

260-RICR-30-10-2

TITLE 260 – DEPARTMENT OF LABOR AND TRAINING

CHAPTER 30 – WORKFORCE REGULATION AND SAFETY

SUBCHAPTER 10 – OCCUPATIONAL SAFETY

PART 2 – Boiler and Pressure Vessel Inspection

2.1 Authority

This regulation is promulgated pursuant to the authority granted in R.I. Gen. Laws §§ 28-25-5 and 28-25-9.

2.2 Purpose

To provide the public with information pertaining to the inspection of boilers and pressure vessels.

2.3 Incorporated Materials

These regulations hereby adopt and incorporate code of rules published by the American Society of Mechanical Engineers and the National Board of Boiler and Pressure Vessel Inspectors (2017) by reference, not including any further editions or amendments thereof and only to the extent that the provisions therein are not inconsistent with these regulations.

2.4 Definitions

- A. “Act” means the Boiler and Pressure Vessel Safety Act which was enacted as R.I. Gen. Laws Chapter 28-25.
- B. “Administrator” means the Administrator of the Division of Occupational Safety is appointed by the Director of Labor and is responsible for implementation and enforcement of all provisions under R.I. Gen. Laws Chapter 28-20.
- C. “Alteration” means a change in any item described on the original Manufacturer's Data Report which affects the pressure capability of the boiler or pressure vessel. Non-physical 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.

- D. "API-ASME code" means the American Petroleum Institute (API) in conjunction with the ASME Code as used in these rules and regulations shall mean the Code for unfired pressure vessels for petroleum liquids and gases.
- E. "Approved" means approved by the Code Commission for Occupational Safety and Health.
- F. "ASME" means the American Society of Mechanical Engineers (ASME), 345 E. 47th Street, New York, New York 10017.
- G. "Authorized inspection agency" means any of the following:
1. a department or division established by a jurisdiction which has adopted and does administer one or more sections of the ASME Code, one of which shall be Section I as a legal requirement, and whose inspectors hold valid commissions issued by The National Board of Boiler and Pressure Vessel Inspectors;
 2. an insurance company which has been licensed or registered by the appropriate authority of a State of the United States or a Province of Canada to write and does write boiler and pressure vessel insurance and to provide inspection service of boilers and pressure vessels in such State or Province.
- H. "Boiler" means a closed vessel in which water or other liquid is heated, steam or vapor is generated, steam or vapor is superheated, or any combination thereof, under pressure or vacuum, for use external to itself, by the direct application of energy from combustion of fuels, electricity or solar energy. 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. The term boiler also shall include the apparatus used by which heat is generated and all controls and safety devices associated with such apparatus or the closed vessels.
- I. "Power boiler" means a boiler in which steam or other vapor is generated at a pressure of more than 15 psi.
- J. "High pressure boiler" or "High-temperature boiler" means a boiler in which water, oil, or other fluid is heated and intended for operation at pressures in excess of 160 psi and/or temperatures in excess of 250 degrees Fahrenheit.
- K. "Heating boiler" means a steam or vapor boiler operating at a pressure not exceeding 15 psi steam pressure or a hot water boiler in which water or other fluid is heated and intended for operation at pressures not exceeding 160 psi or temperatures not exceeding 250 degrees Fahrenheit.
- L. "Electric boiler" means a power boiler or heating boiler in which the source of heat is electricity.

- M. "Miniature boiler" means a power boiler or high-temperature water boiler which does not exceed the following limits:
1. 16" inside diameter of shell;
 2. 20 sq. ft. heating surface (not applicable to electric boilers);
 3. 5 cu. ft. gross volume exclusive of casing and insulation.
 4. 100 psi maximum allowable working pressure.
- N. "Unfired power boiler" means an unfired steam or other vapor generating system using heat from the operation of a processing system or other indirect heat source.
- O. "Hot water supply boiler" means a boiler completely filled with water used for storage and/or supply of hot water to be used externally to itself at pressures not exceeding 160 psi or at temperatures not exceeding 250 degrees Fahrenheit at or near the boiler outlet.
- P. "Portable boiler" means 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.
- Q. "Certificate of competency" means a certificate issued to a person who has passed the examination prescribed by the Administrator - See R.I. Gen. Laws § 28-25-4.
- R. "Certificate of inspection" means a certificate issued by the Administrator for the operation of a boiler, pressure vessel or nuclear system as required by the Act.
- S. "Certificate inspection" means an inspection, the report of which is used by the Administrator 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.
- T. "Internal inspection" means as complete an examination as can reasonably be made of the internal and external surfaces of a boiler or pressure vessel while it is shut down and manhole plates, handhole plates or other inspection opening closures are removed as required by the inspector.
- U. "External inspection" means an inspection made when a boiler or pressure vessel is in operation, if possible.
- V. "Chief inspector" means the Chief Boiler and Pressure Vessel Inspector in the Division of Occupational Safety is appointed by the Director of Labor and is charged to administer and implement the provisions of this Chapter. The Chief

Inspector is responsible to the Administrator of Occupational Safety as outlined in R.I. Gen. Laws § 28-25-3.

- W. "Commission-National Board" means 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 National Board Bylaws and whose employer submits the inspector's application to the National Board for such commission.
- X. "Code commission" means the State of Rhode Island Code Commission on Occupational Safety and Health.
- Y. "Condemned boiler" and "Condemned pressure vessel" means 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 Authorized Inspector.
- Z. "Director" means the Director of Labor or his duly authorized representative.
- AA. "Division" means the Division of Occupational Safety within the State Department of Labor.
- BB. "Existing installation" means any boiler or pressure vessel constructed, installed, placed in operation, or contracted for before July 1, 1985.
- CC. "Inspector" means the Chief Inspector, or any Authorized Inspector, or Owner-User Inspector.
 - 1. "Chief inspector" means the Chief Boiler and Pressure Vessel Inspector appointed under the Act.
 - 2. "Authorized inspector" means an Inspector employed by the State of Rhode Island or an Authorized Insurance Company holding a Rhode Island Certificate of Competency, and who is regularly employed by the State or an Insurance Company authorized to insure against loss from explosion of boilers or pressure vessels in this State.
 - 3. "Owner-user inspector" means an Inspector who holds a valid National Board Owner-User Commission who has passed the examination prescribed by the Administrator and who is continuously employed as an inspector by an owner-user inspection agency.
- DD. "Jurisdiction" means a State, commonwealth, county or municipality of the United States or a Province of Canada which has adopted one or more sections of the ASME Code, one of which is Section I, and maintains a duly constituted department, bureau or division for the purpose of enforcement of such Code.

- EE. "Lined potable water heater" means a water heater with a corrosion resistant lining used to supply potable hot water.
- FF. "National Board" means 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.
- GG. "National Board inspection code" means the manual for boiler and pressure vessel inspectors published by the National Board from which copies may be obtained.
- HH. "New boiler" or "New pressure vessel installation" means all boilers and pressure vessels constructed, installed, placed in operation or contracted for after July, 1986.
- II. "Nonstandard boiler or pressure vessel" means 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 Department.
- JJ. "Owner" or "User" means any person, firm or corporation legally responsible for the safe installation, operation and maintenance of any boiler or pressure vessel within the jurisdiction.
- KK. "Owner-user inspection agency" means 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 Division.
- LL. "Pressure vessel" means a vessel in which the pressure is obtained from an external source, or by the application of heat from an indirect source, or from a direct source other than those boilers defined in § 2.4(H) of this Part.
- MM. "PSI" means pounds per square inch gauge.
- NN. "Reinstalled boiler" or "Reinstalled pressure vessel" means a boiler or pressure vessel removed from its original setting and reinstalled at the same location or at a new location without change or ownership.
- OO. "Relief valve" means a pressure relief valve actuated by inlet static pressure having a gradual lift generally proportional to the increase in pressure over opening pressure. It may be provided with an enclosed spring housing suitable for closed discharge system application and is primarily used for liquid service.
- PP. "Repair" means the work necessary to restore a boiler or pressure vessel to a safe and satisfactory condition, provided there is no deviation from the original design.

- QQ. "Repair of pressure relief valve" means the replacement, re-machining or cleaning of any critical part, lapping of seat and disk or any other operation which may affect the flow passage, capacity function or pressure retaining ability of the valve. Disassembly, reassembly and/or adjustments which affect the pressure relief valve function are also considered a repair.
- RR. "Safety relief valve" means a pressure relief valve characterized by rapid opening or pop action, or by opening in proportion to the increase in pressure over opening pressure, depending on application.
- SS. "Safety valve" means a pressure relief valve actuated by inlet static pressure and characterized by rapid opening or pop action.
- TT. "Second-hand boiler" or "Second-hand pressure vessel" means a boiler or pressure vessel which has changed both location and ownership since primary use.
- UU. "Standard boiler" or "Standard pressure vessel" means a boiler or pressure vessel which bears the stamp of this State, the ASME stamp, the API-ASME stamp, both the ASME and National Board stamp, or the stamp of another jurisdiction which has adopted a standard of construction equivalent to that required by the Board.
- VV. "Water heater" means a closed vessel used exclusively to supply potable water which is heated by the combustion of fuels, electricity or any other source and withdrawn for use external to the system at pressures not exceeding 160 psi and shall include all controls and devices necessary to prevent water temperatures from exceeding 210 degrees Fahrenheit as well as storage vessel connected to the water.

2.5 Administration

2.5.1 Minimum Construction Standards for Boilers and Pressure Vessels:

- A. All boilers, pressure vessels, water heaters and storage tanks, unless otherwise exempt, shall be registered with the Department of Labor and Training ~~on an annual basis~~. 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 2017 ASME Code and the latest addenda including code cases in effect, and these rules and regulations. Boilers and pressure vessels for which an ASME Manufacturers' Data Report is required shall bear the manufacturer's "NB" number as registered with the National Board. A copy of the Manufacturers' Data Report, signed by the manufacturer's representative and the National Board commissioned inspector shall be filed with the Chief Inspector through the National Board.

- B. State Special - If, due to a valid impediment to full ASME Code compliance, a boiler or pressure vessel cannot bear the ASME and National Board stamping, details in the English language and United States customary units of the proposed construction material specifications and calculations approved by a Registered Professional Engineer experienced in boiler and pressure vessel design shall be submitted to the Administrator by the owner or user for approval as "State Special" which must be obtained from the Administrator before construction is started.
- 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 his approval obtained.
- D. The following shall be exempt from the 2017 ASME Code construction requirements of § 2.5.1(A) of this Part.
 - 1. Water heaters and water storage tanks where none of the following limitations are exceeded:
 - a. Heat input of 200,000 BTU/Hr;
 - b. Water temperature of 210 degrees Fahrenheit;
 - c. Nominal water capacity of 120 gallons; except that they shall be provided with one or more safety relief valves meeting the requirements of § 2.7.6 of this Part.
 - 2. Continuous coil type hot water boilers used only for "steam vapor" cleaning of such things as machinery, equipment and building when none of the following limitations are exceeded:
 - a. 3/4" diameter tubing or pipe size with no drums or headers attached;
 - b. Nominal water containing capacity does not exceed six (6) gallons;
 - c. Water temperature does not exceed 350 degrees Fahrenheit.
 - d. Steam is not generated within the coil, except that they shall be provided with one or more safety relief valves meeting the requirements of § 2.6.6 of this Part.
 - 3. In any circumstances other than the above, the owner or user shall contact the Chief Inspector.

2.5.2 Frequency of Inspections of Boilers and Pressure Vessels

- A. Power boilers and high-pressure, high temperature water boilers shall receive an inspection annually which shall be an internal inspection where construction permits; otherwise, it shall be as complete an inspection as possible. Such boilers shall also be inspected externally annually while under normal operating conditions.
- B. Low pressure boilers, hot water heaters, and hot water storage tanks shall receive an inspection biennially.
 - 1. Steam or vapor boilers shall have an external inspection and an internal inspection biennially where construction permits.
 - 2. Hot water heating and hot water supply boilers shall have an external inspection biennially 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 biennially and shall include the function of all controls and devices.
- C. Except as provided for in §§ 2.5.2(D) and (E) of this Part, unfired pressure vessels shall receive an inspection triennially. This inspection shall be internal where construction permits. Pressure vessels not subject to internal corrosion shall be inspected externally.
- D. 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 Chief Inspector with that Agency.
- E. Based upon documentation of safe service conditions by the owner or user of the operating equipment and after an external inspection by the Chief Inspector, said Chief Inspector may, in his discretion, permit variations in the inspection frequency requirements as provided in these Rules and Regulations.

2.5.3 Notification of Inspection

- A. Certificate inspection, as required in § 2.5.2 of this Part, shall be carried out prior to the expiration date of the certificate at a time mutually agreeable to the inspector and owner or user.
- B. External inspections may be performed by the inspector during reasonable hours and without prior notification in accordance with R.I. Gen. Laws § 28-25-7.
- C. 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 such instances the owner or user shall prepare the boiler or

pressure vessel for such inspections or tests as the inspector designates in accordance with R.I. Gen. Laws § 28-25-7.

2.5.4 Examination for an Inspector's Certificate of Competency

- A. Examination for an inspector's certificate of competency may be held at the office of the Division or at any other location to be selected by the Administrator. An applicant for an examination shall have education and experience equal to at least one of the following:
1. a degree in mechanical engineering plus one 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 years of experience in design, construction, operation inspection of high pressure boilers and pressure vessels;
 3. the equivalent of a high school education plus three years of experience:
 - a. in high pressure boiler and pressure vessel construction or repair;
or
 - 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 Administrator stating the education of the applicant, a list of his employers, his 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 45 days prior to the date of examination.
- C. If the applicant's education and experience are acceptable to the Administrator, he shall be given a written examination dealing with the design, 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 Division, a certificate of competency will be issued by the Administrator, when the applicant is employed by an authorized inspection agency. Upon the expiration of 90 days, an applicant who failed to pass the examination will be permitted to take another written examination and his acceptance or rejection will be determined by the Administrator on the basis of this examination.

2.5.5 Examination Fees

A fee of sixty dollars (\$60.00) will be charged for each applicant taking the examination for a certificate of competency.

2.5.6 Certificate of Competency and Identification Card

- A. Upon request of his employer, a certificate of competency and an identification card may be issued by the Administrator to:
1. a boiler and pressure vessel inspector employed by the State of Rhode Island.
 2. an inspector who is employed by an insurance company which is authorized to insure and does insure against loss from explosions of boilers and pressure vessels in the State of Rhode Island.
 3. an inspector employed as described in either §§ 2.5.6(A)(1) or (2) of this Part who conducts shop or field inspections of new boilers or pressure vessels in accordance with the 2017 ASME Code requirements.
 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 in § 2.5.11 of this Part, provided that the applicant has satisfactorily passed the examination as set forth in § 2.5.11 of this Part or provided that (s)he 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. The request for the certificate of competency and identification card shall be completed on forms to be provided by the Administrator and shall be accompanied by, when applicable, a facsimile of the applicant's commission and commission card, certificate of competency and identification card as named above, and a fee of sixty dollars (\$60.00).
 5. The certificate of competency and valid identification card shall be returned to the Administrator when the inspector to whom they were issued is no longer employed by the organization employing him at the time that the certificate was issued.
 6. Each person holding a valid certification of competency and who conducts inspections as provided by the Act shall apply to the Administrator on forms provided and obtain a renewal identification card annually, not later than March 31 of each year. A fee of \$30.00 for each card shall accompany each application.
 7. An inspector's certificate of competency may be suspended by the Administrator after due investigation and recommendation by the Chief Inspector for adequate and just cause. Written notice of any such suspension shall be given by the Administrator, within not more than 10

days, to the inspector and his employer. Persons whose certificates of competency have been suspended shall be entitled to an appeal to the Administrator as provided for in the Act and to be present in person and represented by counsel at the hearing of the appeal.

2.5.7 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.

2.5.8 Inspection Reports to be Submitted by Inspectors

- A. Inspectors employed by an Insurance Company shall, within one year of the effective date of these rules and regulations for boilers and three years for pressure vessels, submit to the Chief Inspector an inspection report on Form NB-5 of NATIONAL BOARD INSPECTION CODE for each boiler and pressure vessel subject to inspection in this State. Complete data shall be submitted on Form NB-5 for each non-standard boiler or pressure vessel.
- B. Subsequent inspections by authorized insurance inspectors, of both standard and non-standard boilers and pressure vessels shall be reported on Form NB-6 and NB-7 of the NATIONAL BOARD INSPECTION CODE.
- C. Inspection reports are required in §§ 2.5.8(A) and (B) of this Part above shall be submitted within 21 days from date of the completion of the inspection.
- D. Owner-user inspection agencies shall report in accordance with §§ 2.5.8(B) and (C) of this Part or upon forms acceptable to the Chief Inspector or Administrator, which shall be filed as provided in § 2.5.11 of this Part.

2.5.9 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 30 days, of all boilers or pressure vessels on which insurance is written, cancelled, not renewed or suspended because of unsafe conditions.

2.5.10 Authorized Inspectors to Notify Chief Inspector of Unsafe Boilers or Pressure Vessels

If an authorized inspector, upon first inspection of a new risk, finds that a boiler or pressure vessel or any appurtenance thereof, is in such condition that his company would refuse insurance or that it does not comply with jurisdictional rules, the company shall immediately notify the Chief Inspector and submit a report on the defects. If, upon inspection, an authorized inspector finds a boiler or pressure vessel to be unsafe for further operation, he 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 and regulations. Unless the

owner or user makes such repairs or adopts such other corrective measures promptly, the authorized inspector shall immediately notify the Chief Inspector. Until such 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 re-inspection establishes that the necessary repairs have been made or corrective actions have been taken and that the boiler or pressure vessel is safe to operate, the Chief Inspector shall be notified by report. At that time an inspection certificate, where applicable, will be issued.

2.5.11 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 Administrator on prescribed forms and request approval by the Division. Each such application shall be accompanied by a fee of sixty dollars (60.00) bond in the penal sum of twenty-five thousand dollars (\$25,000) which shall continue to be valid during the time the approval and registration of the company as an owner-user inspection agency is in effect.
- B. Application and registration shall show the name of such agency and its principal address in this State, and the name and address of the person or persons having supervision over inspections made by said agency. Changes in supervisory personnel shall be reported to the Administrator with 30 days after any such change.
- C. Each owner-user inspection agency as required by the provisions of the Act and these rules and regulations shall:
 - 1. conduct inspections of pressure vessels, not exempt by the Act, utilizing only qualified inspection personnel, as provided in § 2.5.6 of this Part.
 - 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 such inspections;
 - 4. promptly notify 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 such 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 such inspection record is compiled.

6. Regarding frequency and type of inspection, see § 2.5.2 of this Part. Such inspection record shall be readily available for examination by the Chief Inspector or his authorized representative during business hours.

2.5.12 Defective Conditions Disclosed at Time of External Inspection

If, upon an 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, he may order the operation of the boiler or pressure vessel stopped until such time as the covering can be removed and proper examination made.

2.5.13 Owner or User to Notify Chief Inspector of Accident

When an accident occurs to a boiler, pressure vessel, power piping or process piping, the owner or user shall promptly 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, pressure vessel, power piping or process piping, nor any parts thereof, shall be removed or disturbed before permission has been granted by the Chief Inspector, except for the purpose of saving human life and limiting consequential damage.

2.5.14 Inspection Certificate and Inspection Fees

- A. Certificate Inspection by Authorized Insurance Inspectors or State Inspectors
 1. If, after inspection by an authorized insurance inspector or state inspector, a boiler or pressure vessel is found to be safe and in conformance with these rules and regulations, the owner or user shall pay directly to the jurisdiction a biennial certificate fee of sixty (\$60.00) dollars for each boiler which shall include hot water heaters. A triennial certificate fee of forty-five (\$45.00) shall be assessed for each unfired pressure vessel inspected under the provisions of R.I. Gen. Laws Chapter 28-25.
- B. Certificate Inspection by Authorized Owner/User Inspection Agency
 1. If a boiler or pressure vessel after inspection, by an authorized owner/user inspection agency is found to be suitable and to conform to these rules and regulations, the owner or user shall pay directly to the jurisdiction a fee of sixty dollars (\$60.00) for each boiler or pressure vessel required to be inspected under the Act upon which an inspection certificate shall be issued in accordance with R.I. Gen. Laws §§ 28-25-10 and 28-25-11. Checks and money orders for payment of inspection certificate fees

should be made payable to the Department of Labor, Division of Occupational Safety, Boiler Unit.

C. Certificate Inspection by State Inspector

1. The owner or user of a boiler or pressure vessel required by this Act to be inspected by the Chief Inspector, or by an authorized State inspector, shall pay directly to the Division of Occupational Safety, upon completion of inspection, fees in accordance with the following schedule:
2. Power boilers and high pressure, high temperature water boilers: \$96.00
 - a. External Inspections Fees: \$60.00
3. Heating Boilers
 - a. Certificate and Inspection Fees: \$60.00 ~~Biannually~~Biennially
 - (1) A fee shall be assessed for inspections of boilers and storage tanks at the same location not to exceed \$240.00 ~~biannually~~ biennially per location.
4. For boilers where the only source of heat is electrical energy, the fee shall be \$60.00 ~~biannually~~ biennially.
5. Pressure Vessels
 - a. Certificate and Inspection Fees
 - (1) Each pressure vessel shall be subject to inspection every three (3) years and shall be charged at a rate of \$45.00.
 - (2) A group of pressure vessels, such as the rolls of a paper machine or dryer operating as a single machine or unit, shall be considered as one pressure vessel.
 - (3) Not more than one fee shall be charged or collected for any and all inspections as above of any pressure vessels in any required inspection period except as provided below.
6. Hydrostatic tests
 - a. When it is necessary to make a special trip to witness the application of a hydrostatic test, an additional fee based on the scale of fees outlined in § 2.5.14(C)(7) of this Part below shall be charged.
7. All other inspections, including reviews and surveys, shop inspections, special inspections, and inspections of second-hand or used boilers, or

pressure vessels made by the Chief Inspector or authorized inspector employed by the State of Rhode Island shall be charged at the rate of not less than \$190.00 for 1/4 day (2 Hrs.), \$275.00 1/2 day (4 Hrs.), or \$500.00 for one full day, including travel time, plus all expenses, including traveling, meals and lodging, where applicable. Minimum charge shall be 1/4 day (\$190.00).

- D. Disposition of fees - The Administrator shall account for and transfer all fees so received to the Treasurer of the State.
- E. If the owner or user of a boiler or pressure vessel or system, which is required to be inspected refuses to allow an inspection to be made or refuses to pay the fee stipulated above, the inspection certificate shall be suspended by the Chief Inspector until the owner or user complies with the requirements.
- F. The owner or user who causes a boiler or pressure vessel or system to be operated without a valid certificate shall be subject to the penalty as provided for in the Act.
- G. Fees for Services
 - 1. Hydrostatic tests by state inspections \$100.00
 - 2. Repair and alteration permit \$100.00
 - 3. Return visits for violations/charged to contractors \$100.00
 - 4. Return check fee \$25.00
 - 5. Overdue invoices \$25.00
 - 6. Certificate replacement fee \$10.00
 - 7. Portable boiler permits \$300.00

2.5.15 Validity of Inspection Certificate

An inspection certificate, issued in accordance with § 2.5.14 of this Part 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 an authorized inspector employed by an insurance company 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.

2.5.16 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 re-stamped. Request for permission to re-stamp 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 such authorization. Re-stamping authorized by the Chief Inspector shall be done only in the presence of an authorized inspector, and shall be identical with the original stamping except for the ASME Code Symbol Stamp. Notice of completion of such stamping 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.

2.5.17 Penalty for Operation of Unsafe Boilers or Pressure Vessels

- A. If, upon inspection, a boiler or pressure vessel is found to be in such 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 such objects to continue to be operated shall be subject to the penalty provided in the Act.

2.5.18 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:
- 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.

2.5.19 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 for repair, alteration, or modification, 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 non-standard boiler or pressure vessel is removed from this State, it shall not be reinstalled within this State.

2.5.20 Installation, Operation, Sale or Offering for Sale of Non-Standard Boilers or Pressure Vessels

The installation, operation, sale or the offering for sale of non-standard boilers or pressure vessels in this jurisdiction is prohibited without permission from the Chief Inspector.

2.5.21 Installation of Used or Second-Hand Boilers or Pressure Vessels

Before a used or second-hand boiler or pressure vessel can be shipped for installation in this State, an inspection must be made by an inspector qualified by this jurisdiction or by an inspector holding a valid National Board Commission, and data submitted by him shall be filed by the owner or user of the boiler or pressure vessel with the Chief Inspector for his approval. Such boilers and pressure vessels when installed in the jurisdiction shall be equipped with fittings and appurtenances that comply with the rules and regulations for new construction.

2.5.22 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 rules and regulations for new installations.

2.5.23 Working Pressure for Existing Installations

Any authorized 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 Administrator who may request a joint inspection by the Chief Inspector and the authorized inspector. The Chief Inspector shall render his report to the Administrator and the Administrator shall render the final decision, based upon the data contained in the inspector's reports.

2.5.24 Repairs and Alterations to Boilers & Pressure Vessels

- A. Repairs and alterations to boilers and pressure vessels shall be made in accordance with the rules of the National Board Inspection Codes latest edition. Repairs shall be made by a repair organization having one of the following types of authorization:
 - 1. an organization in possession of a valid Certificate of Authorization for use of the "R" Symbol Stamp, issued by the National Board.
 - 2. an organization in possession of a valid ASME Certificate of Authorization provided such repairs are within the scope of the organization's Quality Control System.
 - 3. an organization working within the State provided authorization for the organization to perform such repairs has been issued by the Chief Inspector.
- B. Alterations to a boiler or pressure vessel shall be made by an organization in possession of a valid ASME Certificate of Authorization.

2.5.25 Repairs to Pressure Relief Valves

- A. Repairs to pressure relief valves shall be made only by an organization which holds a valid Certification of Authorization for use of the National Board Pressure Relief Valve Repair "VR" Symbol Stamp. The initial installation testing and adjustments of a new pressure relief valve on a boiler or pressure vessel are not considered a repair, if made by the manufacturer or assembler of the valve.
- B. The Chief Inspector may authorize properly trained and qualified employees of boiler and pressure vessel users or their designees to make adjustments to set pressure and/or blow-down to pressure relief valves owned by them, provided the adjusted settings and/or capacities and the date of the adjustment are recorded on a metal tag secured to the seal wire. All external adjustments shall be resealed showing the identification of the organization making the adjustments. A record of all external adjustments shall be maintained and made available to the inspector.
- C. No person shall attempt to remove or do any work on any safety appliance prescribed by these rules and regulations while the appliance is subject to pressure.
- D. 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.
- E. 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.

2.5.26 Riveted Patches

In applying riveted patches, the design of the patch and method of installation shall be in accordance with the National Board Inspection Code, 1973 Edition. Approval for such repairs must be obtained from the chief inspector prior to making such repairs.

2.5.27 Requirements for New Installations

- A. In accordance with R.I. Gen. Laws § 28-25-10, any person erecting or installing a new or second-hand boiler or pressure vessel shall first make application for a permit to install to the Division of Occupational Safety, Boiler Unit. A permit fee of one hundred twenty dollars (\$120.00) will be required for all heating boilers (low pressure) and a fee of three hundred dollars (\$300.00) for all power boilers (high pressure). The installer of such installations must record his/her Pipefitter Master I license number on the permit application.
- B. All new and second-hand item installations shall comply with the general requirements of these regulations. In addition, applicable sections of these

regulations that pertain to the specific requirements for items falling into categories outlined in § 2.5.3 of this Part, shall be followed.

1. No boiler or pressure vessel shall hereafter be installed in this State unless it has been constructed in accordance with ASME Code, incorporated above, registered with the National Board and installed in conformity with these rules and regulations except:
 - a. those exempt by the Act;
 - b. those outlined in § 2.5.1(B) of this Part
2. 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.

2.5.28 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 identified by the inspector with a serial number of the State, consisting of letters and figures to be not less than 5/16 inch in height and arranged as follows:
- B. All cast iron, low-pressure heating boilers shall have securely attached to the front of the boiler a corrosion resistant metal tag or suitable tag allowed by construction code which shall have the serial number of the State stamped thereon. All pressure vessels constructed of cast iron, or of material of such thickness that it should not be stamped, shall have securely attached a corrosion resistant metal tag and or suitable tag allowed by the construction code, which shall have the serial number of the State stamped thereon.

2.5.29 Variations

- A. Any person who believes the rules and regulations promulgated under R.I. Gen. Laws Chapter 28-25 impose an undue burden upon the owner or user, may request a variation from such rule or regulation. The request for variation shall be made to the Administrator of Occupational Safety in writing and shall specify how equivalent safety is to be maintained. The Administrator, after investigation and such hearing as it may direct, may grant such variation from the terms of any rule or regulation provided such special conditions as may be specified are maintained in order to provide equivalent safety.
- B. Any person denied a variance under § 2.5.30 of this Part may grieve such determination by submitting such appeal in writing to the Occupational Safety and Health Review Board. Said board, created by R.I. Gen. Laws Chapter 28-20,

shall hear evidence concerning such action and determine whether said variation does, in fact, provide for equivalent safety.

- C. When there is a reason to believe, or upon receipt of a complaint that a variation does not provide freedom from danger equivalent to the published rule or regulation, the Administrator or Chief Inspector by direction after notice to the owner or user and complainant, and after 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 Administrator or of the Chief Inspector, or authorized inspectors other than a written order authorizing a variation as permitted above, 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 or regulation.

2.5.30 Penalties

Any person, firm or corporation violating any of the provisions of these rules and regulations shall be charged with a violation and may be subject to a fine not to exceed \$500.00 per day for each such violation. The Department of Labor shall impose said fine on the installer of new construction or the owner/user of existing boilers or pressure vessels as provided for in R.I. Gen. Laws § 28-25-16. Each day of such operation in violation of the provisions shall be considered a separate offense.

2.6 Existing Installation: Power Boilers

2.6.1 EBO-1 Age Limit of Existing Boilers

- A. The age limit of any boiler of nonstandard construction, installed prior to the date the Act became effective, shall be 30 years except that, a boiler having other than lap-riveted longitudinal joint, after a thorough internal and external inspection, and when required by the inspector, a hydrostatic pressure test of 1-1/2 times the allowable working pressure held for a period of at least 30 minutes during which no distress or leakage develops, may be continued in operation at the working pressure determined by § 2.6.3 of this Part.. The age limit of any nonstandard boiler having lap-riveted longitudinal joints and operating at a pressure in excess of 50 psi shall be 20 years. This type of boiler, when removed from an existing setting, shall not be reinstalled for a pressure in excess of 15 psi. A reasonable time for replacement, not to exceed one year, may be given at the discretion of the Chief Inspector.
- B. The age limit of boilers of standard construction installed prior to the date this law became effective shall be dependent on thorough internal and external inspection and where required by the inspector, a hydrostatic pressure test not exceeding 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 § 2.6.2 of this Part.

- 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.

2.6.2 EBO-2 Maximum Allowable Working Pressure for Standard Boiler

The maximum allowable working pressure for standard boilers shall be determined in accordance with the applicable provisions of the edition of the ASME Code under which they were constructed and stamped.

2.6.3 EBO-3 Maximum Allowable Working Pressure for Nonstandard Boilers

- A. The maximum allowable working pressure for boilers fabricated by riveting shall be determined by the applicable rules of the 1971 Edition of Section I of the ASME Code.
- B. The lowest factor of safety permissible on existing installations shall be 5.0, except for horizontal-return- tubular boilers having continuous longitudinal lap seams more than 12 ft. in length, the factor of safety shall be 8. When this latter type of boilers is removed from its existing setting, it shall not be reinstalled for pressures in excess of 15 psi.
- C. The maximum allowable working pressure for boilers of welded construction in service may not exceed that allowable in Section I of the 2017 ASME Code, incorporated above, for new boilers of the same construction.
- D. The maximum allowable working pressure on the shell of a boiler or drum 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 allowed by these rules in accordance with the following formula:

1. $TStE$ = maximum allowable working pressure, psi RFS where:

- a. TS = specified minimum tensile strength of shell plate material. When the tensile strength of steel or wrought-iron shell plate is not known, it shall be taken as 55,000 psi for steel and 45,000 psi for wrought-iron.
- b. t = minimum thickness of shell plate in weakest course, in inches.
- c. E = efficiency of longitudinal joint, method of determining which is given in Paragraph PG-27 of Section I of the ASME Code.
- d. R = inside radius of the weakest course of the shell or drum, in inches.

- e. FS = factor of safety which shall be at least 5.0.
- E. The inspector may increase the factor of safety, if the condition and safety of the boiler warrants it.

2.6.4 EBO-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 160 psi.

2.6.5 EBO-5 Pressure on Cast Iron Boilers

The maximum allowable working pressure for any cast iron boiler, except hot water boilers, shall be 15 psi. See §§ 2.7.1, 2.7.2, and 2.7.4 of this Part.

2.6.6 EBO-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 2017 ASME Code, Section I.
- B. Each boiler shall have at least one ASME/NB Stamped and certified safety valve, and if it has more than 500 sq. ft. of water-heating surface, or an electric power input of more than 1100 KW, it shall have two or more safety valves of the same type.
- C. The valve or valves 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.
- E. The safety valve capacity of each boiler shall be such that the safety valve or valves will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than six percent (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 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 boilers of different maximum allowable working pressures with minimum safety valve settings varying more than six percent are so connected that steam can flow toward the lower pressure units, the latter shall be protected by additional safety valve capacity, if necessary, on the lower pressure side of the system. The additional safety valve capacity shall be based upon the maximum amount of steam which can flow into the lower pressure system.
- H. In those cases where the boiler is supplied with feed-water 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 94 percent 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 of the three 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 super-heater or re-heater;
 - 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 2017 ASME Code, Section I;
 - 3. by measuring the maximum amount of feed-water that can be evaporated;
- J. When either of the methods outlined in § 2.6.6(I)(2) and (3) of this Part 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.

2.6.7 EBO-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 500 sq. ft. of water heating surface shall have at least two suitable means of feeding, at least one of which shall be a feed pump. A source of feed at a pressure 6 percent greater than the set pressure of the safety valve with the highest setting may be considered one 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 feed-water shall be introduced into a boiler in such a manner that the water will not be discharged directly against surfaces exposed to gases of high temperature or to direct radiation from the fire. For pressures of 400 psi or over, the feed-water inlet through the drum shall be fitted with shields, sleeves, or other suitable means to reduce the effects of temperature differentials in the shell or head.
- D. 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 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.
- E. 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.
- F. Where de-aerating heaters are not employed, it is recommended that the temperature of the feed-water be not less than 120 degrees Fahrenheit to avoid the possibility of setting up localized stress. Where de-aerating heaters are employed, it is recommended that the minimum feed-water temperature be not less than 215 degrees Fahrenheit so that dissolved gases may be thoroughly released.

2.6.8 EBO-8 Water Level Indicators

- A. Each boiler, except forced-flow steam generators with no fixed steam and waterline, and high-temperature water boilers of the forced circulation type that have no steam and water-line, shall have at least one water gage glass. Boilers operated at pressures over 400 psi shall be provided with two water gage glasses which may be connected to a single water column or connected directly to the drum.
- B. Two independent remote level indicators may be provided instead of one of the two required gage glasses for boiler drum water level indication in the case of power boilers with all drum safety valves set at or above 900 psi. When both

remote level indicators are in reliable operation, the remaining gage glass may be shut off, but shall be maintained in serviceable condition.

- C. When the direct reading of gage glass water level is not readily visible to the operator in his working area, two dependable indirect indications shall be provided, either by transmission of the gage glass image or by remote indicators.
- D. The lowest visible part of the water gage glass shall be at least 2 in. above the lowest permissible water level, at which level there will be no danger of overheating any part of the boiler when in operation at that level. When remote level indication is provided for the operator in lieu of the gage glass, the same minimum level reference shall be clearly marked.
- E. Connections from the boiler to the remote level indicator shall be at least 3/4-inch pipe size to and including the isolation valve and from there to the remote level indicator at least 1/2 in. O.D. tubing. These connections shall be completely independent of other connections for any function other than water level indication. For pressures of 400 psi or over, lower connections to drums shall be provided with shields, sleeves, or other suitable means to reduce temperature differentials in the shells or heads.
- F. Boilers of the horizontal fire-tube type shall be so set that when the water is at the lowest reading in the water gage glass there shall be at least 3 in. of water over the highest point of the tubes, flues, or crown sheets.
- G. Boilers of locomotives type shall have at least one water glass provided with top and bottom shutoff cocks and lamp, and two gage cocks for boilers 36 in. in diameter and under, and three gage cocks for boilers over 36 in. in diameter.
- H. The lowest gage cock and the lowest reading of water glass shall not be less than 2 in. above the highest point of crown sheet on boilers 36 in. in diameter and under, nor less than 3 in. for boilers over 36 in. in diameter. These are minimum dimensions, and on larger locomotives and those operating on steep grades, the height should be increased, if necessary, to compensate for change of water level on descending grades.
- I. The bottom mounting for water glass and for water column if used must extend not less than 1-1/2 in. inside the boiler and beyond any obstacle immediately above it, and the passage therein must be straight and horizontal.
- J. Tubular water glasses must be equipped with a protecting shield.
- K. All connections on the gage glass shall be not less than 1/2 in. pipe size. Each water-gage glass shall be fitted with a drain cock or valve having an unrestricted drain opening of not less than 1/4 in. diameter to facilitate cleaning. When the boiler operating pressure exceeds 100 psi the glass shall be furnished with a connection to install a valved drain to the ash pit or other safe discharge point.

- L. Each water gage glass shall be equipped with a top and a bottom shutoff valve of such through-flow construction as to prevent stoppage by deposits of sediments. If the lowest valve is more than 7 ft. above the floor or platform from which it is operated, the operating mechanism shall indicate by its position whether the valve is open or closed. The pressure-temperature rating shall be at least equal to that of the lowest set pressure of any safety valve on the boiler drum and the corresponding saturated-steam temperature.
- M. Straight-run globe valves, shall not be used on such connection.
- N. Automatic shutoff valves, if permitted to be used, shall conform to the requirements of Section I of the 2017 ASME Code.

2.6.9 EBO-9 Water Columns

- A. The water column shall be so mounted that it will maintain its correct position relative to the normal waterline under operating conditions.
- B. The minimum size of pipes connecting the water column to a boiler shall be 1 in. For pressures of 400 psi or over, lower water column connections to drums shall be provided with shields, sleeves, or other suitable means to reduce the effect of temperature differentials in the shells or heads. Water glass fittings or gage cocks may be connected directly to the boiler.
- C. The steam and water connections to a water column or a water gage glass shall be such that they are readily accessible for internal inspection and cleaning. Some acceptable methods of meeting this requirement are by providing a cross or fitting with a back outlet at each right-angle turn to permit inspection and cleaning in both directions, or by using pipe bends or fittings of a type which does not leave an internal shoulder or pocket in the pipe connection and with a radius of curvature which will permit the passage of a rotary cleaner.
- D. Screwed plug closures using threaded connections as allowed by Section I of the 2017 ASME Code are acceptable means of access for this inspection and cleaning. For boilers with all drum safety valves set at or above 400 psi, socket-welded plugs may be used for this purpose in lieu of screwed plugs. The water column shall be fitted with a connection for a drain cock or drain valve to install a pipe of at least 3/4 in. pipe size to the ash pit or other safe point of discharge. If the water connection to the water column has a rising bend or pocket which cannot be drained by means of the water-column drain, an additional drain shall be placed on this connection in order that it may be blown off to clear any sediment from the pipe.
- E. The design and material of a water column shall comply with the requirements of Section I of the 2017 ASME Code. Water column made of cast iron in accordance with SA-278 may be used for maximum boiler pressures not exceeding 250 psi. Water columns made of ductile iron in accordance with SA-

395 may be used for maximum boiler pressure not exceeding 350 psi. For higher pressures, steel construction shall be used.

- F. Shutoff valves shall not be used in the pipe connections between a boiler and a water column or between a boiler and the shutoff valves required for the gage glass, unless they are either outside-screw-and-yoke or lever-lifting type gate valves or stopcocks with lever permanently fastened thereto and marked in line with their passage, or of such other through-flow construction as to prevent stoppage by deposits of sediment, and to indicate by the position of the operating mechanism whether they are in open or closed position; and such valves or cocks shall be locked or sealed open. Where stop cocks are used, they shall be of a type with the plug held in place by a guard or gland.
- G. No outlet connections, except for control devices (such as damper regulators and feed-water regulators), drains, steam gages, or apparatus of such form as does not permit the escape of an appreciable amount of steam or water therefrom shall be placed on the pipes connecting a water column or gage glass to a boiler.

2.6.10 EBO-10 Gage Glass Connections

- A. Gage glasses and gage cocks that are not connected directly to a shell or drum of the boiler shall be connected by one of the following methods:
 - 1. The water gage glass or glasses and gage cocks shall be connected to an intervening water column.
 - 2. When only water gage glasses are used, they may be mounted away from the shell or drum and the water column omitted, provided the following requirements are met:
 - 3. The top and bottom gage glass fittings are aligned, supported, and secured so as to maintain the alignment of the gage glass; and
 - 4. The steam and water connections are not less than 1 in. pipe size and each water glass is provided with a valved drain; and
 - 5. The steam and water connections comply with the requirements of the following:
- B. The lower edge of the steam connection to a water column or gage glass in the boiler shall not be below the highest visible water level in the water gage glass. There shall be no sag or offset in the piping which will permit the accumulation of water; and
- C. The upper edge of the water connection to a water column or gage glass and the boiler shall not be above the lowest visible water level in the gage glass. No part of this pipe connection shall be above the point of connection at the water column.

- D. Each boiler (except those not requiring water level indicators) shall have three or more gage cocks located within the visible length of the water glass, except when the boiler has two water glasses located on the same horizontal lines.
- E. Boilers not over 36 in. in diameter in which the heating surface does not exceed 100 sq. ft. need have but two gage cocks.
- F. The gage cock connections shall be not less than 1/2 in. pipe size.

2.6.11 EBO-11 Pressure Gages

- A. Each boiler shall have a pressure gage so located that it is easily readable. The pressure gage shall be installed so that it shall at all times indicate the pressure in the boiler. Each steam boiler shall have the pressure gage connected to the steam space or to the water column or its steam connection. A valve or cock shall be placed in the gage connection adjacent to the gage. An additional valve or cock may be located near the boiler providing it is locked or sealed in the open position. No other shutoff valves shall be located between the gage and the boiler. The pipe connection shall be of ample size and arranged so that it may be cleared by blowing out. For a steam boiler the gage or connection shall contain a siphon or equivalent device which will develop and maintain a water seal that will prevent steam from entering the gage tube. Pressure gage connections shall be suitable for the maximum allowable working pressure and temperature, but if the temperature exceeds 406 degrees Fahrenheit, brass or copper pipe or tubing shall not be used. The connections to the boiler, except the siphon, if used, shall not be less than 1/4 in. inside diameter standard pipe size but where steel or wrought-iron pipe or tubing is used they shall not be less than 1/2 in. The minimum size of a siphon, if used, shall be 1/4 in. inside diameter. The dial of the pressure gage shall be graduated to approximately double the pressure at which the safety valve is set, but in no case to less than 1-1/2 times this pressure.
- B. Each forced-flow steam generator with no fixed steam and water line shall be equipped with pressure gages or other pressure measuring devices located as follows:
 - 1. At the boiler or super-heater outlet (following the last section which involves absorption of heat), and
 - 2. At the boiler or economizer inlet (preceding any section which involves absorption of heat), and
 - 3. Upstream of any shutoff valve which may be used between any two sections of the heat absorbing surface.
- C. Each high-temperature water boiler shall have a temperature gage so located and connected that it shall be easily readable. The temperature gage shall be installed so that it at all times indicates the temperature in degrees Fahrenheit of the water in the boiler, at or near the outlet connection.

2.6.12 EBO-12 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 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 automatic non-return valve (set next to the boiler) and a second valve of the outside-screw-and-yoke type.

2.6.13 EBO-13 Blow-off Piping

- A. A blow-off as required herein is defined as a pipe connection provided with valves located in the external piping through which the water in the boiler may be blown out under pressure, excepting drains such as are used on water columns, gage glasses, or piping to feed-water regulators, etc., used for the purpose of determining the operating condition of such equipment. Piping connections used primarily for continuous operation, such as de-concentrators on continuous blow-down systems, are not classed as blow-off's but the pipe connections and all fittings up to and including the first shutoff valve shall be equal at least to the pressure requirements for the lowest set pressure of any safety valve on the boiler drum and with the corresponding saturated-steam temperature.
- B. A surface blow-off shall not exceed 2-1/2 in. pipe size, and the internal pipe and the terminal connection for the external pipe, when used, shall form a continuous passage, but with clearance between their ends and arranged so that the removal of either will not disturb the other. A properly designed steel bushing, similar to or the equivalent of those shown in Fig. PG-59.1 of Section I of the 2017 ASME Code or a flanged connection shall be used.
- C. Each boiler except forced-flow steam generators with no fixed steam and waterline and high-temperature water boilers shall have a bottom blow-off outlet in direct connection with the lowest water space practicable for external piping conforming to PG-58.3.6 of Section I of the 2017 ASME Code.
- D. All water walls and water screens which do not drain back into the boiler, and all integral economizers, shall be equipped with outlet connections for a blow-off or drain line and conform to the requirements of PG-58.3.7 of the 2017 ASME Code.

- E. Except as permitted for miniature boilers, the minimum size of pipe and fittings shall be 1 in., and the maximum size shall be 2-1/2 in., except that for boilers with 100 sq. ft. of heating surface or less, the minimum size of pipe and fittings may be 3/4 in.
- F. Condensate return connections of the same size or larger than the size herein specified may be used, and the blow-off may be connected to them. In such case the blow-off shall be so located that the connection may be completely drained.
- G. A bottom blow-off pipe when exposed to direct furnace heat shall be protected by firebrick or other heat resisting material which is so arranged that the pipe may be inspected.
- H. An opening in the boiler setting for a blow-off pipe shall be arranged to provide free expansion and contraction.

2.6.14 EBO-14 Repairs and Renewals of Boiler Fittings and Appliances

Whenever repairs are made to fittings or appliances or it becomes necessary to replace them, the work shall comply with the requirements for new installations.

2.6.15 EBO-15 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.

2.7 Existing Installation: Heating Boilers

2.7.1 EHB-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.

2.7.2 EHB-2 Nonstandard Riveted Boilers

The maximum allowable working pressure on the shell of a nonstandard riveted heating boiler shall be determined in accordance with § 2.6.3 of this Part. Power Boilers, except that in no case shall the maximum allowable working pressure of a steam heating boiler exceed 15 psi, or a hot water boiler exceed 160 psi or 250 degrees Fahrenheit temperature.

2.7.3 EHB-3 Nonstandard Welded Boilers

The maximum allowable working pressure of a nonstandard steel or wrought iron heating boiler of welded construction shall not exceed 15 psi for steam. For other than steam service, the maximum allowable working pressure shall be calculated

in accordance with Section IV of the 2017 ASME Code, but in no case shall it exceed 30 psi.

2.7.4 EHB-4 Nonstandard Cast Iron Boilers

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

2.7.5 EHB-5 Potable Water Heaters

A potable water heater shall not be installed or used as a heating boiler.

2.7.6 EHB-6 Safety Valves

- A. Each steam boiler shall have one or more ASME/National Board certified and stamped safety valves of the spring pop-type adjusted and sealed to discharge at a pressure not to exceed 15 psi. Seals shall be attached in a manner to prevent the valve from being taken apart without breaking the seal. The safety valves shall be arranged so that they cannot be reset to relieve at a higher pressure than the maximum allowable working pressure on 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 inspection. For valves exceeding 2 in. pipe size, the drain hole or holes shall be tapped not less than 3/8 in. pipe size. For valves less than 2 in., the drain hole shall not be less than 1/4 in. in diameter.
- B. No safety valve for a steam boiler shall be smaller than 1/2 in. No safety valve shall be larger than 4-1/2 in. The inlet opening shall have an inside diameter equal to, or greater than, the seat diameter.
- C. The minimum relieving capacity of the valve or valves shall be governed by the capacity marking on the boiler.
- D. The minimum valve capacity in pounds per hour shall be the greater of that determined by dividing the maximum BTU output at the boiler nozzle obtained by the firing of any fuel for which the unit is installed by 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 § 2.7.6 (D)(1) of this Part in text. 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 shall be met.

1. Table

MINIMUM POUNDS OF STEAM PER HOUR PER SQUARE FOOT OF HEATING SURFACE		
	Firetube Boilers	Watertube Boilers
Boiler Heating Surface:		
Hand Fired	5	6
Stoker fired	7	8
Oil, gas, or pulverized fuel fired		
Waterwall Heating Surface:		
Hand fired	8	8
Stoker fired	10	12
Oil, gas, or pulverized fuel	14	16

2. When a boiler is fired only by a gas giving a heat value not in excess of 200 BTU per cu. ft., the minimum safety valve or safety relief valve relieving capacity may be based on the value given for hand-fired boilers above.
 3. The minimum safety valve or safety relief valve relieving capacity for electric boilers shall be 3-1/2 pounds per hour per kilowatt input.
 4. For heating surface determination see 2017 ASME Code Section IV. paragraph HG-403.
- E. The safety valve capacity for each steam boiler shall be such that with the fuel burning equipment installed, and operating at maximum capacity, the pressure cannot rise more than 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 § 2.7.6 of this Part) in text. 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 2017 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.

2.7.7 EHB-7 Safety Relief Valve Requirements for Hot Water Heating and Hot Water Supply Boilers

- A. Each hot water heating and hot water supply boiler shall have at least one ASME/National Board stamped and certified safety relief valve set to relieve at or below the maximum allowable working pressure of the boiler. Each hot water supply boiler shall have at least one ASME/National Board stamped and 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/National Board stamped and certified as to capacity shall have pop action when tested by steam. When more than one safety relief valve is used on either hot water heating or hot water supply boiler, the additional valve or valves shall be ASME rated and may be set within a range not to exceed 6 psi above the maximum allowable working pressure of the boiler up to and including 60 psi and 5 percent for those having a maximum allowable working pressure exceeding 60 psi. Safety relief valves shall be spring loaded. Safety relief valves shall be so arranged that they cannot be reset at a higher pressure than the maximum permitted by this paragraph.
- B. 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.
- C. No safety relief valve shall be smaller than 3/4 in. nor larger than 4-1/2 in. standard pipe size, except that boilers having a heat input not greater than 15,000 BTU per hour may be equipped with a safety relief valve of 1/2 in. 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 1/4 in. in diameter or its equivalent area.
- D. The required steam relieving capacity, in pounds per hour, of the pressure relieving device or devices on a boiler shall be the greater of that determined by dividing the maximum output in BTU at the boiler nozzle obtained by the firing of

any fuel for which the unit is installed by 1,000 or shall be determined on the basis of pounds of steam generated per hour per square foot of boiler heating surface as given in § 2.7.6(D)(1) of this Part. 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 § 2.7.7(F) of this Part shall be met.

- E. 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 § 2.7.7(F) of this Part. The additional valves required, on account of changed conditions, may be installed on the outlet piping provided there is no intervening valve.
- F. Safety relief valve capacity for each boiler shall be such that, with the fuel burning equipment installed and operated at maximum capacity, the pressure cannot rise more than 10 percent above the maximum allowable working pressure for pressure. When more than one safety relief valve is used, the over pressure shall be limited to 10 percent above the set pressure of the highest set valve allowed by § 2.7.6(A) of this Part in text.
- G. If there is any doubt as to the capacity of the safety relief valve, an accumulation test shall be run. (See 2017 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 relief valve and the boiler, nor on the discharge pipe between the safety relief valve and the atmosphere. The discharge pipe shall be not less than the diameter of the safety relief valve 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.

2.7.8 EHB-8 Steam Gages

- A. Each steam boiler shall have a steam gage or a compound steam gage connected to its steam space or to its water column or to its steam connection. The gage or connection shall contain a siphon or equivalent device which will develop and maintain a water seal that will prevent steam from entering the gage tube. The connection shall be so arranged that the gage cannot be shut off from the boiler except by a cock placed in the pipe at 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. The connections to the boiler shall be not less than 1/4 in. standard pipe size, but where steel or wrought iron pipe or tubing is used, they shall be not less than 1/2 in. standard pipe size. The minimum size of a siphon, if used, shall be 1/4 in. in inside diameter. Ferrous and nonferrous tubing having inside

diameters at least equal to that of standard pipe sizes listed above may be substituted for pipe.

- B. The scale on the dial of a steam boiler gage shall be graduated to not less than 30 psi nor more than 60 psi. The travel of the pointer from 0 to 30 psi pressure shall be at least 3 in.

2.7.9 EHB-9 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 such 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 1-1/2 nor more than three 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 1 in. 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. The thermometer shall be so located that it shall at all times indicate the temperature in degrees Fahrenheit of the water in the boiler at or near the outlet.

2.7.10 EHB-10 Water Gage Glasses

- A. Each steam boiler shall have one or more water gage glasses attached to the water column or boiler by means of valved fittings not less than 1/2 in. pipe size, with the lower fitting provided with a drain valve of a type having an unrestricted drain opening not less than 1/4 in. in diameter to facilitate cleaning. Gage glass replacement shall be possible under pressure. Water glass fittings may be attached directly to a boiler.
- B. Boilers having an internal vertical height of less than 10 in. 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.
- C. The lowest visible part of the water gage glass shall be at least 1 in. 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.
- D. Each boiler shall be provided at the time of the manufacture with a permanent marker indicating the lowest permissible water level. The marker shall be

stamped, etched, or cast in metal; or it shall be a metallic plate attached by rivets, screws, or welding; or it shall consist of material with documented tests showing its suitability as a permanent marking for the application. This marker shall be visible at all times. Where the boiler is shipped with a jacket, this marker may be located on the jacket.

- E. In electric boilers of the submerged electrode type, the water gage shall be so located to indicate the water levels both at startup and under maximum steam load conditions as established by the manufacturer.
- F. In electric boilers of the resistance heating element type the lowest visible part of the water gage glass shall not be below the top of the electric resistance heating element. Each boiler of this type shall also be equipped with an automatic low-water electrical power cutoff so located as to automatically cut off the power supply before the surface of the water falls below the top of the electrical resistance heating elements.
- G. Tubular water glasses on electric boilers having a normal water content not exceeding 100 gal. shall be equipped with a protective shield.

2.7.11 EHB-11 Stop Valves

- A. When a stop valve is used in the supply pipe connection of a single steam boiler, there shall be one used in the return pipe connection.
- B. Stop valves in single hot water heating boilers shall be located at an accessible point in the supply and return pipe connections as near the boiler nozzle as is convenient and practicable, of a single hot water heating boiler installation to permit draining the boiler without emptying the system.
- C. When the boiler is located above the system and can be drained without draining the system, stop valves may be eliminated. A stop valve shall be used in each supply and return pipe connection of two or more boilers connected to a common system.
- D. All valves or cocks shall conform with the applicable portions of HF-203 of Section IV of the 2017 ASME Code and may be ferrous or nonferrous.
- E. The minimum pressure rating of all valves or cocks shall be at least equal to the pressure stamped upon the boiler, and the temperature rating of such valves or cocks, including all internal components shall be not less than 250 degrees Fahrenheit.
- F. Valves or cocks shall be flanged, threaded or have ends suitable for welding or brazing.
- G. All valves or cocks with stems or spindles shall have adjustable pressure type packing glands and, in addition, all plug type cocks shall be equipped with a

guard or gland. The plug or other operating mechanism shall be distinctly marked in line with the passage to indicate whether it is opened or closed.

- H. All valves or cocks shall have tight closure when under boiler hydrostatic test pressure.
- I. When stop valves are used, they shall be properly designated substantially by tags of metal or other durable material fastened to them as follows:
 - 1. Supply Valve - Number ()
 - 2. Do Not Close Without Also Closing Return Valve - Number ()
 - 3. Return Valve - Number ()
 - 4. Do Not Close Without Also Closing Supply Valve - Number ()

2.7.12 EHB-12 Feed-Water Connections

- A. Feed-water, makeup water, or water treatment shall be introduced into a boiler through the return piping system. Alternatively, makeup water or water treatment may be introduced through an independent connection. The water flow from the independent connection shall not discharge directly against parts of the boiler exposed to direct radiant heat from the fire. Makeup water or water treatment shall not be introduced through openings or connections provided for inspection or cleaning, safety valve, safety relief valve, blow-off, water column, water gage glass, pressure gage, or temperature gage.
- B. The makeup water 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.

2.7.13 EHB-13 Water Column and Water Level Control Pipes

- A. The minimum size of ferrous or nonferrous pipes connecting a water column to a steam boiler shall be 1 in. No outlet connections, except for damper regulator, feed-water regulator, steam gages, or apparatus which does not permit the escape of any steam or water except for manually operated blow-downs, shall be attached to a water column or the piping connecting a water column to a boiler (see HG-705 of Section IV of the 2017 ASME Code for introduction of feed-water into a boiler). If the water column, gage glass, low-water fuel cutoff, or other water level control device is connected to the boiler by pipe and fittings, no shutoff valves of any type shall be placed in such pipe, and a cross or equivalent fitting to which a drain valve and piping may be attached shall be placed in the water piping connection at every right angle turn to facilitate cleaning. The water column drain pipe and valve shall be not less than 3/4 in. pipe size.

- B. The steam connections to the water column of a horizontal Fire-tube wrought boiler shall be taken from the top of the shell or the upper part of the head, and the water connection shall be taken from a point not above the center line of the shell. For a cast iron boiler, the steam connection to the water column shall be taken from the top of an end section or the top of the steam header, and the water connection shall be made on an end section not less than 6 in. below the bottom connection to the water gage glass.

2.7.14 EHB-14 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.

2.7.15 EHB-15 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 2017 ASME Code for new construction.

2.8 Existing Installation: Pressure Vessels

2.8.1 EPV-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 edition of the ASME Code or the API-ASME Code under which they were constructed and stamped.

2.8.2 EPV-2 Maximum Allowable Working Pressure for Nonstandard Pressure Vessels, Except as Provided in § 2.8.3 of this Part.

- 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.
1. $TStE$ = maximum allowable working pressure, psi
 2. $DDDD$
 3. RFS
 4. where:

- a. TS = specified minimum tensile strength of shell plate material, psi.
(When the tensile strength of carbon steel plate is not known, it may be taken as 55,000 psi for temperatures not exceeding 650 degrees Fahrenheit. For other materials use the lowest stress values for that material from Section VIII.)
 - b. t = minimum thickness of shell plate of weakest course, inches.
 - c. E = efficiency of longitudinal joint depending upon construction.
 - (1) for riveted joints - calculated riveted efficiency; for fusion-welded and brazed joints - the following percentages apply:
 - (AA) Single lap weld 40%
 - (BB) Double lap weld 50%
 - (CC) Single butt weld 60%
 - (DD) Double butt weld 70%
 - (EE) Forge weld 70%
 - (FF) Brazed steel 80%
 - d. R = inside radius of weakest course of shell, (inches) provided the thickness does not exceed 10 percent of the radius. If the thickness is over 10 percent of the radius, the outer radius shall be used.
 - e. FS = factor of safety allowed by these rules.
- B. The minimum factor of safety in no case be less than 5 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 the determining factors.
 - C. The maximum allowable working pressure permitted for formed heads under pressure shall be determined by using the appropriate formulas from 2017 ASME Code Section VIII, Division 1, and the tensile strength and factors of safety given in §§ 2.8.1 and 2.8.2 of this Part
 - 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 2017 ASME Code.

2.8.3 EPV-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 Code shall be calculated on the same basis as used in the original design.

2.8.4 EPV-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 such material to permit proper inspection and to determine remaining thickness.

2.8.5 EPV-5 Overpressure Protection

Each pressure vessel shall be provided with pressure relief devices indicating and controlling devices as necessary to protect against overpressure. These devices shall be so constructed, located and installed that they cannot readily be rendered inoperative. The relieving capacity of such pressure relief device shall be adequate to prevent a rise in pressure in the vessel of more than 10 percent or 3 psi, whichever is greater, above the maximum allowable working pressure except when multiple relieving devices are provided, they shall prevent the pressure from rising more than 16 percent or 4 psi, whichever is greater above the maximum allowable working pressure. When multiple pressure relieving devices are provided, at least one device shall be set at or below the maximum allowable working pressure and the additional devices shall be set no higher than 105% of the maximum allowable working pressure. Where 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, paragraph UG-125 or Division 2, paragraph AR-130, whichever is applicable.

2.8.6 EPV-6 Repairs and Renewals of Fittings and Appliances

Whenever repairs are made to fittings and appurtenances or it becomes necessary to replace them, the work must comply with the requirements for new installations.

2.9 General Requirements

2.9.1 GR-1 Inspection of Boilers and Pressure Vessels

- A. All boilers and pressure vessels not exempted by the Act or by rules and regulations promulgated under the Act and which are subject to regular inspections, shall be prepared for such inspections as required in § 2.9.2 of this Part.

B. Approved pressure vessels(hot water heaters listed by a nationally recognized testing agency), with approved safety devices including pressure temperature relief valve, with a nominal water containing capacity of one hundred twenty (120) gallons or less having a heat input of less than two hundred thousand (200,000) B.T.U. per hour, used solely for hot water supply at pressure of one hundred sixty (160) pounds per square inch or less, and at temperatures of two hundred ten degrees (210°) Fahrenheit or less, boilers having a heat input of less than 200,000 B.T.U. per hour, steam boilers having a generating capacity of less than 200 lbs. an hour provided; that such pressure vessels and boilers are not installed in places of public assembly such as schools, child care centers, public and private hospitals, nursing and boarding homes, churches, public buildings, or any similar place of public assembly (boilers which are less than 200,000 B.T.U. per hour or steam boilers which generate less than 200 lbs. per hour capacity and are included in these exemption categories will be considered residential type boilers and not subject to ASME-CSD-1 rules; these units must still conform to local code ordinance and manufacturer specifications for proper installation and use.). For purposes of this section, the following definitions shall apply:

1. “schools” and such other places of public assembly means every public, private, parochial or charter school recognized by any Rhode Island city or town school committee or by the Rhode Island Department of Education;
2. “child care centers” and such other places of public assembly means any Family Child Care Home, Group Family Care Home, Child Day Care Center and Child Day Care Center (School Age) as defined by the State of Rhode Island Department of Children, Youth and Families regulations for licensure;
3. “public and private hospitals” and such other places of public assembly means an Organized Ambulatory Care Facility-Freestanding, Ambulatory Surgery Center, a Freestanding Ambulatory Surgical Center, Emergency Care Facility, and a Hospital as defined by the State of Rhode Island Department of Health regulations for licensure for healthcare providers and R.I. Gen. Laws § 23-17-1 *et seq.* and any mental health, substance abuse and developmental disability residential treatment facility licensed or certified by the Rhode Island Department of Behavioral Health Care, Developmental Disabilities and Hospitals and any Adult Day Care Center licensed by the Rhode Island Division of Elderly Affairs;
4. “nursing homes” and such other places of public assembly means Adult Day Care centers, Assisted Living Residences, Hospice Inpatient Facilities, Nursing Home Facilities and Rehabilitation Hospital Centers as defined by the State of Rhode Island Department of Health regulations for licensure and R.I. Gen Laws § 23-17-1 *et seq.*;
5. “boarding homes” means a residential house in which one or more rooms are rented to members of the general public by the week or month and

where lodgers receive laundry and cleaning services and at least one meal per day;

6. "churches" means a place of worship or location where a group of people or congregation comes to perform acts of religious study, honor or devotion;
7. "public buildings" means any building owned, leased or controlled in whole or in part by the State of Rhode Island or any agency or political subdivision thereof;
8. "similar place of public assembly" means those places specifically defined herein.

2.9.2 GR-2 Preparation for Inspection

- A. The owner or user shall prepare each 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. Boilers - The owner or user shall prepare a boiler for internal inspection in the following manner:
 - a. Water shall be drawn off and the boiler washed thoroughly;
 - b. Manhole and hand-hole 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;
 - 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. Prior to the inspection, the owner/user shall make any and all preparations with regards to asbestos containing materials which are necessary to provide proper access to equipment and to control exposure to asbestos fibers during the inspection. The required preparatory work shall be conducted in accordance with the provisions of the Rhode Island "Rules and Regulations for Asbestos Control;"
 - f. The pressure gage shall be removed for testing as required by the inspector;

- g. 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;
 - h. Before opening the manhole or hand-hole covers and entering any parts of the steam generating unit connected to a common header with other boilers, the non-return and steam stop valves must be closed, tagged, and padlocked, and drain valves or cocks between the two valves opened. The feed valves must be closed, tagged, and padlocked, and drain valves or cocks located between the two valves opened. After draining the boiler, the blow-off valves shall be closed, tagged and padlocked. Blow-off lines, where practicable, shall be disconnected between pressure parts and valves. All drains and vent lines shall be opened.
- 2. Pressure Vessels - Pressure vessels shall be prepared for inspection to the extent deemed necessary by the inspector and the applicable procedures outlined in § 2.9.2(A)(1) of this Part

2.9.3 GR-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 or right to operate revoked, until the owner or user complies with the requirements.

2.9.4 GR-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 such information cannot be determined by other means.

2.9.5 GR-5 Lap Seam Crack

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

2.9.6 GR-6 Pressure Test

- A. A hydrostatic pressure test, when applied to boilers or pressure vessels, shall not exceed 1-1/2 times the maximum allowable working pressure. The pressure shall

be under proper control so that in no case shall the required test pressure be exceeded by more than 2 percent.

- B. During a hydrostatic test the safety valve or valves 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.
- C. It is suggested that the minimum temperature of the water used to apply a hydrostatic test shall be not less than 70 degrees Fahrenheit, but the maximum temperature during inspection shall not exceed 120 degrees Fahrenheit.
- D. 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.
- E. 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 such cases, there shall be agreement between the owner and the inspector.

2.9.7 GR-7 Automatic Low Water Fuel Cutoff and/or Water Feeding Device

- A. Each automatically fired steam or vapor system boiler shall be equipped with an 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 feed-water. The lowest safe water line should not be lower than the lowest visible part of the water glass.
- B. Such fuel or feed-water control device may be attached direct to a boiler or for low pressure boilers to the tapped openings provided for attaching a water glass direct to a boiler, provided that such connections from the boiler are nonferrous tees or Y's not less than 1/2 in. pipe size between the boiler and the water glass, so that the water glass is attached direct and as close as possible to the boiler; the straightway tapping of the Y or tee to take the water glass fittings, 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.
- C. Designs embodying a float and float bowl shall have a vertical straight away valve drain pipe at the lowest point in the water equalizing pipe connections by which the bowl and the equalizing pipe can be flushed and the device tested.

2.9.8 GR-8 Pressure Reducing Valves

- A. Where pressure reducing valves are used, one 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 be such 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 reduction 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 over-pressuring the low pressure side.
- C. A pressure gage shall be installed on the low pressure side of a reducing valve.

2.9.9 GR-9 Boiler Blow-off Equipment

- A. The blow-down from a boiler or boilers that enters a sanitary sewer system or blow-down which is considered a hazard to life or property shall pass through some form of blow-off equipment that will reduce pressure and temperature as required hereinafter.
- B. The temperature of the water leaving the blow-off equipment shall not exceed 150 degrees Fahrenheit.
- C. The pressure of the blow-down leaving any type of blow-off equipment shall not exceed 5 psi.
- D. All blow-off equipment shall be fitted with openings to facilitate cleaning inspection.
- E. Blow-off equipment shall conform to the provisions set forth in the recommended rules for National Board Boiler Blow-off Equipment.

2.9.10 GR-10 Location of Discharge Piping Outlets

The discharge of safety valves, blow-off pipes and other outlets shall be located and supported as to prevent injury to personnel.

2.9.11 GR-11 Supports

Each boiler and pressure vessel shall be supported by masonry or structural supports 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.

2.9.12 GR-12 Boiler Door Latches

- A. A water-tube boiler shall have the firing doors of the inward opening type, unless such doors are provided with substantial and effective latching or fastening devices or otherwise so constructed as to prevent them, when closed, from being blown open by pressure on the furnace side.
- 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. The foregoing 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 7 ft. of the firing floor or operating platform, shall be provided with substantial deflectors to divert the blast.

2.9.13 GR-13 Clearance

When boilers are replaced or new boilers are installed in either existing or new buildings, a minimum height of at least 3 ft. shall be provided between the top of the boiler proper and the ceiling and at least 3 ft. between all sides of the boiler and adjacent walls or other structures. Boilers and pressure vessels having manholes shall have 5 ft. 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 will be provided for the proper operation of the boilers and pressure vessels and their appurtenances, for the inspection of all surfaces, tubes, water-walls, economizers, piping, valves and other equipment, and for their necessary maintenance and repair and replacement of tubes.

2.9.14 GR-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 means of exit, each to be remotely located from the other.

2.9.15 GR-15 Exit from Boiler Room

All boiler rooms exceeding 500 square feet floor area and containing one or more boilers having a fuel burning capacity of 1,000,000 BTU, or equivalent electrical heat input, shall have at least two means of exit. Each exit shall be remotely located from the other. Each elevation in such boiler room shall have two means of exit, each remotely located from the other.

2.9.16 GR-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.

2.9.17 GR-17 Air and Ventilation Requirements - Combustion Air Supply and Ventilation of Boiler Room

- A. 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.
1. 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 square foot. The following table or formula shall be used to determine the net louvered area in square feet:

INPUT	REQUIRED AIR	MIN. NET LOUVERED
BTU/HOUR	CU/FT/MIN.	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	1,000	3.3
5,000,000	1,250	4.1
6,000,000	1,500	5.0
7,000,000	1,750	5.8
8,000,000	2,000	6.6

9,000,000	2,250	7.5
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10,000,000	2,500	8.3
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(BTU/10,000) X 2.5 = CFM	500CFM per sq. ft. of net req. area
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2. When mechanical ventilation is used in lieu of § 2.9.17(A)(1) of this Part the supply of combustion and ventilation air to the boiler room and the firing device will not operate with the fan off. The velocity of the air through the ventilating fan shall not exceed 500 feet per minute and the total air delivered shall be equal to or greater than shown in § 2.9.17(A)(1) of this Part above.

2.9.18 GR-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.

2.9.19 GR-19 Conditions Not Covered by These Rules and Regulations

For any conditions not covered by these requirements, the applicable provisions of the 2017 ~~ASME~~ [ASME](#) Code or the 2017 NATIONAL BOARD INSPECTION CODE shall apply.