
Rules of
Department of Public Safety
Division 40—Division of Fire Safety
Chapter 2—Boiler and Pressure Vessel Safety Rules

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**Title 11—DEPARTMENT OF
PUBLIC SAFETY**

**Division 40—Division of Fire Safety
Chapter 2—Boiler and Pressure Vessel
Safety Rules**

11 CSR 40-2.010 Definitions

PURPOSE: This rule formulates definitions concerning boilers and pressure vessels in Missouri.

Editor's Note: The following material is incorporated into this rule by reference:

1) American Society of Mechanical Engineers Code (ASME Code) (New York City: American Society of Mechanical Engineers, 1995).

In accordance with section 536.031(4), RSMo, the full text of material incorporated by reference will be made available to any interested person at the Office of the Secretary of State and the headquarters of the adopting state agency.

(1) Act—The Boiler and Pressure Vessel Safety Act which was enacted as sections 650.200—650.290, RSMo.

(2) ASME Code—The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code as made, approved and adopted by the Council of the Society and approved and adopted by the board. Copies of the code may be obtained from the society at 345 E. 47th Street, New York, NY 10017.

(3) Alteration—A change in any item described on the original Manufacturers' Data Report which affects the pressure capability of the boiler or pressure vessel. Nonphysical changes such as an increase in the maximum allowable working pressure (internal or external) or design temperature of a boiler or pressure vessel shall be considered an alteration. A reduction in minimum temperature such that additional mechanical tests are required shall also be considered an alteration.

(4) API-ASME Code—The American Petroleum Institute (API) in conjunction with the ASME Code as used in these rules shall mean the Code for Unfired Pressure Vessels for Petroleum Liquids and Gases.

(5) Approved—Approved by the Board of Boiler and Pressure Vessel Rules.

(6) Authorized inspection agency—One (1) of the following:

(A) A department, division, or unit, established by a jurisdiction which has adopted and does administer one (1) or more sections of the ASME Code as a legal requirement and whose inspectors hold valid commissions issued by the National Board of Boiler and Pressure Vessel Inspectors (NB); and

(B) An insurance company which has been licensed or registered by the appropriate authority of the state of Missouri to write and does write boiler and pressure vessel insurance and provides inspection service of boilers and pressure vessels in the state.

(7) Board—The Board of Boiler and Pressure Vessel Rules created by the Act and empowered to make, alter, amend and interpret rules for the safe construction, installation, inspection, alteration and repair of boilers and pressure vessels.

(8) Boiler—A pressurized vessel in which water is heated, steam is generated, steam is superheated, or any combination of these, under pressure or vacuum by the direct application of heat. The term boiler includes fired units for heating or vaporizing liquids other than water where these units are separate from processing systems and complete within themselves.

(A) Power boiler—A boiler in which steam or other vapor is generated at a pressure of more than fifteen pounds per square inch (15 psi).

(B) High temperature water boiler—A water boiler intended for operation at pressures in excess of one hundred sixty (160) psi and/or temperatures in excess of two hundred fifty degrees Fahrenheit (250°F).

(C) Heating boiler—A steam or vapor boiler operating at pressures not exceeding fifteen (15) psi or a hot water boiler operating at pressures not exceeding one hundred sixty (160) psi or temperatures not exceeding two hundred fifty degrees Fahrenheit (250°F).

(D) Electric boiler—A power boiler or heating boiler in which the source of heat is electricity.

(E) Miniature boiler—A power boiler or high temperature water boiler which does not exceed the following limits:

1. Sixteen inches (16") inside diameter of shell;

2. Twenty (20) square feet heating surface (not applicable to electric boilers);

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

4. One hundred (100) psi maximum allowable working pressure.

(F) Unfired steam boiler—An unfired pressure vessel or system of unfired pressure vessels intended for operation at a pressure in

excess of fifteen (15) psi steam for the purpose of producing and controlling an output of thermal energy.

(G) Waste heat boiler—An unfired pressure vessel or system of unfired pressure vessels intended for operation in excess of fifteen (15) psi steam for the purpose of producing and controlling an output of thermal energy.

(H) Heat recovery boiler—A vessel or system of vessels comprised of one (1) or more heat exchanger surfaces used for the recovery of waste heat.

(I) Steam heating boiler—A steam boiler for operation at pressures not exceeding fifteen (15) psi.

(J) Hot water heating boiler—A boiler in which no steam is generated, from which hot water is circulated for heating purposes and then returned to the boiler, and which operates at a pressure not exceeding one hundred sixty (160) psi and/or a temperature of two hundred fifty degrees Fahrenheit (250°F) at or near the boiler outlet.

(K) Hot water supply boiler—A boiler completely filled with water that furnishes hot water to be used externally to itself at pressures not exceeding one hundred sixty (160) psi or at temperatures not exceeding two hundred fifty degrees Fahrenheit (250°F) at or near the boiler outlet.

(L) Portable boiler—A boiler which is primarily intended for temporary location and the construction and usage permits it to be readily moved from one location to another.

(M) Jacketed steam kettle/cooker—A gas or electrically fired kettle or cooker with jacket(s), operating at pressures not exceeding fifty (50) psi.

(9) Certificate of competency—A certificate issued to a person who has passed the examination and met the experience requirements, prescribed by the board.

(10) Certificate of inspection—A certificate issued by the chief inspector for the operation of a boiler or pressure vessel as required by the Act. The certificate of inspection shall be posted, under glass, at or near the object.

(11) Certificate inspection—An inspection, the report of which is used by the chief inspector as justification for issuing, withholding or revoking the inspection certificate. This certificate inspection shall be an internal inspection when required; otherwise, it shall be as complete an inspection as possible.

(A) Internal inspection—As complete an examination as can reasonably be made of the internal, including water side, and external surfaces of a boiler or pressure vessel while it is shut down and manhole plates, handhold

plates or other inspection opening closures are removed as required by the inspector.

(B) External inspection—An inspection made when a boiler or pressure vessel is in operation, if possible. An external inspection should include verification that required safety devices are operable, in good working order, and tested periodically.

(12) Commission National Board—The commission issued by The National Board of Boiler and Pressure Vessel Inspectors to a holder of a certificate of competency who desires to make shop inspections or field inspections in accordance with the NB bylaws and whose employer submits the inspector's application to the NB for the commission.

(13) Condemned boiler or pressure vessel—A boiler or pressure vessel that has been inspected and declared unsafe, or disqualified by legal requirements, by an inspector and a stamping or marking designating its condemnation has been applied by the chief or deputy boiler and pressure vessel inspector.

(14) Director—The director of the inspection section of the Department of Public Safety.

(15) Existing installation—Includes any boiler or pressure vessel constructed, installed, placed in operation or contracted on or before November 12, 1986.

(16) Fittings and appliances—Include but are not limited to pressure relief devices, low water protection, pressure controls, temperature controls, thermometers, gages, expansion tanks, pipe fittings, pipe valves, pipe, etc., within the scope of these rules and the Act.

(17) Inspector—The chief inspector, any deputy inspector, special inspector or owner-user inspector.

(A) Chief inspector—The chief boiler and pressure vessel inspector appointed under the Act.

(B) Deputy inspector—Any inspector appointed by the director under the provisions of the Act.

(C) Special inspector—An inspector holding a Missouri certificate of competency and who is regularly employed by an insurance company authorized to insure against loss from explosion of boilers or pressure vessels in this state.

(D) Owner-user inspector—An inspector who holds a valid National Board Owner-User Commission, who has passed the examination prescribed by the board and who is continuously employed as an inspector by an

owner-user inspection agency recognized by the state of Missouri.

(18) Jurisdiction—A state, province, or territory of the United States, Canada, or Mexico or any city of the United States having a population of one (1) million or more that has adopted and does administer one (1) or more sections of the *ASME Boiler and Pressure Vessel Code* as a legal requirement, one (1) of which is Section I, and maintains a duly constituted department, bureau, division, or unit for the purpose of enforcement of the Code.

(19) Lined potable water heater—A water heater with a corrosion resistant lining used to supply potable hot water.

(20) National Board—The National Board of Boiler and Pressure Vessel Inspectors (NB), 1055 Crupper Avenue, Columbus, Ohio 43229, whose membership is composed of the chief inspectors of jurisdictions who are charged with the enforcement of the provisions of the *ASME Code*.

(21) *National Board Inspection Code*—The manual for boiler and pressure vessel inspectors published by the NB from which copies may be obtained.

(22) Nuclear power plant—One (1) or more nuclear power systems and containment systems.

(23) Nuclear power systems—A system which serves the purpose of producing and controlling an output of thermal energy from nuclear fuel and those associated systems essential to the functions of the power system. The components of the system include items such as pressure vessels, piping systems, pumps, valves and storage tanks.

(24) New boiler or pressure vessel installation—Includes all boilers or pressure vessels constructed, installed, placed in operation or contracted for after November 12, 1986.

(25) Nonstandard boiler or pressure vessel—A boiler or pressure vessel that does not bear the ASME stamp, the API-ASME stamp or the stamp of any jurisdiction which has adopted a standard of construction equivalent to that required by the board.

(26) Owner or user—Any person, firm or corporation legally responsible for the safe installation, operation and maintenance of any boiler or pressure vessel within the state of Missouri.

(27) Owner-user inspection agency—An owner or user of pressure vessels who maintains a regularly established inspection department, whose organization and inspection procedures meet the requirements of the National Board rules and are acceptable to the board.

(28) Pressure vessel—A vessel or an unfired steam boiler, as defined in subsection (8)(F); in which the pressure is obtained from an external source, by the application of heat from an indirect source or from a direct source other than those boilers defined in subsections (8)(A)—(M).

(29) Psi—Pounds per square inch.

(30) Reinstalled boiler or pressure vessel—A boiler or pressure vessel removed from its original setting and reinstalled at the same location or at a new location without change of ownership.

(31) Repair—The work necessary to restore a boiler or pressure vessel to a safe and satisfactory operating condition, provided there is no deviation from the original design.

(32) Second-hand boiler or pressure vessel—A boiler or pressure vessel which has changed both location and ownership since primary use.

(33) Standard boiler or pressure vessel—A boiler or pressure vessel which bears the stamp of this state, the ASME stamp, the API-ASME stamp, both the ASME and NB stamp or the stamp of another jurisdiction which has adopted a standard of construction equivalent to that required by the board.

(34) Water heater—A closed vessel in which water is heated by the combustion of fuels, electricity or any other source and withdrawn for use external to the system at pressures not exceeding one hundred sixty (160) psi and shall include all controls and devices necessary to prevent water temperatures from exceeding two hundred ten degrees Fahrenheit (210°F).

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**Original authority 1984, amended 1990, 1993, 1995.*



11 CSR 40-2.020 Administration

PURPOSE: This rule addresses the safe construction, installation, inspection, operation, maintenance and repair of boilers and pressure vessels in Missouri.

(1) Minimum Construction Standards for Boilers and Pressure Vessels.

(A) All new boilers, pressure vessels, water heaters and storage tanks, unless otherwise exempt, to be operated in this jurisdiction, shall be designed, constructed, inspected, stamped and installed in accordance with the *American Society of Mechanical Engineers (ASME) Code* and these regulations. Boilers and pressure vessels for which an ASME Manufacturer's Data Report is required shall bear the manufacturer's National Board (NB) number as registered with the National Board. A copy of the Manufacturer's Data Report, signed by the manufacturer's representative and the NB-commissioned inspector, shall be filed with the chief inspector through the National Board.

(B) State Special. If a boiler or pressure vessel cannot bear the ASME and NB stamping or is to be constructed to another code approved by the board, details in the English language and United States customary units of the proposed construction material specifications and calculations shall be submitted to the chief inspector by the owner or user and approval as State Special obtained from the board before construction is started. Copies of all applicable codes and referenced standards shall be made available, as requested, by the board.

(C) Before a second-hand boiler or pressure vessel is installed, application for permission to install it shall be filed by the owner or user with the chief inspector and the chief inspector's approval obtained.

(D) The following shall be exempt from the *ASME Code* construction requirements of subsection (1)(A):

1. Water heaters where none of the following limitations are exceeded:

A. Heat input of two hundred thousand (200,000) British thermal units (BTU/hr) (57.1kw);

B. Water temperature of two hundred ten degrees Fahrenheit (210°F); and

C. Nominal water capacity of one hundred twenty gallons (120 g) and which are provided with one (1) or more safety relief valves meeting the requirements of 11 CSR 40-2.040(6); and

2. Coil-type hot water boilers used only for steam vapor cleaning of things such as machinery, equipment and building when

none of the following limitations are exceeded:

A. One inch (1") diameter tubing or three-fourths inch (3/4") nominal pipe size with no steam drums or headers attached;

B. Nominal water containing capacity does not exceed six (6) gallons;

C. Water temperature does not exceed three hundred fifty degrees Fahrenheit (350°F);

D. Steam is not generated within the coil; and

E. One (1) or more safety relief valves meeting the requirements of 11 CSR 40-2.030(6) must be installed and adequate controls are provided.

(E) In any circumstances other than those previously mentioned, the owner or user shall contact the chief inspector.

(2) Frequency of Inspections of Boilers and Pressure Vessels.

(A) Power boilers; high pressure, high temperature water boilers; and waste heat boilers shall receive a certificate inspection annually which shall be an internal inspection where construction permits; otherwise it shall be as complete an inspection as possible. Boilers shall also be annually inspected externally while under normal operating conditions.

(B) Unfired steam boilers shall receive a certificate inspection every year. The inspection shall be an external inspection and an internal inspection, where construction permits.

(C) Waste heat boilers shall receive a certificate inspection every year. The inspection shall be an internal inspection. Boilers shall also be annually inspected externally while under normal operating conditions.

(D) Low pressure boilers, hot water heaters and hot water storage tanks shall receive a certificate inspection every two (2) years.

1. Steam or vapor boilers have an external inspection and an internal inspection every two (2) years, where construction permits.

2. Hot water heating and hot water supply boilers shall have an external inspection every two (2) years and, where construction permits, an internal inspection at the discretion of the inspector.

3. Water heaters including hot water storage tanks shall have an external inspection every two (2) years and shall include the function of all controls and devices.

(E) Except as provided for in subsections (2)(F) and (G), pressure vessels subject to internal corrosion shall receive a certificate inspection every two (2) years. This inspec-

tion shall be internal, where construction permits and where preparation of the vessel for internal inspection does not present a hazard due to the materials involved. Pressure vessels not subject to internal corrosion shall be inspected externally every two (2) years.

(F) Pressure vessels that are under the supervision of an owner-user inspection agency shall be inspected at the same interval unless otherwise agreed upon by the board with the agency.

(G) Nuclear power plants, that are included in the Act, shall be inspected as provided by Section XI of the *ASME Code*.

(H) Based upon documentation of actual service conditions by the owner or user of the operating equipment, the board, in its discretion, may permit variations in the inspection frequency requirements as provided in the Act.

(3) Notification of Inspection. Certificate inspection, as required in section (2), shall be carried out prior to the expiration date of the certificate at a time mutually agreeable to the inspector and owner or user. External inspections may be performed by the inspector during reasonable hours and without prior notification. When, as a result of external inspection or determination by other objective means, it is the inspector's opinion that continued operation of the boiler or pressure vessel constitutes a menace to public safety, the inspector may request an internal inspection or an appropriate pressure test or both to evaluate conditions. In these instances the owner or user shall prepare the boiler or pressure vessel for the inspections or tests as the inspector designates.

(4) Examination for an Inspector's Certificate of Competency.

(A) Examination for an inspector's certificate of competency shall be held at the office of the board or at any other location to be selected by the board, four (4) times each year, namely the first Wednesday and one-half (1/2) day Thursday in the months of March, June, September and December. An applicant for an examination shall have education and experience equal to at least one (1) of the following:

1. A degree in mechanical engineering plus one (1) year of experience in design, construction, operation or inspection of high pressure boilers and pressure vessels;

2. A degree in a branch of engineering, other than mechanical engineering or an associate degree in mechanical technology plus two (2) years of experience in design, construction, operation or inspection of high pressure vessels; or

3. The equivalent of a high school education plus three (3) years of experience—

A. In high pressure boiler and pressure vessel construction or repair;

B. As an operating engineer in charge of high pressure boiler operation; or

C. As an inspector of high pressure boilers and pressure vessels.

(B) Applications for examination shall be in writing on a form to be furnished by the chief inspector stating the education of the applicant, a list of the applicant's employers, the applicant's period of employment and position held with each employer. Applications containing willful falsifications or untruthful statements shall be cause for rejection. Applications shall be submitted to the chief inspector at least forty-five (45) days prior to the date of examination. If the applicant's education and experience are acceptable to the board, the applicant shall be given a written examination dealing with the construction, maintenance and repair of boilers and pressure vessels and their appurtenances and the applicant shall be accepted or rejected on the merits of this examination. If the applicant is successful in meeting the requirements of the board, a certificate of competency will be issued by the chief inspector when the applicant is employed on a full-time basis by an authorized inspection agency as defined in 11 CSR 40-2.010(6) and (26). Upon the expiration of ninety (90) days, an applicant who failed to pass the examination will be permitted to take another written examination and the applicant's acceptance or rejection will be determined by the board on the basis of this examination.

(5) Examination Fees. A fee as required in section (14) will be charged for each applicant (for each examination) taking the examination for a certificate of competency.

(6) Certificate of Competency and Identification Card.

(A) Upon the request of the applicant's employer, a certificate of competency and an identification card may be issued by the chief inspector to the following:

1. An inspector who is employed by the jurisdiction;

2. An inspector who is employed full-time by an insurance company which is authorized to insure and does insure against loss from explosions of boilers and pressure vessels in the jurisdiction;

3. An inspector employed as described in either paragraph (6)(A)1. or 2. who conducts shop or field inspections of new boilers, pressure vessels or nuclear components in

accordance with the applicable *ASME Code* requirements; or

4. An inspector who is continuously employed by a company which operates pressure vessels in this state and has a valid owner-user inspection agency agreement as provided for in section (11), provided that the applicant has satisfactorily passed the examination as set forth in section (4) or holds a valid commission or certificate of competency from a state that has a standard of examination substantially equal to that of this jurisdiction and a valid commission and a current commission card issued by the National Board.

(B) The request for the certificate of competency and identification card shall be completed on forms to be provided by the chief inspector and shall be accompanied by, when applicable, a facsimile of the applicant's commission and commission card, certificate of competency and identification card as mentioned previously and a fee as required in section (14).

(C) The certificate of competency and valid identification card shall be returned to the chief inspector when the inspector, to whom they were issued, is no longer employed by the organization employing the inspector at the time that the certificate was issued.

(D) Each person holding a valid certificate of competency and who conducts inspections as provided by the Act shall apply to the chief inspector on forms provided and obtain a renewal identification card annually. A fee as required in section (14) for each card shall accompany each application.

(E) An inspector's certificate of competency may be suspended by the chief inspector after due investigation and recommendation by the board for neglect of duty, incompetency, untrustworthiness or conflict of interest of the holder of the certificate, or for willful falsification of any matter or statement contained in the inspector's application or in a report of any inspection made by the inspector. Written notice of any suspension shall be given, within not more than ten (10) days, by the chief inspector, to the inspector and the inspector's employer. Persons whose certificates of competency have been suspended shall be entitled to an appeal to the board as provided for in the Act and to be present in person and represented by counsel at the hearing of the appeal.

(7) Conflict of Interest. An inspector shall not engage in the sale of any services, article or device relating to boilers, pressure vessels or their appurtenances.

(8) Inspection Reports to Be Submitted by Inspectors.

(A) Inspectors, within one (1) year of the effective date of these rules (October 27, 1986) for boilers and three (3) years for pressure vessels, shall submit to the chief inspector an inspection report on forms acceptable to the board for each boiler and pressure vessel subject to inspection in this state. Forms NB-5, NB-6, NB-7 and the Missouri Boiler and Pressure Vessel-Report of Inspection are three (3) acceptable forms. Complete data shall be submitted on forms acceptable to the board for each nonstandard boiler or pressure vessel.

(B) Subsequent inspections by deputy and special inspectors of both standard and nonstandard boilers and pressure vessels shall be reported on forms acceptable to the board.

(C) Inspection reports as required in subsections (8)(A) and (B) shall be submitted within thirty (30) days from the date of inspection.

(D) Owner-user inspection agencies shall report in accordance with subsections (8)(B) and (C), or upon forms acceptable to the board, which shall be filed as provided in section (11).

(9) Insurance Companies to Notify Chief Inspector of New, Cancelled or Suspended Insurance on Boilers or Pressure Vessels. All insurance companies shall notify the chief inspector, within thirty (30) days, of all boilers or pressure vessels on which insurance is written, cancelled, not renewed or suspended because of unsafe conditions.

(10) Special Inspectors to Notify Chief of Unsafe Boilers and Pressure Vessels. If a special inspector, upon first inspection of a new risk, finds that a boiler or pressure vessel, or any appurtenance of the boiler or pressure vessel, is in a condition that the inspector's company would refuse insurance, the company immediately shall notify the chief inspector and submit a report on the defects. If upon inspection a special inspector finds a boiler or pressure vessel to be unsafe for further operation, the inspector shall promptly notify the owner or user, stating what repairs or other corrective measures are required to bring the object into compliance with these rules. Unless the owner or user makes repairs or adopts other corrective measures promptly, the special inspector immediately shall notify the chief inspector. Until the corrections have been made, no further operation of the boiler or pressure vessel involved shall be permitted. If an inspection certificate for the object is required and is in force, it shall be



suspended by the chief inspector. When reinspection establishes that the necessary repairs have been made or corrective actions have been taken and the boiler or pressure vessel is safe to operate, the chief inspector shall be notified. At that time an inspection certificate, where applicable, will be issued.

(11) Owner-User Inspection Agency.

(A) Any person, firm, partnership or corporation operating pressure vessels in this jurisdiction may seek approval and registration as an owner-user inspection agency by filing an application with the chief inspector on prescribed forms and request approval by the board.

(B) Application and registration shall show the name of the agency and its principal address in this state and the name and address of the person(s) having supervision over inspections made by the agency. Changes in supervisory personnel shall be reported to the chief inspector within thirty (30) days after the change.

(C) Each owner-user inspection agency as required by the provisions of the Act and these regulations shall—

1. Conduct inspections of pressure vessels, not exempt by the Act, utilizing only qualified inspection personnel, as provided in section (6);

2. Retain on file at the location where the equipment is inspected, a true record or copy of each of the latest inspection reports signed by the inspector;

3. Execute and deliver to the chief inspector and those responsible for the operation of the pressure vessel, a true report of each inspection together with appropriate requirements or recommendations that result from the inspections;

4. Notify promptly the chief inspector of any pressure vessel which does not meet the requirements for safety;

5. Maintain inspection records which will include a list of each pressure vessel covered by the Act, showing a serial number and abbreviated descriptions as may be necessary for identification, the date of last inspection of each unit and approximate date for the next inspection, arrived at by applying the appropriate rules to all data available at the time the inspection record is compiled. Information regarding frequency and type of inspection is provided in section (2). The inspection record shall be readily available for examination by the chief inspector or his/her authorized representative during business hours; and

6. Submit to a periodic audit of the owner-user program and records, at least triennially. Fees will be in accordance with the rates established in section (14).

(12) Defective Conditions Disclosed at Time of External Inspection. If, upon external inspection, there is evidence of a leak or crack, sufficient covering of the boiler or pressure vessel shall be removed to permit the inspector to satisfactorily determine the safety of the boiler or pressure vessel. If the covering cannot be removed at that time, the inspector may order the operation of the boiler or pressure vessel stopped until such time as the covering can be removed and proper examination made.

(13) Owner or User to Notify Chief Inspector of Accident. When an accident occurs to a boiler or pressure vessel, the owner or user promptly shall notify the chief inspector by submitting a detailed report of the accident. In the event of a personal injury or any explosion, notice shall be given immediately by telephone, telegraph or messenger, and neither the boiler or pressure vessel, nor any parts of the boiler or pressure vessel, shall be removed or disturbed before permission has been given by the chief inspector, except for the purpose of saving human life and limiting consequential damage.

(14) Inspection Certificate, Inspection and Miscellaneous Fees.

(A) If a boiler or pressure vessel after inspection, is found to be suitable and to conform to these regulations, the owner or user shall pay directly to the jurisdiction a fee in accordance with the schedule of fees. Checks and money orders for payment of all fees should be made payable to the Division of Fire Safety.

Fee Schedule

Examination Fees	\$50.00
Commissions	
New Issuance	\$50.00
Renewal	\$25.00
Certificate of Inspection	\$20.00
Inspections	
Power Boilers & High Temp Hot Water Heating Boilers	
Internal Inspections—	
Boilers of 4,000 lbs/hr Capacity or Less	\$35.00
Boilers Over 4,000 lbs/hr up to 16,000 lbs/hr Capacity	\$60.00
Boilers With 16,000 lbs/hr or More	Hourly Rate
External Inspections—	
Boilers of 4,000 lbs/hr Capacity or Less	\$25.00

Boilers of Over 4,000 lbs/hr Capacity	\$35.00
Heating Boilers and Hot Water Supply Boilers	
Internal Inspections—	
Boilers of 4,000 lbs/hr Capacity or Less	\$35.00
Boilers of Over 4,000 lbs/hr Capacity	\$45.00
External Inspections—	
Hot Water Heating and less than or equal to 15 psi Steam Boilers	\$25.00
Hot Water Supply Boilers and Water Heaters, Jacketed Kettles, Storage Water Heaters	\$18.00
Pressure Vessels	
Fees are Based on the Volume in cu. ft. 500 cu. ft. or Less	\$16.00
Over 500 cu. ft.	\$25.00
Internal Inspection Requiring Entry	Hourly Rate
No more than \$120 shall be charged for any one pressure vessel in any one year for routine certificate inspections.	

Miscellaneous

Accreditation Reviews—ASME and National Board	\$1000.00
(includes all travel and preparation time and all expenses)	
Each Hour or Part Thereof Up to Eight Hours	\$35.00
Each Hour or Part Thereof Over Eight Hours in Any One Day	\$50.00
(per hour fees are plus mileage and lodging)	

(B) Disposition of Fees. The chief inspector shall account for and transfer all fees so received to the director of revenue.

(C) If the owner or user of a boiler or pressure vessel which is required to be inspected refuses to allow an inspection to be made or refuses to pay the fee stipulated, a new inspection certificate shall not be issued. If a valid inspection certificate exists, it shall be suspended by the chief inspector until the owner or user complies with the requirements.

(D) The owner or user who causes a boiler or pressure vessel to be operated without a valid certificate shall be subject to the penalty as provided for in the Act. It is the owner's responsibility to assure a valid certificate of inspection is posted at the location of the object.

(15) Validity of Inspection Certificate. An inspection certificate, issued in accordance with section (14), shall be valid until expiration unless some defect or condition affecting

the safety of the boiler or pressure vessel is disclosed provided, however, that a certificate issued for a boiler or pressure vessel inspected by a special inspector shall be valid only if the boiler or pressure vessel for which it was issued continues to be insured by a duly authorized insurance company.

(16) Restamping Boilers and Pressure Vessels. When the stamping on a boiler or pressure vessel becomes indistinct, the inspector shall instruct the owner or user to have it restamped. Request for permission to restamp the boiler or pressure vessel shall be made to the chief inspector and proof of the original stamping shall accompany the request. The chief inspector may grant the authorization. Restamping shall be in accordance with the *National Board Inspection Code*. Notice of completion of the restamping shall be filed with the chief inspector by the inspector who witnessed the stamping on the boiler or pressure vessel, together with a facsimile of the stamping applied.

(17) Penalty for Operation of Unsafe Boilers or Pressure Vessels.

(A) If, upon inspection, a boiler or pressure vessel is found to be in a condition that it is unsafe to operate, the inspector shall notify the chief inspector and the inspection certificate may be suspended by the chief inspector.

(B) Any person, firm, partnership or corporation causing the boiler or pressure vessel to continue to be operated shall be subject to the penalty provided in the Act.

(18) Condemned Boilers and Pressure Vessels.

(A) Any boiler or pressure vessel having been inspected and declared unfit for further service by an inspector shall be stamped by the chief inspector or a deputy inspector on either side of the state number with the letters XXX as shown by the following facsimile, which will designate a condemned boiler or pressure vessel:

XXX MO XXX

This stamping shall be applied directly to the boiler or pressure vessel, whenever possible.

(B) Any person, firm, partnership or corporation using, or offering for sale, a condemned boiler or pressure vessel for operation within this state shall be subject to the penalties provided by the Act.

(19) Reinstallation of Boilers or Pressure Vessels. When a standard boiler or pressure vessel located in this jurisdiction is to be moved outside the jurisdiction for temporary

use or repair, application shall be made by the owner or user to the chief inspector for permission to reinstall the boiler or pressure vessel in the jurisdiction. When a nonstandard boiler or pressure vessel is removed from this state, it shall not be reinstalled within this state.

(20) Installation, Operation, Sale or Offering for Sale of Nonstandard Boilers or Pressure Vessels. The installation, operation, sale or the offering for sale of nonstandard boilers or pressure vessels in this jurisdiction is prohibited without permission from the board.

(21) Installation of Used or Second-Hand Boilers or Pressure Vessels. Before a used or second-hand boiler or pressure vessel can be installed in this state, an inspection must be made by an inspector qualified by this jurisdiction. Data submitted by the inspector shall be filed by the owner or user of the boiler or pressure vessel with the chief inspector for approval. An internal and external certificate inspection of the object shall be made by an inspector qualified by this jurisdiction, prior to issuance of a certificate of inspection for the object. The inspection shall be documented on a form acceptable to the chief inspector. Boilers and pressure vessels, when installed in the jurisdiction, shall be equipped with fittings and appurtenances that comply with the regulations for new installations, in effect on the date of the installation. Exceptions must be referred to the chief inspector for resolution.

(22) Reinstalled Boilers or Pressure Vessels. When a stationary boiler or pressure vessel is moved and reinstalled, the attached fittings and appurtenances shall comply with these regulations for new installations, in effect on the date of the installation. Exceptions must be referred to the chief inspector for resolution.

(23) Working Pressure for Existing Installations. Any inspector may decrease the working pressure on any existing installation if the condition of the boiler or pressure vessel warrants it. If the owner or user does not concur with the inspector's decision, the owner or user may appeal to the board which may request a joint inspection by the chief inspector or a deputy inspector and the inspector. The chief inspector shall render a report to the board and the board shall render the final decision, based upon the data contained in the inspector's reports.

(24) Repairs and Alterations.

(A) When repairs or alterations are to be made to boilers and pressure vessels, permis-

sion shall be obtained from an inspector before the work is started. Organizations making repairs or alterations, must have one (1) of the following authorizations:

1. A valid certificate of authorization for use of the R symbol, issued by the National Board; or

2. A certificate of authorization from the board of boiler and pressure vessel rules.

(B) All work shall conform to the rules of the *National Board Inspection Code* or API-510, as applicable.

(25) Riveted Patches. In applying riveted patches, the design and method of installation shall meet the requirements of subsection (24)(B).

(26) Safety Appliances.

(A) No person shall attempt to remove or do any work on any safety appliance prescribed by these regulations while the appliance prescribed is subject to pressure.

(B) Should any of these appliances be removed for repair during an outage of a boiler or pressure vessel, they must be reinstalled and in proper working order before the object is again placed in service.

(C) No person shall alter any safety or safety relief valves or pressure relief devices in any manner to maintain a working pressure in excess of that stated on the boiler or pressure vessel inspection certificate.

(D) Repair of ASME- and NB-stamped safety or safety relief valves shall be made only by an organization which holds a valid Certificate of Authorization for use of the NB Safety or Safety Relief Valve Repair VR symbol stamp and the scope of the certificate includes the appropriate type of valve to be repaired.

(27) Requirements For New Installations.

(A) No boiler or pressure vessel shall be installed in this state after October 27, 1986, unless it has been constructed in accordance with the *ASME Code*, registered with the NB and installed in conformity with these regulations except—

1. Those exempt by the Act; or

2. Those outlined in subsection (1)(B) of this rule.

(B) The stamping shall not be concealed by lagging or paint and shall be exposed at all times unless a suitable record is kept of the location of the stamping so that it may be readily uncovered at any time this may be desired.

(28) Application of State Serial Numbers.

(A) Upon completion of the installation of a boiler or pressure vessel or at the time of the initial certificate inspection of an existing

installation, each boiler or pressure vessel shall be stamped by the inspector with a serial number of the state, consisting of letters and figures to be not less than five-sixteenths inch (5/16") in height and arranged as follows:

MO 123456

Alternatively, a metal tag issued by the chief inspector, may be securely affixed using screws, rivets, wire or other means so that the tag cannot be easily removed. The "MO" number may not be transferred to any other object. The tag or stamping shall be placed as close to the ASME nameplate or stamping, as practicable.

(B) All cast iron, low pressure heating boilers (including all "HLW" stamped hot water supply boilers) shall have securely attached to the front of the boiler a corrosion-resistant metal tag of not less than one inch by four inches (1" × 4") in size which shall have the serial number of the state stamped on it. All pressure vessels constructed of cast iron, or of material of a thickness that it should not be stamped, shall have securely attached a corrosion-resistant metal tag not less than one inch by four inches (1" × 4") in size which shall have the serial number of the state stamped on it.

(29) Variations.

(A) Any person who believes the rules promulgated by the board are unreasonable or impose an undue burden upon the owner or user may request a variation from the rule. The request for variation shall be in writing and shall specify how equivalent safety is to be maintained. The board, after investigation and hearing as it may direct, may grant a variation from the terms of any rule provided special conditions as may be specified are maintained in order to provide equivalent safety.

(B) When there is reason to believe, or upon receipt of a complaint that a variation does not provide freedom from danger equivalent to that described the published rule, the board, after notice to the owner or user and complainant after the hearing and investigation as it may direct, may continue in force, suspend, revoke or modify the conditions specified in any variation. No declaration, act or omission of the board or of the chief inspector, deputy inspectors or special inspectors other than a written order authorizing a variation as permitted previously, shall be deemed to exempt, either wholly or in part, expressly or implied, any owner or user from full compliance with the terms of any rule.

(30) Penalties. Any person, firm or corporation violating any of the provisions of these rules shall be guilty of a misdemeanor and subject to a fine to be collected by suit or through compromise as provided for in section 650.270, RSMo of the Act. Each day of operation in violation of the provisions shall be considered a separate offense.

AUTHORITY: section 650.215, RSMo 1998. Original rule filed May 12, 1986, effective Oct. 27, 1986. Amended: Filed Dec. 1, 1987, effective Feb. 11, 1988. Amended: Filed Sept. 27, 1990, effective Feb. 14, 1991. Amended: Filed Oct. 3, 1995, effective April 30, 1996. Amended: Filed March 15, 1999, effective Sept. 30, 1999.*

**Original authority 1984, amended 1990, 1993, 1995.*

11 CSR 40-2.030 Existing Installation—Power Boilers

PURPOSE: This rule applies to existing power boilers.

Editor's Note: The following material is incorporated into this rule by reference:

1) American Society of Mechanical Engineers Code (ASME Code) (New York City: American Society of Mechanical Engineers, 1995).

In accordance with section 536.031(4), RSMo, the full text of material incorporated by reference will be made available to any interested person at the Office of the Secretary of State and the headquarters of the adopting state agency.

(1) Age Limit of Existing Boilers.

(A) The age or limit of any boiler of non-standard construction, installed prior to the date the Act became effective, shall be thirty (30) years except that, a boiler having other than a lap-riveted longitudinal joint, after a thorough internal and external inspection, including the testing of safety controls, and when required by the inspector, a hydrostatic pressure test of one and one-half (1 1/2) times the allowable working pressure held for a period of at least thirty (30) minutes during which no distress or leakage develops, may be continued in operation at the working pressure determined by section (3). The age limit of any nonstandard boiler having lap-riveted longitudinal joints and operating at a pressure in excess of fifty pounds per square inch (50 psi) shall be twenty (20) years. This type of boiler, when removed from an existing setting, shall not be reinstalled for a pressure in excess of fifteen (15) psi. A reason

able time for replacement, not to exceed one (1) year, may be given at the discretion of the jurisdiction.

(B) The age limit of boilers of standard construction installed prior to November 12, 1985, shall be dependent on thorough internal and external inspection and, where required by the inspector, a hydrostatic pressure test not exceeding one and one-half (1 1/2) times the allowable working pressure. If the boiler, under these test conditions, exhibits no distress or leakage, it may be continued in operation at the working pressure determined by section (2).

(C) The shell or drum of a boiler in which a lap seam crack develops along a longitudinal lap-riveted joint shall be condemned. A lap seam crack is a crack found in lap seams extending parallel to the longitudinal joint and located either between or adjacent to rivet holes.

(2) Maximum Allowable Working Pressure for Standard Boilers. The maximum allowable working pressure for standard boilers shall be determined in accordance with the applicable provisions of the edition of the American Society of Mechanical Engineers Code (ASME Code) under which they were constructed and stamped.

(3) Maximum Allowable Working Pressure for Nonstandard Boilers.

(A) The maximum allowable working pressure of a nonstandard boiler shall be determined by the strength of the weakest section of the structure, computed from the thickness of the plate, the tensile strength of the plate, the efficiency of the longitudinal joint or tube ligaments, the inside diameter of the weakest course and the factor of safety allowed by these regulations.

$\frac{TS_tE}{RFS}$ = maximum allowable working pressure, expressed in psi

where:

TS = ultimate tensile strength of shell plates, psi

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

E = efficiency of longitudinal joint (For tube ligaments, E shall be determined by the rules given in Section I of the ASME Code. For seamless construction, E shall be considered one hundred percent (100%))

R = inside radius of the weakest course of the shell, in inches

FS = factor of safety permitted

(B) Tensile Strength. When the tensile strength of steel or wrought iron shell plates

is not known, it shall be taken as fifty-five thousand (55,000) psi for steel and forty-five thousand (45,000) psi for wrought iron.

(C) Factors of Safety. The working pressure shall be decreased by the inspector if the condition and safety of the boiler warrants it. The following factors of safety represent minimum values to be used. The lowest factor of safety permissible on existing installations shall be four and one-half (4 1/2), except for horizontal-return-tubular boilers having continuous longitudinal lap-riveted seams more than twelve feet (12') in length, the factor of safety shall be eight (8). When this latter type of boiler is removed from its existing setting, it shall not be reinstalled for pressures in excess of fifteen (15) psi.

(4) 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 one hundred sixty (160) psi water pressure.

(5) Pressure on Cast Iron Boilers. The maximum allowable working pressure for any cast iron boiler, except hot water boilers, shall be fifteen (15) psi steam pressure (see 11 CSR 40-2.040(1), (2) and (4)(A)).

(6) Safety Valves.

(A) The use of weighted-lever safety valves or safety valves having either the seat or disc of cast iron are prohibited; valves of this type of construction shall be replaced by direct, spring-loaded, pop-type valves that conform to the requirements of *ASME Code*, Section I and shall be installed with the spindle vertical.

(B) Each boiler shall have at least one (1) ASME/National Board-certified safety valve and if it has more than five hundred (500) square feet of water-heating surface, or an electric power input of more than one thousand one hundred kilowatts (1100 kw), it shall have two (2) or more safety valves of the same type. The maximum safety valve or relief valve capacity for electric boilers shall be three and one-half (3.5) pounds per hour per kilowatt of input. The ASME/NB capacity rating shall be used.

(C) The valve(s) shall be connected to the boiler, independent of any other steam connection and attached as close as possible to the boiler, without unnecessary intervening pipe or fittings. Where alteration is required to conform to this requirement, owners or users shall be allowed reasonable time in which to complete the work as permitted by the chief inspector.

(D) No valves of any description shall be placed between the safety valve and the boiler nor on the escape pipe, if used. When an escape pipe is used, it shall be at least the full size of the safety valve discharge and fitted with an open drain to prevent water lodging in the upper part of the safety valve or in the escape pipe. 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 anchored and supported securely. All safety discharges shall be so located or piped as to be carried clear from walkways or platforms. The discharge pipe shall be at least full size and be fitted with an open drain to prevent water from lodging in the upper part of the safety valve or, if in the discharge pipe, the drain shall be at least three-eighths inch (3/8") in diameter.

(E) The safety valve capacity of each boiler shall operate so that the safety valve(s) will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than six percent (6%) above the highest pressure to which any valve is set and in no case to more than six percent (6%) above the maximum allowable working pressure.

(F) One (1) or more safety valves on every boiler shall be set at or below the maximum allowable working pressure. The remaining valves may be set within a range of three percent (3%) above the maximum allowable working pressure but the range of setting of all the safety valves on a boiler shall not exceed ten percent (10%) of the highest pressure to which any valve is set.

(G) When two (2) or more boilers operating at different pressures and safety valve settings are interconnected, the lower pressure boilers or interconnected piping shall be equipped with safety valves of sufficient capacity to prevent overpressure, considering the maximum generating capacity of all boilers.

(H) In those cases where the boiler is supplied with feedwater directly from water mains without the use of feeding apparatus (not to include return traps), no safety valve shall be set at a pressure greater than ninety-four percent (94%) of the lowest pressure obtained in the supply main feeding the boiler.

(I) The relieving capacity of the safety valves on any boiler shall be checked by one (1) of the three (3) following methods and, if found to be insufficient, additional valves shall be provided:

1. By making an accumulation test, which consists of shutting off all other steam discharge outlets from the boiler and forcing the fires to the maximum. The safety valve

capacity shall be sufficient to prevent a rise of pressure in excess of six percent (6%) of the maximum allowable working pressure. This method should not be used on a boiler with a superheater or reheater;

2. By measuring the maximum amount of fuel that can be burned and computing the corresponding evaporative capacity (steam generating capacity) upon the basis of the heating value of this fuel. These computations shall be made as outlined in the appendix of the *ASME Code*, Section I; or

3. By measuring the maximum amount of feedwater that can be evaporated.

(J) When either of the methods outlined in paragraph (6)(I)2. or 3. is employed, the sum of the safety valve capacities shall be equal to or greater than the maximum evaporative capacity (maximum steam generating capacity) of the boiler.

(7) Boiler Feeding.

(A) Each boiler shall have a feed supply which will permit it to be fed at any time while under pressure.

(B) A boiler having more than five hundred (500) square feet of water heating surface shall have at least two (2) suitable means of feeding, at least one (1) of which shall be a feed pump. A source of feed at a pressure six percent (6%) greater than the set pressure of the safety valve with the highest setting may be considered one (1) of the means. Boilers fired by gaseous liquid or solid fuel in suspension may be equipped with a single means of feeding water provided means are furnished for the shutoff of heat input prior to the water level reaching the lowest safe level.

(C) The feedwater shall be introduced into the boiler in a manner so that it will not be discharged close to riveted joints of shell or furnace sheets or directly against surfaces exposed to products of combustion or to direct radiation from the fire.

(D) Feedwater piping, up to the check valve, shall be designed for a working pressure of one hundred twenty-five percent (125%) of the maximum allowable working pressure of the boiler or two hundred twenty-five (225) psi greater than the maximum allowable working pressure of the boiler, whichever is less. In no case shall the piping be designed for lower than the pressure used to feed the boiler or one hundred (100) psi, whichever is greater.

(E) The feed piping to the boiler shall be provided with a check valve near the boiler and a valve or cock between the check valve and the boiler. When two (2) or more boilers are fed from a common source, there shall also be a valve on the branch to each boiler between the check valve and the source of

supply. Whenever a globe valve is used on feed piping, the inlet shall be under the disc of the valve.

(F) In all cases where returns are fed back to the boiler by gravity, there shall be a check valve and stop valve in each return line, the stop valve to be placed between the boiler and the check valve and both shall be located as close to the boiler as is practicable. It is recommended that no stop valves be placed in the supply and return pipe connections of a single boiler installation.

(G) Where deaerating heaters are not employed, it is recommended that the temperature of the feedwater be not less than one hundred twenty degrees Fahrenheit (120°F) to avoid the possibility of setting up localized stress. Where deaerating heaters are employed, it is recommended that the minimum feedwater temperature be not less than two hundred fifteen degrees Fahrenheit (215°F) so that dissolved gases may be thoroughly released.

(8) Water Level Indicators.

(A) No outlet connections (except for damper regulator, feedwater regulator, low water fuel cutout, drains, steam gages or an apparatus that does not permit the escape of an appreciable amount of steam or water) shall be placed on the piping that connects the water column to the boiler. The water column shall be provided with a valved drain of at least three-fourths inch (3/4") nominal pipe size, the discharge to be piped to a safe location.

(B) Each boiler shall have three (3) or more gage cocks located within the visible length of the water glass, except when the boiler has two (2) water glasses located on the same horizontal line. Boilers not over twenty-four inches (24") diameter, in which the heating surface does not exceed one hundred (100') square feet, need two (2) gage cocks.

(C) For all installations where the water gage glass or glasses are more than thirty feet (30') above the boiler operating floor, it is recommended that remote water level indicating or recording gages be installed at eye height above the operating floor.

(9) Steam Gages.

(A) Each steam boiler shall have a steam gage with dial range not less than one and one-half (1 1/2) times the maximum allowable working pressure, connected to the steam space or to the steam connection to the water column. 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 can-

not 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.

(B) When a steam gage connection longer than eight feet (8') becomes necessary, a shutoff valve may be used near the boiler provided the valve is of the outside-screw-and-yoke type and is locked open. The line shall be of ample size with provision for free blowing.

(C) Each boiler shall be provided with a one-fourth inch (1/4") nipple and globe valve connected to the steam space for the exclusive purpose of attaching a test gage when the boiler is in service so that the accuracy of the boiler steam gage may be ascertained.

(10) Stop Valves.

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

(B) When a stop valve is so located that water can accumulate, ample drains shall be provided. The drainage shall be piped to a safe location and shall not be discharged on the top of the boiler or its setting.

(C) When boilers provided with manholes are connected to a common steam main, the steam connected from each boiler shall be fitted with two (2) stop valves having an ample free blow drain between them. The discharge of the drain shall be visible to the operator while manipulating the valves and shall be piped clear of the boiler setting. The stop valves shall consist preferably of one (1) automatic nonreturn valve (set next to the boiler) and a second valve of the outside-screw-and-yoke type.

(11) Blowoff/Blowdown Connection.

(A) The construction of the setting around each blowoff pipe shall permit free expansion and contraction. Careful attention shall be given to the problem of sealing these setting openings without restricting the movement of the blowoff piping.

(B) All blowoff piping, when exposed to furnace heat, shall be protected by fire brick or other heat-resisting material, so constructed that the piping may be inspected readily.

(C) Each boiler shall have a blowoff pipe, fitted with a valve or cock, in direct connection with the lowest water space. Cocks shall be of the gland or guard type and suitable for the pressure allowed. The use of globe valves shall not be permitted. Piping shall be designed for a working pressure of one hundred twenty-five percent (125%) of the maximum allowable working pressure of the boiler or two hundred twenty-five (225) psi

greater than the allowable working pressure of the boiler, whichever is less. In no case shall the piping be designed for lower than one hundred (100) psi. When the maximum allowable working pressure of the boiler exceeds one hundred (100) psi—

1. Each blowoff pipe shall be provided with two (2) valves or a valve and cock;
2. All fittings shall be steel;
3. All piping shall be at least schedule 80; and
4. Piping shall not be galvanized.

(D) All blowoff piping shall be run full size without use of reducers or bushings.

(E) In case of renewal of blowoff pipe or fittings, they shall be installed in accordance with the regulations for new installations.

(12) Repairs and Renewals of Boiler Fittings and Appliances. Whenever repairs are made to piping, fittings, or appliances or it becomes necessary to replace them, the work shall comply with the requirements for new installation.

(13) Conditions Not Covered by These Requirements. All cases not specifically covered by these requirements shall be treated as new installations or may be referred to the chief inspector for instructions concerning the requirements.

*AUTHORITY: section 650.215, RSMo 1994. * Original rule filed May 12, 1986, effective Oct. 27, 1986. Amended: Filed Dec. 1, 1987, effective Feb. 11, 1988. Amended: Filed Sept. 27, 1990, effective Feb. 14, 1991. Amended: Filed Oct. 3, 1995, effective April 30, 1996.*

**Original authority 1984, amended 1990, 1993, 1995.*

11 CSR 40-2.040 Existing Heating Boilers

PURPOSE: This rule applies to existing heating boilers, steel and cast iron.

Editor's Note: The following material is incorporated into this rule by reference:

1) American Society of Mechanical Engineers Code (ASME Code) (New York City: American Society of Mechanical Engineers, 1995).

In accordance with section 536.031(4), RSMo, the full text of material incorporated by reference will be made available to any interested person at the Office of the Secretary of State and the headquarters of the adopting state agency.

(1) Standard Boilers. The maximum allowable working pressure of standard boilers shall in no case exceed the pressure indicated

by the manufacturer's identification stamped or cast on the boiler or on a plate secured to it.

(2) Nonstandard Riveted Boilers. The maximum allowable working pressure on the shell of a nonstandard riveted heating boiler shall be determined in accordance with 11 CSR 40-2.030(3), except that in no case shall the maximum allowable working pressure of a steam heating boiler exceed fifteen pounds per square inch (15 psi), or a hot water boiler exceed one hundred sixty (160) psi or two hundred fifty degrees Fahrenheit (250°F) temperature.

(3) Nonstandard Welded Boilers. The maximum allowable working pressure of a steam heating, nonstandard steel or wrought iron heating boiler of welded construction shall be determined in accordance with 11 CSR 40-2.030(3), but shall not exceed fifteen (15) psi for steam. For other than steam service, the maximum allowable working pressure shall be calculated in accordance with Section IV of the *American Society of Mechanical Engineers Code (ASME Code)*, but in no case shall it exceed thirty (30) psi.

(4) Nonstandard Cast Iron Boilers.

(A) The maximum allowable working pressure of a nonstandard boiler composed principally of cast iron shall not exceed fifteen (15) psi for steam service or thirty (30) psi for hot water service.

(B) The maximum allowable working pressure of a nonstandard boiler having cast iron shell or heads and steel or wrought iron tubes shall not exceed fifteen (15) psi for steam service or thirty (30) psi for hot water service.

(5) Safety Valves.

(A) Each steam boiler shall have one (1) or more ASME/National Board (NB)-certified safety valves of the spring pop-type adjusted and sealed to discharge at a pressure not to exceed fifteen (15) psi. Seals shall be attached in a manner to prevent the valve from being taken apart without breaking the seal. The valve shall be repaired or replaced if the seal is broken. The safety valves shall be arranged so that they cannot be reset to relieve at a higher pressure than the maximum allowable working pressure of the boiler. A body drain connection below seat level shall be provided by the manufacturer and this drain shall not be plugged during or after field installation. For valves exceeding two and one-half inch (2 1/2")-pipe size, the drain hole(s) shall be tapped not less than three-eighths inch (3/8")-pipe size. For valves not exceeding two and one-half inch (2 1/2"), the

drain hole shall not be less than one-fourth inch (1/4") in diameter.

(B) No safety valve for a steam boiler shall be smaller than three-fourths inch (3/4") unless the boiler and radiating surfaces consist of a self-contained unit, except for boilers having an input not greater than fifteen thousand (15,000) BTU/hr, a one-half inch (1/2")-safety valve may be used. No safety valve shall be larger than four and one-half inches (4 1/2"). The inlet opening shall have an inside diameter equal to, or greater than, the seat diameter.

(C) The minimum relieving capacity of the valve(s) shall be governed by the capacity marking on the boiler. All safety and safety relief valves shall be installed with their spindles vertical except for "HLW" stamped boilers. On "HLW" stamped boilers, the pressure/temperature safety valve may be mounted directly on the water heater vessel with no more than four inches (4") maximum interconnecting piping, with the outlet pointed down. For boilers requiring a pressure/temperature rated valve, the American Gas Association (AGA) rating of the valve shall be used to determine the relieving capacity based on the burner input.

(D) The minimum valve capacity in pounds per hour shall be the greater of that determined by dividing the maximum British thermal unit (BTU) output at the boiler nozzle obtained by the firing of any fuel for which the unit is installed by one thousand (1000) or shall be determined on the basis of the pounds of steam generated per hour per square foot of boiler heating surface as given in Table 1. In many cases a greater relieving capacity of valves than the minimum specified by these rules will have to be provided. In every case the requirements of subsection (5)(E) shall be met.

Table 1
Minimum Pounds of Steam
Per Hour Per Square Foot of
Heating Surface

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

1. When a boiler is fired only by a gas giving a heat value not in excess of two hundred (200) BTUs per cubic foot, the minimum safety valve or safety relief valve relieving capacity may be based on the value given for hand-fired boilers.

2. The minimum safety valve or safety relief valve relieving capacity for electric boilers shall be three and one-half (3 1/2) pounds per hour per kilowatt input.

3. For heating surface determination see *ASME Code* Section IV.

(E) The safety valve capacity for each steam boiler shall operate so that with the fuel burning equipment installed and operating at maximum capacity, the pressure cannot rise more than five (5) psi above the maximum allowable working pressure.

(F) When operating conditions are changed, or additional boiler heating surface is installed, the valve capacity shall be increased, if necessary, to meet the new conditions and be in accordance with subsection (5)(E). When additional valves are required, they may be installed on the outlet piping provided there is no intervening valve.

(G) If there is any doubt as to the capacity of the safety valve, an accumulation test shall be run (see *ASME Code*, Section VI, Recommended Rules for Care and Operation of Heating Boilers).

(H) No valve of any description shall be placed between the safety valve and the boiler, nor on the discharge pipe between the safety valve and the atmosphere. *The discharge pipe shall be at least full size and be fitted with an open drain to prevent water lodging in the upper part of the safety valve or in the discharge pipe.* When an elbow is placed on the safety valve discharge pipe, it shall be located close to the safety valve outlet or the discharge pipe shall be securely anchored and supported. All safety valve discharges shall be so located or piped as not to endanger persons working in the area.

(6) Safety Relief Valve Requirements for Hot Water Boilers.

(A) Each hot water heating boiler shall have at least one (1) ASME/NB-certified safety relief valve set to relieve at or below maximum allowable working pressure of the boiler. Each hot water supply boiler shall have at least one (1) ASME/NB-certified safety relief valve of the automatic reseating type set to relieve at or below maximum allowable working pressure of the boiler. Safety relief valves ASME/NB-certified as to capacity shall have pop action when tested by steam.

(B) When more than one (1) safety relief valve is used on either hot water heating or

hot water supply boilers, the additional valve(s) shall be ASME rated and may be set within a range not to exceed six (6) psi above the maximum allowable working pressure of the boiler up to and including sixty (60) psi and five percent (5%) for those having a maximum allowable working pressure exceeding sixty (60) psi. Safety relief valves shall be spring loaded. Safety relief valves shall be set and sealed so that they cannot be reset without breaking the seal.

(C) No materials liable to fail due to deterioration or vulcanization when subject to saturated steam temperature corresponding to capacity test pressure shall be used for any part.

(D) No safety relief valve shall be smaller than three-fourths inch (3/4") nor larger than four and one-half inches (4 1/2") standard pipe size, except that boilers having a heat input not greater than fifteen thousand (15,000) BTU/hr may be equipped with a safety relief valve of one-half inch (1/2") standard pipe size. The inlet opening shall have an inside diameter approximately equal to, or greater than, the seat diameter. In no case shall the minimum opening through any part of the valve be less than one-half inch (1/2") in diameter or its equivalent area.

(E) The required steam relieving capacity, in pounds per hour, of the pressure relieving device(s) on a boiler shall be the greater of that determined by dividing the maximum output in BTU/hr at the boiler nozzle obtained by the firing of any fuel for which the unit is installed by one thousand (1000) or shall be determined on the basis of pounds of steam generated per hour per square foot of boiler heating surface as given in Table 1. In many cases a greater relieving capacity of valves will have to be provided than the minimum specified by these rules. In every case the requirements of subsection (6)(G) shall be met.

(F) When operating conditions are changed or additional boiler heating surface is installed, the valve capacity shall be increased, if necessary, to meet the new conditions and shall be in accordance with subsection (6)(G). The additional valves required, on account of changed conditions, may be installed on the outlet piping provided there is no intervening valve.

(G) Safety relief valve capacity for each boiler shall operate so that, with the fuel burning equipment installed and operated at maximum capacity, the pressure cannot rise more than ten percent (10%) above the maximum allowable working pressure. When more than one (1) safety relief valve is used, the overpressure shall be limited to ten per-

cent (10%) above the set pressure of the highest valve.

(H) If there is any doubt as to the capacity of the safety relief valve, an accumulation test shall be run (see *ASME Code*, Section VI, Recommended Rules for Care and Operation of Heating Boilers).

(I) No valve of any description shall be placed between the safety relief valve and the boiler, nor on the discharge pipe between the safety relief valve and the atmosphere. ***The discharge pipe shall be at least full size and fitted with an open drain to prevent water lodging in the upper part of the safety relief valve or in the discharge pipe.*** When an elbow is placed on the safety relief valve discharge pipe, it shall be located close to the safety relief valve outlet or the discharge pipe shall be securely anchored and supported. All safety relief valve discharges shall be so located or piped as not to endanger persons working in the area.

(7) Steam Gages.

(A) Each steam boiler shall have a steam gage connected to its steam space, its water column or its steam connection, by means of a siphon or equivalent device exterior to the boiler. The siphon shall be 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 with tee or lever handle placed in the pipe near the gage. The handle of the cock shall be parallel to the pipe in which it is located when the cock is open.

(B) The scale on the dial of a steam gage shall be graduated to not less than thirty (30) psi or more than sixty (60) psi. The travel of the pointer from zero to thirty (0–30) psi pressure shall be at least three inches (3").

(8) Pressure or Altitude Gages and Thermometers.

(A) Each hot water boiler shall have a pressure or altitude gage connected to it or to its flow connection in a manner that it cannot be shut off from the boiler except by a cock with tee or lever handle placed on the pipe near the gage. The handle of the cock shall be parallel to the pipe in which it is located when the cock is open.

(B) The scale on the dial of the pressure or altitude gage shall be graduated approximately to not less than one and one-half (1-1/2) times nor more than three (3) times the pressure at which the safety relief valve is set.

(C) Piping or tubing for pressure or altitude gage connections shall be of nonferrous metal when smaller than one-inch (1")-pipe size.

(D) Each hot water boiler shall have a thermometer so located and connected that it shall be easily readable when observing the water pressure or altitude gage. The thermometer shall be so located that it will at all times indicate the temperature in degrees Fahrenheit of the water in the boiler at or near the outlet.

(9) Water Gage Glasses.

(A) Each steam boiler shall have one (1) or more water gage glasses attached to the water column or boiler by means of valved fittings not less than one-half inch (1/2")-pipe size, with the lower fitting provided with a drain valve of a type having an unrestricted drain opening not less than one-fourth inch (1/4") in diameter to facilitate cleaning. Gage glass replacement shall be possible under pressure. Water glass fittings may be attached directly to a boiler. Boilers having an internal vertical height of less than ten inches (10") may be equipped with a water level indicator of the Glass Bull's Eye type provided the indicator is of sufficient size to show the water at both normal operating and low-water cutoff levels.

(B) The lowest visible part of the water gage glass shall be at least one inch (1") above the lowest permissible water level recommended by the boiler manufacturer. With the boiler operating at this lowest permissible water level, there shall be no danger of overheating any part of the boiler.

(10) Pressure/Temperature Controls.

(A) Each automatically fired steam boiler shall be protected from overpressure by two (2) pressure-operated controls.

1. Each individual automatically fired steam boiler shall have a safety limit control that will cut off the fuel supply to prevent steam pressure from exceeding the fifteen (15) psi maximum allowable working pressure of the boiler. Each control shall be constructed to prevent a pressure setting above fifteen (15) psi.

2. Each individual steam boiler or each system of commonly connected steam boilers shall have a control that will cut off the fuel supply when the pressure reaches an operating limit, which shall be less than the maximum allowable pressure.

3. Shutoff valves of any type shall not be placed in the steam pressure connection between the boiler and the controls described in paragraphs (10)(A)1. and 2. above. These controls shall be protected with a syphon or equivalent means of maintaining a water seal that will prevent steam from entering the control. The connections to the boiler shall not be less than one-fourth inch (1/4")-standard pipe size, but where steel or wrought iron

pipe or tubing is used, they shall not be less than one-half inch (1/2")-standard pipe size. The minimum size of a syphon shall be one-fourth inch (1/4")-standard pipe size or three-eighths inch (3/8")-outside diameter nonferrous tubing.

(B) Each automatically fired hot water boiler shall be protected from over-temperature by two (2) temperature operated controls. Each individual automatically fired hot water boiler shall have a safety limit control that will cut off the fuel supply to prevent water temperature from exceeding the maximum allowable temperature of two hundred-fifty degrees Fahrenheit (250°F) at the boiler outlet. This water temperature safety control shall be constructed to prevent a temperature setting above two hundred fifty degrees Fahrenheit (250°F).

(11) Provisions for Thermal Expansion in Hot Water Systems.

(A) All hot water heating systems incorporating hot water tanks or fluid relief columns shall be so installed as to prevent freezing under normal operating conditions.

(B) Systems with open (vented to the atmosphere) expansion tanks must be equipped with an indoor overflow, in addition to the open vent, from the upper portion of the expansion tank to a suitable plumbing fixture or the basement. Provisions must be made for draining the tank without emptying the system.

(C) Closed systems (pressurized) must have an airtight tank or other suitable air cushion installed that will be consistent with the volume and capacity of the system. It shall be suitably designed for a hydrostatic test pressure of two and one-half (2 1/2) times the allowable working pressure of the system. Expansion tanks for systems designed to operate above thirty (30) psi shall be constructed in accordance with Section VIII, Division 1 of the *ASME Code*.

(12) Stop Valves and Check Valves.

(A) If a boiler may be closed off from the heating system by closing a steam stop valve, there shall be a check valve in the condensate return line between the boiler and the system.

(B) If any part of a heating system may be closed off from the remainder of the system by closing a steam stop valve, there shall be a check valve in the condensate return pipe from that part of the system.

(13) Feedwater Connections.

(A) Feedwater, make-up water or water treatment shall be introduced into a boiler through the return piping system or through an independent feedwater connection which

does not discharge against parts of the boiler exposed to direct radiant heat from the fire. For hot water boilers, the make-up water may be introduced into the boiler through the piping system or through an independent connection. Feedwater, make-up or water treatment shall not be introduced through openings or connections provided for inspection or cleaning, safety valve, safety relief valve, surface blowoff, water column, water gage glass, pressure gage or temperature gage.

(B) Feedwater pipe shall be provided with a check valve near the boiler and a stop valve or cock between the check valve and the boiler or between the check valve and the return pipe system.

(14) Electrically heated or gas-fired jacketed steam kettles may be constructed in accordance with *ASME Code* Section VIII, Division 1.

(A) Service Restrictions—No steam or water shall be withdrawn from the jacket for use external to the vessel and the operating pressure of the jacket shall not exceed fifty (50) psi.

(B) Material—When in contact with the products of combustion, austenitic stainless steel parts shall be of either the low carbon or stabilized grades. Structural grade carbon steel, SA-36 and SA-283 (grades A, B, C, and D), shall not be used for any pressure part.

(C) Design.

1. Welded joints in contact with the products of combustion shall be of Type No. 1 from Table UW-12 of Section VIII, Division 1.

2. When parts, subjected to pressure, are made of carbon steel material, the minimum thickness shall be one-fourth inch (1/4").

(D) Inspection and testing—may not be marked with the Stamp "UM" symbol stamp and must be inspected by an authorized inspector, regardless of volume.

(E) Safety Valves—The capacity of the safety valve in pounds of steam per hour shall be at least equal to the BTU/hr rating of the burner divided by one thousand (1000) or the kilowatt rating of the electric heating element multiplied by three and one-half (3 1/2).

(F) Appurtenances and Controls—The jacket shall be furnished with the following minimum appurtenances and controls:

1. A pressure gage;
2. A water gage glass;

3. A separate connection, fitted with a check valve and stop valve, for adding water to the jacket (the water may be added while the vessel is not under pressure);

4. An electric heater control or automatic gas valve controlled by the pressure or temperature to maintain the steam pressure in the jacket below the safety valve setting;

5. A low water fuel cutoff that will cut off the fuel to the burner or power to the electric heating element if the water in the jacket drops below the lowest permissible water level established by the manufacturer;

6. A safety pilot control that will cut off the fuel to both the main burner and the pilot burner in case of pilot flame failure.

(15) Return Pump. Each boiler equipped with a condensate return pump shall be provided with a water level control arranged to automatically maintain the water level in the boiler within the range of the gage glass.

(16) Repairs and Renewals of Fittings and Appliances. Whenever repairs are made to fittings or appliances, or it becomes necessary to replace them, the repairs must comply with Section IV of the *ASME Code* for new construction.

AUTHORITY: section 650.215, RSMo 1994. Original rule filed May 12, 1986, effective Oct. 27, 1986. Amended: Filed Sept. 27, 1990, effective Feb. 14, 1991. Amended: Filed Oct. 3, 1995, effective April 30, 1996.*

**Original authority 1984, amended 1990, 1993, 1995.*



MISSOURI DEPARTMENT OF PUBLIC SAFETY
DIVISION OF FIRE SAFETY

BOILER OR PRESSURE VESSEL - REPORT OF INSPECTION

DATE INSP	CERT EXP DATE	CERT POST Y N	STATE NO	NAT'L BRD NO	OWNER NO	OTHER NO
NATURE OF BUSINESS				KIND OF INSP EXT INT	CERT INSP Y N	SPECIFIC LOC
OWNER						
OWNER ADDRESS						
OWNER CITY			OWNER STATE	OWNER ZIP CODE		
USER						
USER ADDRESS						
USER CITY			USER STATE	USER ZIP CODE	COUNTY	
TYPE BOILER	YR BLT	MANUFACTURER			HEATING SURFACE	PRES GA TESTED Y N
USE		FUEL	METHOD OF FIRE			
TYPE PRES VESSEL	YR BLT	MANUFACTURER			VOLUME - CU. FT.	PRES GA TESTED Y N
USE		CORR SERVICE	CONTENTS			
ALLOW PRES THIS INSP	ALLOW PRES PREV INSP	S R VALVE SET AT	HYDRO TEST Y N	PSI	DATE	
EXPLAIN IF PRESSURE CHANGED					SVRC REQUIRED	
IS CONDITION OF OBJECT SUCH THAT A CERTIFICATE MAY BE ISSUED? IF NO, EXPLAIN FULLY BELOW. YES NO					TOTAL SVRC	
UNLESS OTHERWISE NOTED BELOW THE OBJECT ON THIS REPORT IS CONSIDERED SAFE FOR CONTINUED SERVICE.						
INSPECTOR'S FINDINGS						
NAME AND TITLE OF PERSON TO WHOM REQUIREMENTS WERE EXPLAINED					PHONE NUMBER	
I HEREBY CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION						
INSPECTOR'S SIGNATURE					STATE COMMISSION NUMBER/EMPLOYED BY	
FOR OFFICE USE ONLY		SHOP INSPECTION			TOTAL CHARGE	
INSPECTION		INSPECTION CERTIFICATE			MISC EXPENSE	
SPECIAL INSPECTION		HYDROSTATIC INSPECTION			TRAVEL EXPENSE	

MO 812-0511 (9-99)

DISTRIBUTION: WHITE - STATE CANARY/PINK - DISTRIBUTION AS NEEDED



APPENDIX 5 - NATIONAL BOARD FORMS

FORM NB-4
NOTICE
NEW BUSINESS OR DISCONTINUANCE
USED BY AUTHORIZED INSURANCE INSPECTION AGENCIES

To: _____ JURISDICTION _____ 1. DATE OF NOTICE _____

2. Notice of: New insurance business Discontinuance or cancellation Refusal to insure 3. Effective date _____ 4. Type of object High pressure boiler Low pressure boiler Pressure vessel

5. OBJECT	6. OWNER'S NO.	7. JURISDICTION NO.	8. NATIONAL BOARD NO.	9. NAME OF MANUFACTURER
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10. NAME OF OWNER _____

11. NAME OF OWNER INCLUDING COUNTY _____

12. LOCATION OF OBJECT INCLUDING COUNTY _____

13. USER OF OBJECT (IF SAME AS OWNER SHOW "SAME") _____

14. DATE OF LAST CERTIFICATE INSPECT., IF ANY	15. CERTIFICATE ISSUED <input type="checkbox"/> Yes <input type="checkbox"/> No	16. REASON FOR DISCONTINUANCE OR CANCELLATION <input type="checkbox"/> Phys. condition <input type="checkbox"/> Out of use <input type="checkbox"/> Other
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17. REMARKS (USE REVERSE SIDE)

18. By: _____ CHIEF INSPECTOR _____ BRANCH OFFICE

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, OH. 43229

NB-4
Rev. 1



APPENDIX 5 - NATIONAL BOARD FORMS

FORM NB-5 BOILER OR PRESSURE VESSEL DATA REPORT
FIRST INTERNAL INSPECTION

Standard Form for Jurisdictions Operating Under the ASME Code

1	DATE INSPECTED MO DAY YEAR	CERT EXP DATE MO YEAR	CERTIFICATE POSTED <input type="checkbox"/> Yes <input type="checkbox"/> No	OWNER NO.	JURISDICTION NUMBER	NAT'L BD NO <input type="checkbox"/> OTHER NO <input type="checkbox"/>	
2	OWNER			NATURE OF BUSINESS	KIND OF INSPECTION <input type="checkbox"/> Int <input type="checkbox"/> Ext	CERTIFICATE INSPECTION <input type="checkbox"/> Yes <input type="checkbox"/> No	
3	OWNER STREET ADDRESS			OWNERS CITY	STATE	ZIP	
4	USERS NAME - OBJECT LOCATION			SPECIFIC LOCATION IN PLANT	OBJECT LOCATION - COUNTY		
5	USERS STREET ADDRESS			USERS CITY	STATE	ZIP	
6	TYPE <input type="checkbox"/> FT <input type="checkbox"/> WT <input type="checkbox"/> CI <input type="checkbox"/> Air Tank <input type="checkbox"/> Water Tank <input type="checkbox"/> Other			YEAR BUILT	MANUFACTURER	YEAR INST <input type="checkbox"/> New <input type="checkbox"/> Second Hand	
7	USE <input type="checkbox"/> Power <input type="checkbox"/> Process <input type="checkbox"/> Steam Htg <input type="checkbox"/> HWH <input type="checkbox"/> HWS			FUEL (BOILER)	METHOD OF FIRING (BOILER)	PRESSURE GAGE TESTED <input type="checkbox"/> Yes <input type="checkbox"/> No	
8	PRESSURE This Inspection _____ Prev. Inspection _____			SAFETY - RELIEF VALVES Set at _____	EXPLAIN IF PRESSURE CHANGED		
9	IS CONDITION OF OBJECT SUCH THAT A CERTIFICATE MAY BE ISSUED? <input type="checkbox"/> Yes <input type="checkbox"/> No (If no explain fully on back of form - listing code violations)					HYDRO TEST <input type="checkbox"/> Yes _____ psi Date _____ <input type="checkbox"/> No	
10	SHELL No.	DIAMETER in. <input type="checkbox"/> ID <input type="checkbox"/> OD	OVERALL LENGTH ft. in.	THICKNESS in.	TOTAL HTG SURFACE (BOILER) Sq Ft		MATERIAL ASME Spec Nos
11	ALLOWABLE STRESS psi	BUTT STRAP Thks	<input type="checkbox"/> Single in. <input type="checkbox"/> Double		HEADERS - W T BOILERS TYPE <input type="checkbox"/> Box <input type="checkbox"/> Sinuous <input type="checkbox"/> Wtr Wall <input type="checkbox"/> Other _____		
12	TYPE LONGITUDINAL SEAM <input type="checkbox"/> Lap <input type="checkbox"/> Butt <input type="checkbox"/> Welded <input type="checkbox"/> Brazed <input type="checkbox"/> Riveted			RIVETED Dia Hole in.	PITCH in. X in. X in.	SEAM EFF %	
13	HEAD THICKNESS in.	HEAD TYPE <input type="checkbox"/> Plus <input type="checkbox"/> Minus <input type="checkbox"/> Flat <input type="checkbox"/> Quick Opening	<input type="checkbox"/> Fixed <input type="checkbox"/> Movable		RADIUS DISH in.	ELLIP RATIO	BOLTING No. Dia. in. Material _____
14	TUBE SHEET THICKNESS in.	TUBES No. Dia. in. Length ft. in.	PITCH (W T BLRS) in. X in.		LIGAMENT EFF %		
15	FIRE TUBE BOILERS		DISTANCE UPPER TUBES TO SHELL Front in. Rear in.	STAYED AREA Front Head	Above Tubes _____ Rear Head { Above Tubes _____ Below Tubes _____		
16	STAYS ABOVE TUBES Front No. Rear No.		TYPE <input type="checkbox"/> Head to Head <input type="checkbox"/> Diagonal <input type="checkbox"/> Welded <input type="checkbox"/> Weldless		AREA OF STAYS Front Rear		
17	STAYS BELOW TUBES Front No. Rear No.		TYPE <input type="checkbox"/> Head to Head <input type="checkbox"/> Diagonal <input type="checkbox"/> Welded <input type="checkbox"/> Weldless		AREA OF STAYS Front Rear		
18	FURNACE - TYPE Adamson (No. Sect. _____) <input type="checkbox"/> Corrugated <input type="checkbox"/> Plain <input type="checkbox"/> Other _____			THICKNESS in.	TOTAL LENGTH ft. in.	TYPE LONG. SEAM <input type="checkbox"/> Welded <input type="checkbox"/> Riveted <input type="checkbox"/> Seamless	
19	STAYBOLTS - TYPE <input type="checkbox"/> Threaded <input type="checkbox"/> Welded <input type="checkbox"/> Hollow <input type="checkbox"/> Drilled (Size Hole _____ in.)			DIAMETER in.	PITCH in. X in.	NET AREA sq in.	
20	SAFETY - RELIEF VALVES No. Size		TOTAL CAPACITY _____ Lb/Hr	Cfm Btu/Hr	OUTLETS No. Size	PROPERLY DRAINED <input type="checkbox"/> Yes <input type="checkbox"/> No (If "No" explain on back of form)	
21	STOP VALVES	ON STEAM LINE <input type="checkbox"/> Yes <input type="checkbox"/> No	ON RETURN LINES <input type="checkbox"/> Yes <input type="checkbox"/> No	OTHER CONNECTIONS <input type="checkbox"/> Yes <input type="checkbox"/> No	STEAM LINES PROPERLY DRAINED <input type="checkbox"/> Yes <input type="checkbox"/> No (If "No" explain on back of form)		
22	FEED PIPE Size in.	FEED APPLIANCES No.	TYPE DRIVE <input type="checkbox"/> Steam <input type="checkbox"/> Motor	CHECK VALVES	FEED LINE <input type="checkbox"/> Yes <input type="checkbox"/> No	RETURN LINE <input type="checkbox"/> Yes <input type="checkbox"/> No	
23	WATER GAGE GLASS No.	TRY COCKS No.	BLOW OFF PIPE Size in. Location	INSPECTION OPENINGS COMPLY WITH CODE <input type="checkbox"/> Yes <input type="checkbox"/> No (If "No" explain on back of form)			
24	CAST IRON BOILERS Length in. Width in. Height in. in.			SECTIONS No.	DOES WELDING ON STEAM, FEED, BLOWOFF AND OTHER PIPING COMPLY WITH CODE <input type="checkbox"/> Yes <input type="checkbox"/> No (If "No" explain on back of form)		
25	SHOW ALL CODE STAMPING ON BACK OF FORM. Give details (use sketch) for special objects NOT covered above - such as Double wall vessels etc				DOES ALL MATERIAL OTHER THAN AS INDICATED ABOVE COMPLY WITH CODE <input type="checkbox"/> Yes <input type="checkbox"/> No (If "No" explain on back of form)		
26	NAME AND TITLE OF PERSON TO WHOM REQUIREMENTS WERE EXPLAINED:						
27	I HEREBY CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION Signature of Inspector			IDENT NO.	EMPLOYED BY	IDENT NO.	

Complete When Not Registered National Board

Complete When Not Registered National Board

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Col's., O. 43229

NB-5 Rev.0



APPENDIX 5 - NATIONAL BOARD FORMS

**FORM NB-6 BOILER-FIRED PRESSURE VESSEL
REPORT OF INSPECTION**
Standard Form for Jurisdictions Operating Under the ASME Code

1	DATE INSPECTED MO DAY YEAR	CERT EXP DATE MO YEAR	CERTIFICATE POSTED <input type="checkbox"/> YES <input type="checkbox"/> NO	OWNER NO	JURISDICTION NUMBER	NAT'L BD. NO. <input type="checkbox"/> OTHER NO. <input type="checkbox"/>
2	OWNER			NATURE OF BUSINESS		KIND OF INSPECTION <input type="checkbox"/> INT <input type="checkbox"/> EXT
3	OWNER STREET ADDRESS NUMBER			OWNERS CITY		STATE ZIP
4	USERS NAME - OBJECT LOCATION			SPECIFIC LOCATION IN PLANT		OBJECT LOCATION - COUNTY
5	USERS STREET ADDRESS NUMBER			USERS CITY		STATE ZIP
6	TYPE <input type="checkbox"/> FT <input type="checkbox"/> WT <input type="checkbox"/> CI <input type="checkbox"/> OTHER			YEAR BUILT	MANUFACTURER	
7	USE <input type="checkbox"/> POWER <input type="checkbox"/> PROCESS <input type="checkbox"/> STEAM HTG. <input type="checkbox"/> HWH <input type="checkbox"/> HWS <input type="checkbox"/> OTHER			FUEL	METHOD OF FIRING	PRESSURE GAGE TESTED <input type="checkbox"/> YES <input type="checkbox"/> NO
8	PRESSURE ALLOWED		SAFETY-RELIEF VALVES		HEATING SURFACE OR BTU	
9	THIS INSPECTION		PREV INSPECTION		SET AT TOTAL CAPACITY	
10	IS CONDITION OF OBJECT SUCH THAT A CERTIFICATE MAY BE ISSUED?			HYDRO TEST		
11	<input type="checkbox"/> YES <input type="checkbox"/> NO (IF NO EXPLAIN FULLY UNDER CONDITIONS)			<input type="checkbox"/> YES <input type="checkbox"/> NO PSI DATE		
12	CONDITIONS: <i>With respect to the internal surface, describe and state location of any scale, oil or other deposits. Give location and extent of any corrosion and state whether active or inactive. State location and extent of any erosion, grooving, bulging, warping, cracking or similar condition. Report on any defective rivets, bowed, loose or broken stays. State condition of all tubes, tube ends, coils, nipples, etc. Describe any adverse conditions with respect to pressure gage, water column, gage glass, gage cocks, safety valves, etc. Report condition of setting, linings, bellows, supports, etc. Describe any major changes or repairs made since last inspection</i>					
13	REQUIREMENTS: <i>(List Code violations)</i>					
14	NAME AND TITLE OF PERSON TO WHOM REQUIREMENTS WERE EXPLAINED:					
I HEREBY CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION						
SIGNATURE OF INSPECTOR			IDENT. NO	EMPLOYED BY		IDENT NO

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Col's., OH 43229

NB-6 Rev. 3



APPENDIX 5 - NATIONAL BOARD FORMS

FORM NB-7 PRESSURE VESSELS
REPORT OF INSPECTION
Standard Form for Jurisdictions Operating Under the ASME Code

Form NB-7 Pressure Vessels Report of Inspection. Includes fields for: 1. DATE INSPECTED (MO, DAY, YEAR), CERT EXP DATE (MO, YEAR), CERTIFICATE POSTED (YES/NO), OWNER NO, JURISDICTION NUMBER, NAT'L BD. NO., OTHER NO.; 2. OWNER, NATURE OF BUSINESS, KIND OF INSPECTION (INT/EXT), CERTIFICATE INSPECTION (YES/NO); 3. OWNERS CITY, STATE, ZIP; 4. USERS NAME - OBJECT LOCATION, SPECIFIC LOCATION IN PLANT, OBJECT LOCATION - COUNTY; 5. USERS STREET ADDRESS NUMBER, USERS CITY, STATE, ZIP; 6. TYPE (AIR/WATER/TANK/OTHER), YEAR BUILT, MANUFACTURER; 7. USE (STORAGE/PROCESS/HEAT EXCHANGE/OTHER), SIZE, PRESSURE GAGE TESTED; 8. PRESSURE ALLOWED, SAFETY-RELIEF VALVES, EXPLAIN IF PRESSURE CHANGED; 9. THIS INSPECTION, PREV INSPECTION, SET AT, TOTAL CAPACITY; 10. IS CONDITION OF OBJECT SUCH THAT A CERTIFICATE MAY BE ISSUED?, HYDRO TEST (YES/NO), PSI DATE; 11. CONDITIONS (With respect to the internal surfaces, describe and state location of any scale, oil or other deposits...); 12. REQUIREMENTS: (List Code violations); 13. NAME AND TITLE OF PERSON TO WHOM REQUIREMENTS WERE EXPLAINED; 14. I HEREBY CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION; 15. SIGNATURE OF INSPECTOR, IDENT. NO, EMPLOYED BY, IDENT. NO.

11 CSR 40-2.050 Existing Pressure Vessels

PURPOSE: This rule applies to existing pressure vessels.

Editor's Note: The following material is incorporated into this rule by reference:

1) **American Society of Mechanical Engineers Code (ASME Code)** (New York City: American Society of Mechanical Engineers, 1995).

In accordance with section 536.031(4), RSMo, the full text of material incorporated by reference will be made available to any interested person at the Office of the Secretary of State and the headquarters of the adopting state agency.

(1) Maximum Allowable Working Pressure for Standard Pressure Vessels. The maximum allowable working pressure for standard pressure vessels shall be determined in accordance with the applicable provisions of the *American Society of Mechanical Engineers (ASME) Code* or the *American Petroleum Institute (API) API-ASME Code* under which they were constructed and stamped.

(2) Maximum Allowable Working Pressure for Nonstandard Pressure Vessels, Except as Provided in Section (3).

(A) The maximum allowable working pressure of a nonstandard pressure vessel shall be determined by the strength of the weakest course computed from the thickness of the plate, the tensile strength of the plate, the efficiency of the longitudinal joint, the inside diameter of the course and the factor of safety set by these rules.

TS_{tE} = maximum allowable working pressure, expressed in psi
RFS
 Where:

TS = ultimate tensile strength of shell plate, psi. (When the tensile strength of carbon steel plate is not known, it may be taken as fifty-five thousand (55,000) psi for temperatures not exceeding six hundred fifty degrees Fahrenheit (650°F). For other materials use the lowest stress values for that material from section VIII.)

t = minimum thickness of shell plate of weakest course, inches
E = efficiency of longitudinal joint depending upon construction
 Use the following values:
 For riveted joints—calculated riveted efficiency
 For fusion-welded and brazed joints—

	Percent
Single lap weld	40
Double lap weld	50
Single butt weld	60
Double butt weld	70
Forge weld	70
Brazed steel	80

R = inside radius of weakest course of shell, (inches) provided the thickness does not exceed ten percent (10%) of the radius. If the thickness is over ten percent (10%) of the radius, the outer radius shall be used

FS = Factor of Safety

(B) The minimum factor of safety shall in no case be less than four (4) for existing installations. The working pressure shall be decreased when deemed necessary by the inspector to insure the operation of the vessel within safe limits. The condition of the vessel and the particular service to which it is subject will be determining factors.

(C) The maximum allowable working pressure permitted for formed heads under pressure shall be determined by using the appropriate formulas from *ASME Code*, Section VIII, Division 1 and the tensile strength and factors of safety given in section (1) and subsections (2)(A)–(C).

(D) The maximum allowable working pressure for nonstandard pressure vessels subjected to external pressure shall be determined by the rules of Section VIII, Division 1 of the *ASME Code*.

(3) Nonstandard Pressure Vessels—Use of Other Formulas. Pressure vessels that were not *ASME Code* stamped but which were constructed of known materials and were designed and constructed in accordance with sound engineering standards, formulas and practices that provide safety equivalent to the intent of the *ASME Code* shall be calculated on the same basis as used in the original design or to the latest *ASME Code*, Section VIII, Division 1, whichever is most applicable. All applicable rules of Section VIII, Division 1 shall be implemented.

(4) Inspection of Inaccessible Parts. Where, in the opinion of the inspector, as the result of conditions disclosed at the time of inspection, it may be necessary to remove interior or exterior lining, covering or brickwork to expose certain parts of the vessel not normally visible, the owner or user shall remove the material to permit proper inspection and to determine remaining thickness.

(5) Overpressure Protection. Each pressure vessel shall be provided with safety, relief, indicating, and controlling devices as necessary to protect against overpressure. These devices shall be so constructed, located and installed with the stem in the vertical position so that they cannot readily be rendered inoperative. The relieving capacity of the pressure relief devices shall be adequate to prevent a rise in pressure in the vessel of more than ten percent (10%) or three (3) psi, whichever is greater, above the maximum allowable working pressure. When multiple pressure relieving devices are provided, they shall prevent the overpressure from rising more than sixteen percent (16%) or four (4) psi, whichever is greater, above the maximum allowable working pressure. The opening pressure of the lowest set pressure relieving device shall be no greater than the maximum allowable working pressure of the vessel. Where rupture discs are employed or an additional hazard is involved due to fire or other unexpected sources of external heat, the pressure relief devices shall meet the requirements of *ASME Code*, Section VIII, Division 1, paragraph UG-125 or Division 2, paragraph AR-130, whichever is applicable.

(6) Repairs and Renewals of Fittings and Appliances. Whenever repairs are made to fittings and appliances or it becomes necessary to replace them, the work must comply with the requirements for new installations.

AUTHORITY: section 650.215, RSMo 1994. Original rule filed May 12, 1986, effective Oct. 27, 1986. Amended: Filed Oct. 3, 1995, effective April 30, 1996.*

**Original authority: 650.215, RSMo 1984, amended 1990, 1993, 1995.*

11 CSR 40-2.060 General Requirements

PURPOSE: This rule applies to all boilers and pressure vessels.

Editor's Note: The following material is incorporated into this rule by reference:

1) **American Society of Mechanical Engineers Code (ASME Code)** (New York City: American Society of Mechanical Engineers, 1995).

In accordance with section 536.031(4), RSMo, the full text of material incorporated by reference will be made available to any interested person at the Office of the Secretary of State and the headquarters of the adopting state agency.

(1) Inspection of Boilers and Pressure Vessels. All boilers and pressure vessels not

exempted by the Act or by rules promulgated under the Act and which are subject to regular inspections shall be prepared for inspections as required in section (2). Standard boilers and pressure vessels, that are exempt from the Act, may be inspected, at the owner's discretion, provided they are in full compliance with the Act. If in full compliance, an inspection certificate, may be issued.

(2) Preparation for Inspection.

(A) The owner or user shall prepare each power and steam heating boiler or pressure vessel for inspection and shall prepare for and apply a hydrostatic or pressure test, whenever necessary, on the date arranged by the inspector which shall not be less than seven (7) days after the date of notification.

1. Power and steam heating boilers—The owner or user shall prepare a boiler for internal inspection in the following manner:

A. Water shall be drained from and the boiler washed thoroughly;

B. Manhole and handhole plates, washout plugs and inspection plugs in water column connections shall be removed as required by the inspector. The furnace and combustion chambers shall be cooled and thoroughly cleaned;

C. All grates of internally fired boilers shall be removed as required by the inspector;

D. Insulation or brickwork shall be removed as required by the inspector in order to determine the condition of the boiler, headers, furnace, supports or other parts;

E. The pressure gage shall be removed for testing, as required by the inspector;

F. Any leakage of steam or hot water into the boiler shall be prevented by disconnecting the pipe or valve at the most convenient point or any appropriate means approved by the inspector;

G. Before opening the manhole or handhole covers and entering any parts of the steam generating unit connected to a common header with other boilers, the nonreturn and steam stop valves must be closed, tagged and padlocked and drain valves or cocks between the two (2) valves opened. The feed valves must be closed, tagged and padlocked and drain valves or cocks located between the two (2) valves opened. After draining the boiler, the blowoff valves shall be closed, tagged and padlocked. Blowoff lines, where practicable, shall be disconnected between pressure parts and valves. All drains and vent lines shall be opened.

2. Heating boilers, other than steam heating boilers shall be prepared for inspec-

tion to the extent deemed necessary by the inspector and in accordance with the applicable procedures outlined in (2)(A)1.

3. Pressure Vessels—Pressure vessels shall be prepared for inspection to the extent deemed necessary by the inspector and the applicable procedures outlined in paragraph (2)(A)1.

(3) Boilers and Pressure Vessels Improperly Prepared for Inspection. If a boiler or pressure vessel has not been properly prepared for an internal inspection or if the owner or user fails to comply with the requirements for a pressure test as set forth in these rules, the inspector may decline to make the inspection or test and the inspection certificate shall be withheld until the owner or user complies with the requirements.

(4) Removal of Covering to Permit Inspection. If the boiler or pressure vessel is jacketed so that the longitudinal seams of shells, drums or domes cannot be seen, sufficient jacketing, setting wall or other form of casing or housing shall be removed to permit reasonable inspection of the seams and other areas necessary to determine the condition and safety of the boiler or pressure vessel, provided the information cannot be determined by other means.

(5) Riveted-Lap Seam Crack. The shell or drum of a boiler or pressure vessel, in which a riveted-lap seam crack is discovered along a longitudinal riveted joint, shall be immediately discontinued from use. Patching is prohibited. (By riveted-lap seam crack it is meant a crack found in riveted-lap seams, extending parallel to the longitudinal joint and located either between or adjacent to rivet holes.)

(6) Pressure Tests. A hydrostatic pressure test, when applied to boilers or pressure vessels, shall not exceed one and one-half (1 1/2) times the maximum allowable working pressure except as described in the *American Society of Mechanical Engineers (ASME) Code*, Section VIII, Divisions 1 and 2, for vessels designed to higher temperatures requiring a stress ratio to be used in calculating hydrostatic test pressure. The pressure shall be under proper control so that in no case shall the required test pressure be exceeded by more than two percent (2%). During hydrostatic test the safety valve shall be removed or each valve disc shall be held to its seat by means of a testing clamp and not by screwing down the compression screw upon the spring. A plug device designed for this purpose may be used. It is suggested that the minimum temperatures of the water used

to apply a hydrostatic test shall be not less than seventy degrees Fahrenheit (70°F), but the maximum temperature during inspection shall not exceed one hundred twenty degrees Fahrenheit (120°F). When a hydrostatic test is applied to determine tightness, the pressure shall be equal to the normal operating pressure but need not exceed the release pressure of the safety valve having the lowest release setting. When the contents of the vessel prohibit contamination by any other medium or when a hydrostatic test is not possible, other testing media may be used providing the precautionary requirements of the applicable section of the *ASME Code* are followed. In these cases there shall be agreement between the owner and the inspector.

(7) Automatic Low Water Fuel Cutoff and/or Water Feeding Device.

(A) Each automatically fired steam or vapor system boiler; and each hot water heater boiler with a BTU/hr burner input exceeding four hundred thousand (400,000) BTU/hr, shall be equipped with a manual reset, automatic low water fuel cutoff so located as to automatically cut off the fuel supply when the surface of the water falls to the lowest safe water line. If a water feeding device is installed, it shall be so constructed that the water inlet valve cannot feed water into the boiler through the float chamber and so located as to supply requisite feedwater. The lowest safe water line should be not lower than the lowest visible part of the water glass.

(B) The fuel or feedwater control device may be attached directly to a boiler or for low pressure boilers to the tapped openings provided for attaching a water glass directly to the boiler, provided that the connections from the boiler are nonferrous tees or Y's not less than one-half inch (1/2") pipe size between the boiler and the water glass, so that the water glass is attached directly and as close as possible to the boiler; the straightway tapping of the Y or tee to take the water glass fittings and the side outlet of the Y or tee to take the fuel cutoff or water feeding device. The ends of all nipples shall be reamed to full size diameter.

(8) Pressure Reducing Valves.

(A) Where pressure reducing valves are used, one (1) or more safety or safety relief valves shall be provided on the low pressure side of the reducing valve when the piping or equipment on the low pressure side does not meet the requirements for the full initial pressure. The safety or safety relief valves shall be located adjoining or as close as possible to the reducing valve. Proper protection shall be

provided to prevent injury or damage caused by the escaping fluid from the discharge of safety or safety relief valves if vented to the atmosphere. The combined discharge capacity of the safety or safety relief valves shall operate so that the pressure rating of the lower pressure piping or equipment shall not be exceeded in case the reducing valve fails in the open position.

(B) The use of hand-controlled bypasses around reducing valves is permissible. If a bypass is used around the reducing valve, the safety valve required on the low pressure side shall be of sufficient capacity to relieve all the fluid that can pass through the bypass without overpressuring the low pressure side.

(C) A pressure gage shall be installed on the low pressure side of a reducing valve.

(9) Boiler Blowoff Equipment.

(A) The blowdown from a boiler(s) that enters a sanitary sewer system or blowdown which is considered a hazard to life or property shall pass through some form of blowoff equipment that will reduce pressure and temperature as required in this rule.

(B) The temperature of the water leaving the blowoff equipment shall not exceed one hundred fifty degrees Fahrenheit (150°F).

(C) The pressure of the blowdown leaving any type of blowoff equipment shall not exceed five pounds per square inch (5 psi).

(D) All blowoff equipment shall be fitted with openings to facilitate cleaning inspection.

(E) Blowoff equipment shall conform to the provisions set forth in the recommended rules for *National Board Boiler Blowoff Equipment*.

(10) Location of Discharge Piping Outlets. The discharge of safety valves, blowoff pipes and other outlets shall be located and supported so as to prevent injury to personnel. The escape pipe will not impart a load on the relief valve. If an escape pipe is used, it shall be supported and be installed so that water will not stand in the piping or on the safety valve disc seating area.

(11) Supports. Each boiler and pressure vessel shall be supported of sufficient strength and rigidity to safely support the boiler or pressure vessel and its contents. There shall be no excessive vibration in either the boiler, pressure vessel or its connecting piping.

(12) Boiler Door Latches.

(A) A watertube boiler shall have the firing doors of the inward opening type, unless doors are provided with substantial and effective latching or fastening devices or otherwise so constructed as to prevent them, when

closed, from being blown open by pressure on the furnace side.

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

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

(D) Explosion doors, if used and if located in the setting walls within seven feet (7') of the firing floor or operating platform, shall be provided with substantial deflectors to divert the blast.

(13) Clearance. When boilers and pressure vessels are replaced or new boilers or pressure vessels are installed in either existing or new buildings, a minimum height of at least three feet (3') shall be provided between the top of the boiler proper and the ceiling and at least three feet (3') between all sides of the boiler and adjacent walls or other structures. Boilers and pressure vessels having manholes shall have five feet (5') clearance from the manhole opening and any wall, ceiling or piping that will prevent a person from entering the boiler or vessel. All boilers and pressure vessels shall be so located that adequate space is provided for proper operation of the boilers and pressure vessels and their appurtenances, for the inspection of all surfaces, tubes, waterwalls, economizers, piping, valves and other equipment and for necessary maintenance and repair and replacement of tubes.

(14) Ladders and Runways. When necessary for safety, there shall be a steel runway or platform of standard construction installed across the tops of adjacent boilers or pressure vessels or at some other convenient level for the purpose of affording safe access. All walkways shall have at least two (2) means of exit each to be remotely located from the other.

(15) Exit From Boiler Room. All boiler rooms exceeding five hundred (500) square feet floor area and containing one (1) or more boilers having a fuel burning capacity of one (1) million British thermal units per hour (BTU/hr), or equivalent electrical heat input, shall have at least two (2) means of exit. Each exit shall be remotely located from the other. Each operational elevation in the boiler room shall have two (2) means of exit, each remotely located from the other.

(16) Suggestions for Operations. It is suggested that the "Recommended Rules for

Care of Power Boilers," Section VII and the "Recommended Rules for Care and Operation of Heating Boilers," Section VI of the *ASME Code* be used as a guide for proper and safe operating practices.

(17) Air Ventilation Requirements—Combustion Air Supply and Ventilation of Boiler Room. A permanent source of outside air shall be provided for each boiler room to permit satisfactory combustion of the fuel as well as proper ventilation of the boiler room under normal operating conditions.

(A) The total requirements of the burners for all fired pressure vessels in the boiler room must be used to determine the louver sizes whether fired by coal, oil or gas, however, the minimum net free louvered area must not be less than one (1) square foot. The following table or formula shall be used to determine the net louvered area in square feet:

Input (BTU/Hour)	Minimum Net Required Air (Cu/Ft/Min)	Louvered Area (Sq. Ft.)
500,000	125	1.0
1,000,000	250	1.0
2,000,000	500	1.6
3,000,000	750	2.5
4,000,000	1000	3.3
5,000,000	1250	4.1
6,000,000	1500	5.0
7,000,000	1750	5.8
8,000,000	2000	6.6
9,000,000	2250	7.5
10,000,000	2500	8.3

$(BTUH \div 10,000) \times 2.5 = CFM$ required
CFM required divided by 300 CFM per square foot equals the net area required.

(B) When mechanical ventilation is used in lieu of subsection (17)(A), the supply of combustion and ventilation air to the boiler room and the firing device shall be interlocked with the fan so the firing device will not operate with the fan off. The velocity of the air through the ventilating fan shall not exceed five hundred feet (500') per minute and the total air delivered shall be equal to or greater than shown in subsection (17)(A).

(18) Gas Burners. For installations which are gas fired, the burners used shall conform to the applicable requirements of the American Gas Association or other nationally recognized standards.

(19) Conditions Not Covered by These Regulations. For any conditions not covered

by these requirements, the applicable provisions of the *ASME Code*, the *National Board Inspection Code* and *API-510* shall apply.

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