unqualified welding operator are limited to the following:

(a) Segmental patches that include only a portion of the tube sheet with or without some of the tube holes. Such patches shall be of the flush type and shall extend to and be riveted at the original riveted seam. All stays in the original construction shall be properly re-installed.

(b) Replacement of all the tube hole area of the upper head of a vertical fire-tube boiler provided the new portion is installed on the inside of the remaining portion of the original head as shown in Fig. 3.

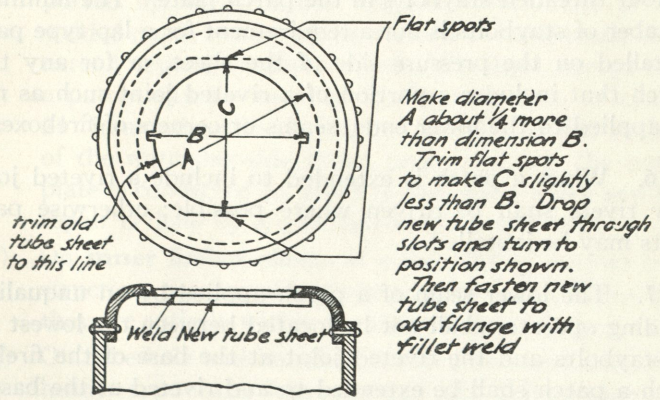


FIGURE 3

25. Patches that may be applied to the tube sheets of **fire-tube** boilers by a qualified welding operator include in addition to Par. 24 the following:

(a) Replacement of that part of a tube sheet or head comprising all or part of the tube hole area in any type of fire tube boiler may be affected by the use of a flush type patch.

1. No welded seams shall be located closer than $\frac{1}{2}''$ to the knuckle or curved part of the flange except seams that

cross the knuckle on a plane approximately parallel to a radius of the knuckle.

2. If a patch is extended to include a riveted joint, new rivets shall be driven where possible; otherwise patch bolts may be used in place of rivets.

3. Lap type patches shall be fitted as closely as possible, and with an overlap of at least $\frac{1}{2}''$ at all edges. A full fillet weld shall be applied as shown in Fig. 4. Wherever the reverse side of the plate is accessible the patch should be welded on both inside and outside edges.

4. Flush type patches shall be installed by fitting them accurately to the hole cut in the original sheet and beveling both the old and new sheets to form a welding groove as shown in Fig. 2. It is recommended that wherever access is possible to the reverse side of the plates, the root of the weld shall be cleaned out to bright metal and the resulting groove welded to obtain a sound weld through the entire thickness of the plate.

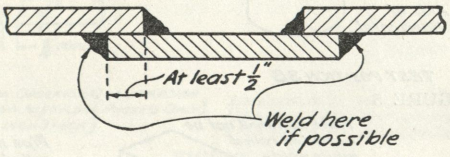


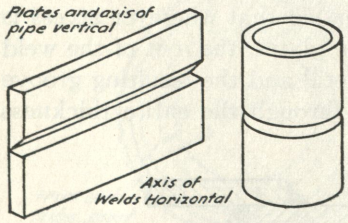
FIGURE 4

26. **Tube holes:** Repairs of tube holes by welding when done by a qualified welding operator are limited to the following:

(a) Tube holes which are out of round by not more than $\frac{1}{4}''$ in diameter may be built up by fusion welding and shall then be reamed, milled or ground to provide a satisfactory tube seat, except that in a water tube boiler drum or header not more than 20% of the total number of tube holes in each drum or header may be so repaired.

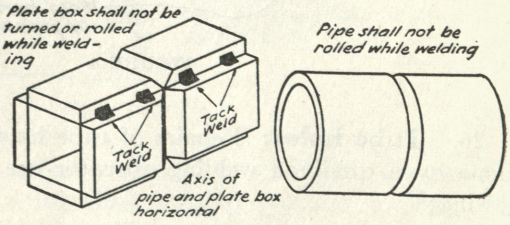
APPENDIX I

1. The test to determine the competency of the welding operator shall require that he make, first, a butt weld between two pieces of pipe placed with their axis in an approximately vertical plane with the welding groove in an approximately horizontal plane, this position being defined as test position 3 B, (See Fig. 5) and second, that he make a butt weld between two pieces of pipe placed with their axis in an approximately horizontal plane with the welding groove in an approximately vertical plane, this position being defined as test position 4 B (See Fig. 6). The material of such test shall be any low carbon steel pipe. The pipe shall **not** be rolled or turned during welding.



TEST POSITION 3B

FIGURE 5



TEST POSITION 4B

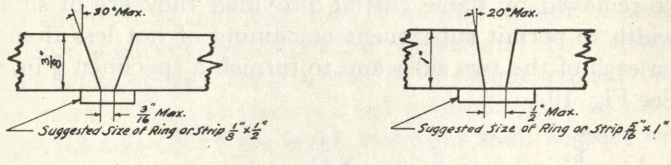
FIGURE 6

NOTE: Plate may be used if pipe is not available and Figs. 5 and 6 show the position in which the plate should be placed for the test. Four Test specimens should be removed from the plate if used for test position 3B, two of which shall be tested as face bend specimens and two as root bend specimens.

2. The diameter of the pipe used for the test shall be not less than 6 in. and the length of each of the two pieces for the test weld shall be approximately 5 in. The thickness of

the pipe wall shall be $\frac{3}{8}$" (plus or minus 1/32 in.) if the welding operator is to be tested for his ability to make a welding in material having a thickness up to and including $\frac{3}{4}$ in. The thickness of the pipe wall shall be 1 in. (plus or minus 1/32 in.) if the welding operator is to be tested for his ability to make a weld in material having a thickness in excess of $\frac{3}{4}$ in.

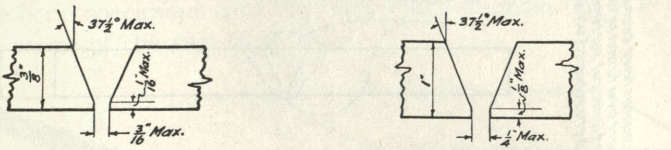
3. The ends of the pipe for the test weld shall be prepared to form a welding groove as shown in Fig. 7 for metallic arc welding and as shown in Fig. 8 for oxyacetylene welding.



BUTT JOINT FOR OPERATOR QUALIFICATION (FOR PLATE OR PIPE 3/8 INCH THICK)

BUTT JOINT FOR OPERATOR QUALIFICATION (FOR PLATE OR PIPE 1 INCH THICK)

FIGURE 7

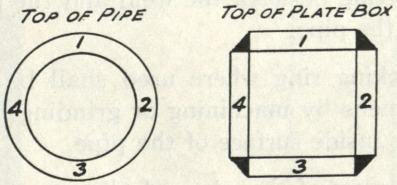


ALTERNATE BUTT JOINT FOR OPERATOR QUALIFICATION (MAY BE USED FOR THE OXY-ACETYLENE PROCESS ONLY) (FOR PLATE OR PIPE 3/8 INCH THICK)

ALTERNATE BUTT JOINT FOR OPERATOR QUALIFICATION (MAY BE USED FOR THE OXY-ACETYLENE PROCESS ONLY) (FOR PLATE OR PIPE 1 INCH THICK)

FIGURE 8

4. The ends of the pipe or plate box shall be stamped with the numbers 1, 2, 3, and 4, and, when arranged for welding in the 4B position, the No. 1 shall be at the top as shown in Fig. 9.



END VIEW OF TEST WELDS FOR POSITION 4B

FIGURE 9

5. When the welding has been completed, a specimen shall be removed lengthwise of the test weld at each of the four locations indicated by the Nos. 1, 2, 3, and 4.

6. For the $\frac{3}{8}$ in. thick test welds the test specimen shall be approximately $1\frac{1}{2}$ in. wide and they may be removed by machine cutting or by flame cutting.

7. For the 1 in. thick test weld the width of the test specimen shall be $\frac{3}{8}$ in. (plus or minus 1/32 in.). Such specimen should be removed, preferably by machine cutting but may be removed by flame cutting provided they are of sufficient width to permit subsequent machining of not less than $\frac{1}{8}$ in. on each of the two sides and to furnish a specimen $\frac{3}{8}$ in. wide. See Fig. 10.

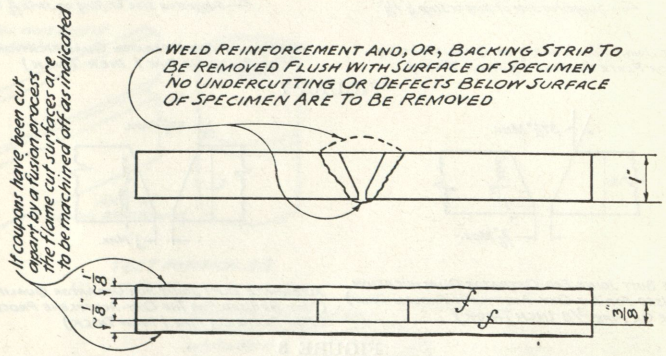


FIGURE 10

8. The weld reinforcement on the outside of the test specimen shall be removed, by machining or grinding, flush with the surface of the pipe and it shall not be permissible to remove undercutting between the weld and the pipe and below the surface of the pipe.

9. The backing ring where used shall be removed from the test specimens by machining or grinding, flush with, but not below, the inside surface of the pipe.

10. The corners of the edges of all test specimens, at and adjacent to the weld, may be rounded by filing, grinding or machining, to a radius of not more than $\frac{1}{16}$ in.

11. Specimens Nos. 1 and 2 from $\frac{3}{8}$ in. thick test weld shall be tested as face bend specimens. (See Par. 14 below)

12. Specimens Nos. 3 and 4 from the $\frac{3}{8}$ in. thick test weld shall be tested as root bend specimens. (See Par. 14 below)

13. All specimens from a 1 in. thick test weld shall be tested as side bend specimens. (See Par. 14 below)

14. Specimens shall be bent in a bending jig (guided bend test) having the profile shown in Fig. 11 until the curvature of the specimen is such that a 1/32 in. wire cannot be passed between the curved portion of the plunger and the specimen. Details showing the construction of a simple guided bend tester suitable for use with a 5 ton hydraulic jack as shown in Figs. 12 and 13. Face bend specimens shall be bent with the face of the weld (outside of the pipe in tension); root bend specimen with the root (inside of the pipe in tension); and side bend specimens with that side which is suspected of being the worse of the two in tension.

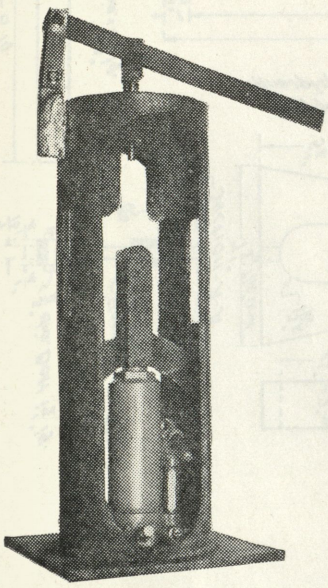


FIGURE 11

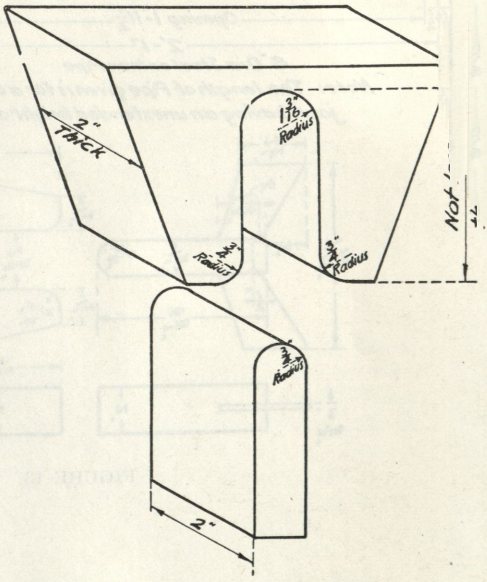


FIGURE 12

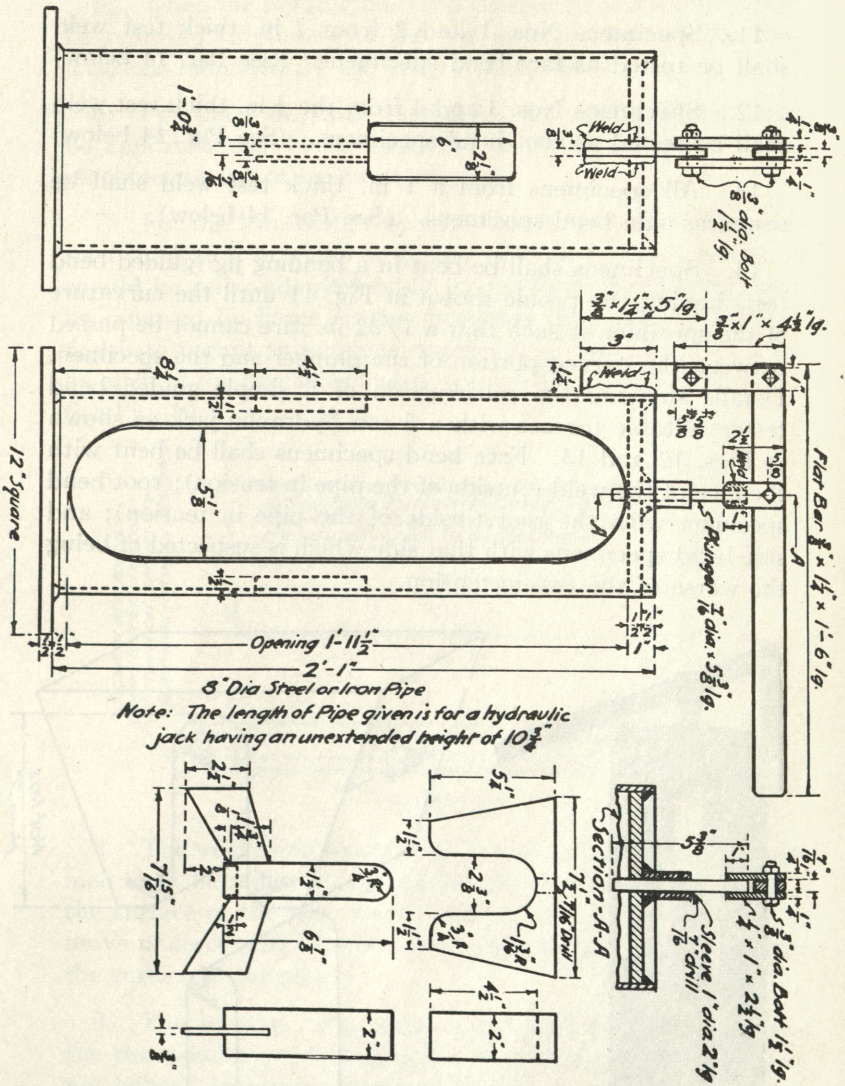

Weld
Weld
3/8" dia. Bolt 1 1/2" lg.
3/8" x 1/4" x 5" lg.
3/8" x 1" x 4 3/4" lg.
Weld
Weld
Flat Bar 3/8" x 1 1/4" x 1'-6" lg.
Plunger 1" dia. x 5 3/8" lg.
12" Square
Opening 1'-11 1/2"
2'-1"
8" Dia Steel or Iron Pipe
Note: The length of Pipe given is for a hydraulic jack having an unextended height of 10 3/4"
Section A-A
Sleeve 1" dia. 2" lg.
3/8" dia. Bolt 1 1/2" lg.
1/4" x 1" x 2 1/2" lg.

FIGURE 13

15. A crack in the weld metal or between the weld and the base material which, during or at the completion of the test, opens up by more than $\frac{1}{8}$ in. in any direction, shall be cause for rejection of that specimen on failure to pass the test.

16. In case a welding operator fails to meet the requirements stated above, a retest may be allowed under the following conditions:

(a) An immediate retest may be made which shall consist of two welds of each thickness on which the welding operator failed, all of which shall meet the requirements.

(b) A retest may be made after a lapse of one week provided there is evidence that the operator has had further training or practice. In this case only one test weld in each thickness, for which the operator is to be tested need be made.

APPENDIX II—A
NATIONAL BOARD RECORD OF WELDING OPERATOR QUALIFICATION TEST OF BOILER AND PRESSURE VESSEL INSPECTORS

Name of Employer.....Address.....

Welding Operator: Name.....Signature.....

Material: Low Carbon Steel Pipe Thickness.....in. Welding Position....

Method of Welding.....Kind of welding rod.....

Oxyacetylene or metal arc. A. W. S. Grade or Manufacturers Trade Name and Grade

FACE-BEND TEST

Specimen No.	Describe the location, nature, and size of any crack or tearing of the specimen

ROOT-BEND TEST

Specimen No.	Describe the location, nature, and size of any crack or tearing of the specimen

SIDE-BEND TEST

Specimen No.	Describe the location, nature, and size of any crack or tearing of the specimen

The undersigned certifies that the statements made in this report are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Appendix I of The National Board Rules for Repair by Fusion Welding.

Date..... Signed.....
Name of Employer

By.....

STATE OF MAINE

County of.....ss. (Date).....19.....

Personally appeared the above named.....
(employer or person designated by said employer) and made oath that he witnessed the operations above described performed by.....
.....(employee) and that said operations were performed in accordance with the requirements of the National Board Rules for Repair by Fusion Welding.

Before me,

.....
Justice of the Peace
Notary Public

A copy of this welding qualification test must be sent at once to the Department of Labor and Industry, Division of Boiler Inspection.

APPENDIX II—B
NATIONAL BOARD RECORD OF WELDING OPERATOR QUALIFICATION TEST OF BOILER AND PRESSURE VESSEL INSPECTORS

Name of Employer.....Address.....

Welding Operator: Name.....Signature.....

Material: Low Carbon Steel Pipe Thickness.....in. Welding Position....

Method of Welding.....Kind of welding rod.....

Oxyacetylene or metal arc. A. W. S. Grade or Manufacturers Trade Name and Grade

FACE-BEND TEST

Specimen No.	Describe the location, nature, and size of any crack or tearing of the specimen

ROOT-BEND TEST

Specimen No.	Describe the location, nature, and size of any crack or tearing of the specimen

SIDE-BEND TEST

Specimen No.	Describe the location, nature, and size of any crack or tearing of the specimen

The undersigned certifies that the statements made in this report are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Appendix I of the National Board Rules for Repair by Fusion Welding and witnessed by him.

Signed.....

STATE OF MAINE

County of.....ss. Date.....19.....

Personally appeared the above named person and made oath that he witnessed the operations above described performed by Welding Operator.....and that said operations were in accordance with the requirements of the National Board Rules for Repair by Fusion Welding.

Before me,

.....

Justice of the Peace
Notary Public

A copy of this welding qualification test must be sent at once to the Department of Labor and Industry, Division of Boiler Inspection.

APPENDIX III

RECORD OF WELDED REPAIR

This is to certify that the fusion welded repair made by or under the direction of the undersigned on.....and consisting of
(Date of Repair)

.....
(Description of Repair)

.....

On Boiler No.*.....located in the plant of

.....at.....
(Name of Boiler Owner) (Address of Plant)

were made in accordance with the requirements of the National Board Rules for Repairs by Fusion Welding to Power Boilers, and that the welding was done by.....who has met the test requirements of said rules.

Signed.....

Dated at.....on.....

State of Maine.....
SS
County of.....

.....being duly sworn, on his oath says that he has read the above, is acquainted with the circumstances to which it relates, and that the matters represented therein are true to the best of his knowledge, information and belief.

.....

.....
Justice of the Peace
Notary Public

Prescribed and sworn to before me, this.....day of

.....19.....

*The Boiler Number should be the State Registration Number stamped on the boiler. If this record is signed by a State of Maine Commissioned Inspector it will not be necessary to have this sworn to.

A copy of this welding record must be sent at once to the Department of Labor and Industry, Division of Boiler Inspection.

Sections 1-2-3-4 and 5 are hereby adopted and approved this ninth day of July, one thousand nine hundred and thirty-five and will become effective as provided in Chapter 85, Section 3, P. L. 1935, together with all amendments thereto to date. Dated this fifth day of November, 1937.

Section 6 is hereby approved and adopted at Public Hearing this twentieth day of August, 1941. This section becomes effective on and after November twentieth, 1941.

JESSE W. TAYLOR, *Chairman*

C. E. McLEAN
Representing Operating Engineers

W. H. HOWARTH
Representing Boiler Manufacturers

W. A. BAYLISS
Representing Insurance Companies

FRED B. EVELETH
Representing Owners and Users

Published to conform to Chapter 85, Section 5, Paragraph 5, Public Laws 1935.

EDWARD K. SAWYER
Chief Inspector of Boilers