APPENDIX IV

STATE OF NORTH CAROLINA

DEPARTMENT OF LABOR

Bureau of Boiler Inspections

1958

BOILER INSPECTION LAW, RULES AND REGULATIONS

FORMULATED AND PUBLISHED BY AUTHORIZATION
OF THE
BOARD OF BOILER RULES

ISSUED BY
THE DEPARTMENT OF LABOR
FRANK CRANE, *Commissioner*
Raleigh, N. C.

State of North Carolina

Department of Labor

Raleigh

APPROVAL OF RULES AND REGULATIONS

December 13, 1957

In accordance with the requirements of Section 95-56 of the General Statutes of North Carolina, the revised portions and additions of the Rules and Regulations of Sections 1, 2, 3, 4, 5, 6, 7, 8, and 9, Parts I, II, and III, governing the construction, installation and operation of steam power boilers, low pressure steam heating boilers, hot water heating boilers, hot water supply boilers and hot water supply tanks, fired or unfired, as submitted to me by the Board of Boiler Rules on this date, are hereby approved and shall become effective on July 1, 1958. All other Rules and Regulations shall remain in effect as heretofore approved.

Sincerely,

Luther H. Hodges

Governor of North Carolina

Frank Crane

Chairman, Board of Boiler Rules

CAUTION!

KINDLY OBSERVE THE FOLLOWING BRIEFS AND AVOID UNNECESSARY INCONVENIENCE

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

DO NOT operate any boiler until same has been inspected by a State Boiler Inspector from this Department or a duly authorized insurance company inspector and a certificate of inspection has been received permitting the operation of same.

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

DO NOT do or have done any WELDING until you have received instructions either from the Department or your insurance carrier.

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

Refer all communications to the Department of Labor, Raleigh, North Carolina.

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

FOREWORD

The requirements of the North Carolina Boiler Construction Code governing the construction of boilers are practically the same as those incorporated in the American Society of Mechanical Engineers' Boiler Construction Code. A copy of this Code is on file in the office of the Chief Boiler Inspector.

The regulations contained herein shall be understood to set forth rules for safeguarding the life and limb of workers in industries in which boilers are used, and to place the responsibility for compliance with the rules and regulations upon both the employer and the employee.

The Board of Boiler Rules has endeavored to minimize the burden upon employers and employees and at the same time establish rules and regulations for the safe construction, installation and operation of boilers in the State of North Carolina.

The North Carolina Boiler Rules and Regulations do not presume to limit in any way the builder's right to choose any method of design or form of construction that conforms to Code rules, as the Code covers certain fundamental features of construction and leaves a number of details to the judgment of designers and inspectors.

Where special designs are not covered by Code provisions their construction may be determined by the manufacturer in cooperation with the purchaser, subject to the approval of the Inspector and the Board of Boiler Rules.

Any person who feels that these Rules and Regulations or interpretations of them impose an undue burden upon him shall have the right to appeal to the Board of Boiler Rules.

THE BOARD OF BOILER RULES RECOMMENDS THAT ALL NEW UNFIRED PRESSURE VESSELS TO BE PURCHASED OR CONSTRUCTED, FOR INSTALLATION IN THE STATE OF NORTH CAROLINA (WHILE NOT COVERED UNDER THIS ACT) SHOULD BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH SECTION VIII OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS' BOILER CONSTRUCTION CODE.

BOILER REGULATIONS

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Adopted by

THE NORTH CAROLINA STATE BOARD OF BOILER RULES

FRANK CRANE, Commissioner of Labor, Chairman
W. E. SHUPING, JR., Representing Insurance Companies
W. W. LLOYD, Representing Operating Engineers
W. M. READING, JR., Representing Owners and Users
R. GORDON THOMAS, Representing Boiler Manufacturers
W. C. PRICE, Representing Heating Contractors

BUREAU OF BOILER INSPECTIONS
DIVISION OF STANDARDS AND INSPECTIONS
NORTH CAROLINA DEPARTMENT OF LABOR

S. F. HARRISON, Chief Boiler Inspector

ARTICLE 7

BOARD OF BOILER RULES AND BUREAU OF BOILER INSPECTION

GENERAL STATUTE 95-54 through 95-69.2

§ General Statute 95-54. Board of boiler rules created; members, appointment, and qualifications; terms of office; vacancies; meetings.—There is hereby created the North Carolina board of boiler rules consisting of six members, of whom five shall be appointed to the board by the governor, one for a term of one year, one for a term of two years, one for a term of three years, one for a term of four years and one for a term of five years. At the expiration of their respective terms of office, their successors shall be appointed for terms of five years each. Upon the death or incapacity of any member, the vacancy for the remainder of the term shall be filled with a representative of the same class. Of these five appointed members, one shall be a representative of the owners and users of steam boilers within the State of North Carolina, one a representative of the boiler manufacturer or a boiler maker who has had not less than five years practical experience as a boiler maker within the State of North Carolina, one a representative of a boiler inspection and insurance company licensed to do business within the State of North Carolina, one a representative of the operating steam engineers in the State of North Carolina and one a licensed heating contractor. The sixth member shall be the commissioner of labor, who shall be chairman of the board. The board shall meet at least twice yearly at the state capital or other place designated by the board. (1935, c. 326, s. 1; 1953, c. 569, s. 1)

§ 95-55. Formulation of rules and regulations.—The board shall formulate rules and regulations for the safe and proper construction, installation, repair, use and operation of steam boilers, steam and hot water heating boilers, and hot water supply tanks and steam or hot water boilers fired or unfired, in this State. The rules and regulations so formulated shall conform as nearly as possible to the boiler code of the American Society of Mechanical Engineers and amendments and interpretations thereto made and approved by the council of the society. Nothing in this Act shall apply to vessels or equipment used in refrigeration, air conditioning or cooling systems. (1935, c. 326, s. 1; 1951, c. 1107, s. 1.)

§ 95-56. Approval of rules and regulations by governor.—The rules and regulations formulated by the board of boiler rules shall become effective upon approval by the governor, except that rules applying to the construction of new boilers shall not become effective to prevent the installation of such new boilers until six months after approval by the governor. Changes in the rules which would raise the standards governing the methods of construction of new boilers or the quality of material used in them shall not become effective until six months after approval by the governor. (1935, c. 326, s. 2.)

§ 95-57. **Compensation and expenses of Board.**—The members of the Board of Boiler Rules, exclusive of the chairman thereof, shall serve without salary but shall be paid a subsistence and travel allowance in accordance with the general provisions of the biennial Appropriations Act, for not to exceed twenty days in any year while in the performance of their duties as members of the board, to be paid in the same manner as in case of other state officers. The chairman of the board of boiler rules shall countersign all vouchers for expenditures under this section. (1935, c. 326, s. 3; 1951, c. 1107, s. 11)

§ 95-58. **Effect of article on boilelrs installed prior to enactment.**—This article shall not be construed as in any way preventing the use or sale of steam boilers and steam and hot water heating boilers and hot water supply tanks and boilers, in this State which shall have been installed or in use in this State prior to the taking effect of this article and which shall have been made to conform to the rules and regulations of the board of boiler rules governing existing installations as provided in § 95-66. (1935, c. 326, s. 4; 1951, c. 1107, s. 2.)

§ 95-59. **Commissioner of Labor empowered to appoint chief inspector; qualifications; salary.**—After the passage of this article and at any time thereafter that the office may become vacant, the commissioner of labor shall appoint, and may remove for cause when so appointed, a citizen of this State who shall have had at the time of such appointment not less than five years' practical experience with steam boilers as a steam engineer, mechanical engineer, boilermaker or boiler inspector, or who has passed the same kind of examination as that prescribed for deputy or special inspectors in §95-63, to be chief inspector for a term of two years or until his successor shall have been appointed, at an annual salary to be fixed by the commissioner of labor with the approval of the assistant director of the budget. (1935, c. 326, s. 5; 1943, c. 469.)

§ 95-60. **Certain boilers excepted.**—This article shall not apply to boilers under federal control or to stationary boilers used by railroads which are inspected regularly by competent inspectors, or to boilers used solely for propelling motor road vehicles; or to boilers of steam fire engines brought into the state for temporary use in times of emergency to check conflagrations; or to portable boilers used for agricultural purposes only or for pumping or drilling in the open field for water, gas or coal, gold, talc or other minerals and metals; or to hot water supply tanks and boilers fired or unfired, which are located in private residences or in apartment houses of less than six (6) families; or to steam boilers used for heating purposes carrying a pressure of not more than 15 pounds per square inch gauge, and which are located in private residences or in apartment houses of less than six (6) families; or to hot water heating boilers carrying a pressure of not more than 30 pounds per square inch gauge, and which are located in private residences or in apartment houses of less than six (6) families. (1935, c. 326, s. 6; 1937, c. 125, s. 1; 1951, c. 1107, s. 3.)

§ 95-61. **Powers of Commissioner of Labor; creation of Bureau of Boil-**

er Inspection.—The commissioner of labor is hereby charged, directed and empowered:

(a) To set up in the division of standards and inspections of the department of labor, a bureau of boiler inspection to be supervised by the chief inspector provided for in §95-59 and one or more deputy inspectors of boilers, who shall have passed the examination provided for in §95-63, at a salary not to exceed the salary of a senior factory inspector, and such office help as may be necessary.

(b) To have free access for himself and his chief boiler inspector and deputies, during reasonable hours, to any premises in the State where a steam boiler or steam or hot water heating boiler or hot water supply tank or boiler fired or unfired is built or being built or is being installed or operated, for the purpose of ascertaining whether such boiler or tank is built, installed or operated in accordance with the provisions of this article.

(c) To prosecute all violators of the provisions of this article.

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

(e) To enforce the laws of the State governing the use of steam boilers and steam and hot water heating boilers and hot water supply tanks and boilers fired or unfired and to enforce the rules and regulations of the board of boiler rules.

(f) To keep a complete record of the type, dimensions, age, conditions, pressure allowed upon, location and date of the last inspection of all steam boilers and steam and hot water heating boilers and hot water supply tanks and boilers fired and unfired to which this article applies.

(g) To publish and distribute among boiler manufacturers and others, requesting them, copies of the rules and regulations adopted by the board of boiler rules. (1935, c. 326, s. 7; 1951, c. 1107, s. 4.

§ 95-62. Special Inspectors; certificate of competency; fees.—In addition to the deputy boiler inspectors authorized by §95-61, the Commissioner of Labor shall, upon the request of any company authorized to insure against loss from explosion of boilers in this State, issue commissions as special inpectors to any qualified boiler inpectors of said company who have certificates of competency. To be entitled to a certificate of competency a boiler inspector must either—

(1) Have passed the examination for inspectors provided for by G.S. 95-63, or

(2) Have passed an examination on boiler inspection in a state having standards therefor equal to this State, or

(3) Hold a certificate from the national board of boiler and pressure vessel inspectors.

The commission shall be in the form of a credential card for which a fee of $2.00 must be paid. The commisison remains in force until the next succeeding December 31, and must be renewed annually thereafter.

Such special inspectors shall receive no salary from, nor shall any of their expenses be paid by the State, and the continuance of a special inspector's commission shall be conditioned upon his continuing in the employ of a boiler inspection and insurance company duly authorized as aforesaid and

upon his maintenance of the standards imposed by this article. Such special inspectors shall inspect all steam boilers insured by their respective companies, and the owners of such insured boilers shall be exempt from the payment of the fees provided for in §95-68. Each company employing such special inspectors shall, within 30 days following each annual internal inspection made by such inspectors, file a report of such inspection with the Commissioner of Labor. (1951, c. 544, s. 1.)

§ 95-63. Examination for inspectors; revocation of commission.—Application for examination as an inspector of boilers shall be in writing, and in duplicate, upon forms furnished by the Department of Labor, and shall be accompanied by a fee of ten ($10.00) dollars.

Examination for deputy or special inspectors shall be given by the board of boiler rules or by at least two examiners to be appointed by said board and must be written or part written and part oral recorded in writing and must be confined to questions the answers to which will aid in determining the fitness and competency of the applicant for the intended service and must be of uniform grade throughout the State. In case an applicant for an inspector's appointment or commission fails to pass this examination, he may appeal to the board of boiler rules for a second examination which shall be given by said board, or if by examiners appointed by said board, then by examiners other than those by whom the first examination was given and these examiners shall be appointed forthwith to give said second examination. Upon the result of this examination on appeal, the board shall determine whether the applicant be qualified. The record of any applicant's examination, whether original or on appeal, shall be accessible to him and his employer. If the applicant is successful in passing the said examination, he is entitled to a Certificate of Competency.

A commission may be revoked by the commissioner of labor upon the recommendation of the chief inspector of boilers, for the incompentence or untrustworthiness of the holder thereof or for willful falsification of any matter or statement contained in his application or in a report of any inspection. A person whose commission is revoked may appeal from the revocation to the board of boiler rules which shall hear the appeal and either set aside or affirm the revocation and its decision shall be final. The person whose commission has been revoked shall be entitled to be present in person and by counsel on the hearing of the appeal. If a certificate or commission is lost or destroyed, a new certificate or commission shall be issued in its place without another examination. A person who has failed to pass the examination for a commission or whose commission has been revoked shall be entitled to apply for a new examination and commission after ninety days from such failure or revocation. (1935, c. 326, s. 9; 1951, c. 1107, s. 5; 1951, c. 544, s. 2.)

§ 95-64. Boiler inspections; fees; certificate; suspension.—On and after April first, nineteen hundred and thirty-five, each steam boiler used or proposed to be used within this State, except boilers exempt under §95-60, shall be thoroughly inspected internally and externally while not under pressure

by the chief inspector or by one of the deputy inspectors or special inspectors provided for herein, as to its design, construction, installation, condition and operation; and if it shall be found to be suitable, and to conform to the rules and regulations of the board of boiler rules, the owner or user of a steam boiler as required in this article to be inspected shall pay to the chief inspector the sum of one dollar ($1.00) for each inspection certificate issued, and the chief shall issue to the owner or user thereof an inspection certificate specifying the maximum pressure which it may be allowed to carry. Such inspection certificate shall be valid for not more than fourteen months from its date, and it shall be posted under glass in the engine or boiler room containing such boiler, or an engine operated by it, or, in the case of a portable boiler, in the office of the plant where it is located for the time being. No inspection certificate issued for a boiler inspected by a special inspector shall be valid after the boiler for which it was issued shall cease to be insured by a duly authorized insurance company. The chief inspector or any deputy may, at any time, suspend an inspection certificate when, in his opinion, the boiler for which it was issued may not continue to be operated without menace to the public safety, or when the boiler is found not to comply with the rules herein provided for and a special inspector shall have corresponding powers with respect to inspection certificates for boilers insured by the company employing him. Such suspension of an inspection certificate shall continue in effect until said boiler shall have been made to conform to the rules and regulations of the board of boiler rules and until said inspection certificate shall have been reinstated by a state inspector, if the inspection certificate was suspended by a state inspector, or by a special inspector, if it was suspended by a special inspector. Not more than fourteen months shall elapse between such inspections and there shall be at least four such inspections in thirty-seven consecutive months. Each such boiler shall also be inspected externally while under pressure with at least the same frequency, and at no greater intervals. (1935, c. 326, s. 10; 1937, c. 125, s. 2; 1939, c. 361, s. 1.)

§ 95-64.1. Inspection of low pressure steam heating boilers, hot water heating and supply boilers and tanks.—(a) This Section applies only to low pressure steam heating boilers, hot water heating boilers, hot water supply boilers and hot water supply tanks, fired or unfired.

(b) On and after July 1, 1951, each boiler or tank proposed to be used within this State, except boilers or tanks exempt under G.S. 95-60, shall be thoroughly inspected as to their construction, installation, condition and operation as follows:

(1) Boilers and tanks shall be inspected both internally and externally biennially where construction will permit; provided that a grace period of two (2) months longer than the twenty-four (24) months period may elapse between internal inspections of a boiler or tank while not under pressure or between external inspections of a boiler or tank while under pressure. The inspection herein required shall be made by the chief inspector, or by a deputy inspector or by a special inspector, provided for in this article.

(2) If at any time a hydrostatic test shall be deemed necessary, it shall be made, at the discretion of the inspector, by the owner or user thereof.

(3) All boilers or tanks to be installed in this State after the date upon which the rules and regulations of the Board relating to such boilers or tanks become effective shall be inspected during construction as required by the applicable rules and regulations of the Board by an inspector authorized to inspect boilers and tanks in this State, or, if constructed outside the State, by an inspector holding a certificate from the National Board of Boiler and Pressure Vessel Inspectors, or a certificate of competency as an inspector of boilers for a state that has a standard of examination substantially equal to that of this State provided by G.S. 95-63.

(4) If upon inspection, a boiler or tank is found to comply with the rules and regulations of the Board, the owner or user thereof shall pay directly to the chief inspector, the sum of one dollar ($1.00) and the chief inspector, or his duly authorized representative, shall issue to such owner or user an inspection certificate bearing the date of inspection and specifying the maximum pressure under which such boiler or tank may be operated. Such inspection certificate shall be valid for not more than twenty-six (26) months. Certificates shall be posted under glass in the room containing the boiler or tank inspected or in the case of a portable boiler or tank in a metal container to be fastened to the boiler or to be kept in a tool box accompanying the boiler.

(5) No inspection certificate issued for an insured boiler or tank inspected by a special inspector shall be valid after the boiler or tank for which it was issued shall cease to be insured by a company duly authorized by this State to carry such insurance.

(6) The chief inspector or his authorizezd representative may at any time suspend an inspection certificate when, in his opinion, the boiler or tank for which it was issued, cannot be operated without menace to public safety, or when the boiler or tank is found not to comply with the rules and regulations herein provided. A special inspector shall have corresponding powers with respect to inspection certificates for boilers or tanks insured by the company employing him. Such suspension of an inspection certificate shall continue in effect until such boiler or tank shall have been made to conform to the rules and regulations of the Board, and until said inspection certificate shall have been reinstated. (1951, c. 1107, s. 6.)

§ 95-65. Operation of unapproved boiler prohibited.—On and after July first, nineteen hundred and thirty-five, it shall be unlawful for any person, firm, partnership or corporation to operate under pressure in this State a steam boiler to which this article applies without a valid inspection certificate as provided for in this article. The operation of a steam boiler without an inspection certificate, shall constitute a misdemeanor on the part of the owner, user or operator thereof and be punishable by a fine not exceeding one hundred dollars ($100) or imprisonment not to exceed thirty days, or both, in the discretion of the court. (1945, c. 326, s. 11.)

§ 95-65.1. Operation of unapproved low pressure steam heating boilers, or hot water heating and supply boilers and tanks prohibited.—On and

after July 1, 1951, it shall be unlawful for any person, firm, partnership, or corporation to operate under pressure in this State a low pressure steam heating boiler, hot water heating boiler, hot water supply boiler or hot water supply tank, fired or unfired, to which this article applies without a valid inspection certificate as provided for in this article. The operation of any such boiler or tank without an inspection certificate shall constitute a misdemeanor on the part of the owner, user, or operator thereof and be punishable by a fine not exceeding one hundred dollars ($100) or imprisonment not to exceed 30 days, or both in the discretion of the court. (1951, c. 1107, s. 7.)

§ 95-66. Installation of boilers not conforming to requirements prohibited; boilers now in use to conform.—No steam boiler or steam or hot water heating boiler or hot water supply tank or boiler, fired or unfired which does not conform to the rules and regulations formulated by the board of boiler rules governing new installations shall be installed in this State after six months from the date upon which the said rules and regulations shall become effective by the approval of the governor.

All boilers and tanks installed and ready for use, or being used, before the said six months shall have elapsed, shall be made to conform to the rules and regulations of the board of boiler rules governing existing installations and the formula therein prescribed shall be used in determining the maximum allowable working pressure for such boilers and tanks. (1935, c. 326, s. 12; 1951, c. 1107, s. 8.)

§ 95-67. Inspection of boilers during construction in state; outside state.—All steam boilers and steam and hot water supply tanks and boilers to be installed after six months from the date upon which the rules and regulations of the board of boiler rules shall become effective by the approval of the governor shall be inspected during construction by an inspector authorized to inspect boilers in this State, or if constructed outside the State, by an inspector holding a certificate of authority from the commissioner of labor of this State, which certificate shall be issued by the said commissioner of labor to any inspector who holds a certificate of authority to inspect steam boilers issued by a State which shall have adopted boiler rules that require standards of construction and operation substantially equal to those of this State, or an inspector who holds a certificate of inspection issued by the national board of boiler and pressure vessel inspectors. (1935, c. 326, s. 12; 1951, c. 1107, s. 9.)

§ 95-68. Fees for internal and external inspections.—The person using, operating or causing to be operated any boiler listed in this section, required by this article to be inspected by the chief boiler inspector or a deputy inspector, shall pay to the inspector, for the inspection of any such boiler, fees in accordance with the following schedule:

Miniature boilers, which do not exceed 18 inches inside diameter of shell,

100 pounds per square inch maximum allowable working pressure:
General inspection ..... $ 5.00
Fire tube boilers with hand holes only:
Internal inspection 6.00
External inspection while under pressure 4.00
Fire tube boilers with man holes:
Internal inspection 12.00
External inspection while under pressure 4.00
Water tube boilers ((coil type):
General inspection 6.00
Water tube boilers with not more than 500 square feet of heating surface:
Internal inspection 6.00
External inspection while under pressure 4.00
Water tube boilers with more than 500 but not more than 3000 square feet of heating surface:
Internal inspection 12.00
External inspection while under pressure 4.00
Water tube boilers with more than 3000 square feet of heating surface:
Internal inspection 20.00
External inspection while under pressure 6.00

Provided, that one ($1.00) dollar of each internal inspection fee shall be the fee for the certificate of inspection required by §95-64. The inspector shall give receipts for said fees and shall pay all sums so received to the commissioner of labor, who shall pay the same to the treasurer of the state. The treasurer of the state shall hold the fees collected under this section and under §95-64 in a special account to pay the salaries and expenses incident to the administration of this article, the surplus, with the approval of the director of the budget, to be added to the appropriation of the division of standards and inspections of the department of labor for its general inspectional service. (1935, c. 326, s. 13; 1937, c. 125, s. 3; 1939, c. 361, s. 2; 1951, c. 544, s. 3.)

§ 95-68.1. **Other inspection fees.**—The person using, operating or causing to be operated any low pressure steam heating boiler, hot water heating boiler, hot water supply boiler, or hot water supply tank, fired or unfired, required by this article to be inspected by the chief boiler inspector or a deputy inspector, shall pay to the inspector for the biennial inspection of any such boiler or tank fees in accordance with the following schedule: Provided that one dollar ($1.00) of each inspection fee shall be the fee for the certificate of inspection required by G.S. 95-64.1:

Low pressure steam and hot water boilers, equipped only with hand holes and washout plugs $3.00
Low pressure steam and hot water boilers, equipped with manhole $5.00
Hot water supply boilers $2.00
Tanks that are not equipped with manhole $2.00
Tanks equipped with manhole $4.00
(1951, c. 1107, s. 10.)

§ 95-69. **Bonds of chief inspector and deputy inspectors.**—The chief inspector shall furnish a bond in the sum of five thousand dollars ($5,000), and

each of the deputy inspectors shall furnish a bond in the sum of one thousand dollars ($1,000), conditioned upon the faithful performance of their duties and upon a true account of moneys handled by them respectively, and the payment thereof to the proper recipient. The cost of said bonds shall be paid by the state treasurer out of the special fund provided for in §95-68. (1935, c. 326, s. 14; 1937, c. 125, s. 4.)

§ 95-69.1. Appeals to board.—Any person aggrieved by an order or act of the Commissioner of Labor, or the chief inspector, under this article may, within 15 days after notice thereof, appeal from such order or act to the board which shall, within 30 days thereafter, hold a hearing after having given at least ten days written notice to all interested parties. The board shall, within 30 days after such hearing, issue an appropriate order either approving, modifying or disapproving said order or act. A copy of such order by the board shall be delivered to all interested parties. (1951, c. 1107, s. 12.)

§ 95-69.2. Court review of orders and decisions.—(a) Any order or decision made, issued or executed by the board shall be subject to review in the superior court of the county in which the inspection took place on petition by any person aggrieved filed within 30 days from the date of the delivery of a copy of the order or decision made by the board to such person. A copy of such petition for review as filed with and certified to by the clerk of said court shall be served upon the chairman of the board. If such petition for review is not filed within the said 30 days the parties aggrieved shall be deemed to have waived the right to have the merits of the order or decision reviewed and there shall be no trial of the merits thereof by any court to which application may be made by petition or otherwise, to enforce or restrain the enforcement of the same.

(b) The chairman of the board shall within 30 days, unless the time be extended by order of court, after the service of the copy of the petition for review as provided in paragraph (a) of this section, cause to be prepared and filed with the clerk of the superior court of Wake county a complete transcript of the record of the hearing, if any, had before the board, and a true copy of the order or decision duly certified. The order or decision of the board if supported by substantial evidence shall be presumed to be correct and proper. The court may change the place of hearing, (1) upon consent of the parties; or (2) when the convenience of witnesses and the end of justice would be promoted by the change; or (3) when the judge has at any time been interested as a party or counsel. The cause shall be heard by the trial judge as a civil case upon transcript of the record for review of findings of fact and errors of law only. It shall be the duty of the trial judge to hear and determine such petition with all convenient speed and to this end the cause shall be placed on the calendar for the next succeeding term for hearing ahead of all other cases except those already given priority by law. If on the hearing before the trial judge it shall appear that the record filed by the chairman of the board is incomplete, he may by appropriate order direct the chairman to certify any or all parts of the record so omitted.

(c) The trial judge shall have jurisdiction to affirm or to set aside the order or decision of the board and to restrain the enforcement thereof.

(d) Appeals from all final orders and judgments entered by the superior court in reviewing the orders and decisions of the board may be taken to the supreme court of North Carolina by any party to the action in other civil cases.

(e) The commencement of proceedings under this section shall not operate as a stay of the board's order or decision, unless so ordered by the court.

(f) The following rights may be exercised by any party in lieu of the right of review provided by the above subsections (a) through (d):

The person aggrieved by any order or decision of the board may, within 30 days after delivery to him of a copy of the board's order or decision, file an appeal and a request for trial de novo and right to jury trial in the superior court of the county in which the inspection took place. Such right must be granted. However, unless such appeal and request for right to trial de novo and jury trial is filed as provided above, such right shall be deemed waived. In the event of such trial de novo, the board shall file with the clerk of said superior court certified copy of the board's order or decision from which appeal is taken, and also, upon written request filed ten days prior to the trial, furnish to the appealing party a copy of the transcript of the record of the hearing held before the board. Any party to the action may take appeal to the superior court from any final order and judgment entered by the superior court after any such trial de novo or jury trial, which appeal shall be as in other civil actions. (1951, c. 1107, s. 12.)

BOILER RULES AND REGULATIONS

PART I

DEFINITIONS

1—COMMISSIONER

The term, COMMISSIONER, shall mean the Commissioner of Labor.

2—BOARD OF BOILER RULES

The term, BOARD OF BOILER RULES, shall mean the Board created by law and empowered to make, alter, amend, and interpret Rules and Regulations for the safe and proper construction, installation, repair, and use of boilers in this State.

3—CHIEF INSPECTOR

The term, CHIEF INSPECTOR, shall mean the Chief Boiler Inspector appointed under General Statutes 95-59.

4—DEPUTY INSPECTOR

The term, DEPUTY INSPECTOR, as used herein shall mean any Deputy Inspector of boilers appointed by the Commissioner of Labor under the provisions of General Statutes 95-61.

5—SPECIAL INSPECTOR

The term, SPECIAL INSPECTOR, shall mean an Inspector holding a North Carolina Commission, and who is regularly employed by an Insurance Company authorized to insure against loss from explosions of boilers in this State.

6—INSPECTOR

The term, INSPECTOR, shall mean the Chief Boiler Inspector or any Deputy Inspector or any Special Inspector.

7—DEPARTMENT

The term, DEPARTMENT, as used herein shall mean the Department of Labor of the State of North Carolina.

8—OWNER OR USER

The term, OWNER OR USER, as used herein shall mean any person, firm or corporation owning or operating any boiler within this State.

9—INTERNAL INSPECTION.

The term, INTERNAL INSPECTION, shall mean an inspection made when a boiler is shut down and handholes or manholes opened for inspection of the interior.

10—EXTERNAL INSPECTION

The term, EXTERNAL INSPECTION, shall mean an inspection made when a boiler is in operation.

11—CERTIFCATE OF COMPETENCY

The term, CERTIFICATE OF COMPETENCY, shall mean a certificate issued to a person who has passed an examination prescribed by the Board of Boiler Rules.

12—ASME BOILER CONSTRUCTION CODE

The term, ASME BOILER CONSTRUCTION CODE, shall mean the Boiler Construction Code of the American Society of Mechanical Engineers with amendments and interpretations thereto made and approved by the Council of the Society, whose headquarters are at 29 West 39th Street, New York, and from whom copies of the Code with all amendments and interpretations can be obtained.

13—CODE BOILER

The term, CODE BOILER, shall mean a boiler which bears the stamp of the ASME and the National Board Stamp.

14—NON-CODE BOILER

The term, NON-CODE BOILER, shall mean a boiler that does not bear the ASME and the National Board stamping.

15—SECONDHAND BOILER

The term, SECONDHAND BOILER, as used herein shall mean a boiler of which both the location and ownersip have been changed after primary use.

16—REINSTALLED BOILER

The term, REINSTALLED BOILER, shall mean a boiler removed from its original setting and re-erected at the same location or erected at a new location without change of ownership.

17—CONDEMNED BOILER

The term, CONDEMNED BOILER, shall mean a boiler that has been inspected and declared unsafe or disqualified by legal requirements by an inspector qualified to take such action who has applied a stamping or marking designating its rejection.

18—APPROVED

The term, APPROVED, shall mean approved by the Board of Boiler Rules.

19—POWER BOILER

The term, POWER BOILER, shall mean a closed vessel in which steam or other vapor (to be used externally to itself) is generated at a pressure of more than fifteen (15) lbs. per sq. in. gage by the direct or indirect application of heat to the primary vessel.

20—MINIATURE BOILER

The term, MINIATURE BOILER, as used herein shall mean any boiler which does not exceed any of the following limits: 16 inches inside

diameter of shell, 42 inch over-all length of outside to outside of heads at center, 20 square feet of water heating surface, 100 pounds per square inch maximum allowable working pressure.

21—LOW PRESSURE HEATING BOILER

The term, LOW PRESSURE HEATING BOILER, shall mean a boiler operated at pressures not exceeding 15 pounds per square inch gage steam or at pressures not exceeding 160 pounds per square inch and temperatures not exceeding 250F for water.

22—HOT WATER SUPPLY BOILER

The term, HOT WATER SUPPLY BOILER, shall mean a boiler furnishing hot water to be used externally to itself at pressures not exceeding 160 pounds per square inch and temperatures not exceeding 250F for water.

23—MAJOR REPAIR

The term, MAJOR REPAIR, as used herein shall be considered as one upon which the strength of a boiler would depend.

24—HOT WATER SUPPLY TANK

The term, HOT WATER SUPPLY TANK, shall mean a tank fired or unfired used for storage or generation of hot water to be used externally to itself.

25—FIRED RADIATORS

The term, FIRED RADIATOR, shall mean a radiator in which steam pressure is generated at a pressure of 15 lb. or less and is considered a low pressure boiler.

BOILER RULES AND REGULATIONS

PART II

ADMINISTRATION

Rule 1. Boiler manufacturers shall furnish to the district agent, or distributor of their boilers, two copies of the manufacturers data sheet; one of which shal be sent by the district agent, or distributor, directly to the Boiler Inspection Bureau of the North Carolina Department of Labor; the other to be given to the purchaser of the boiler.

Where a manufacturer sells direct to a customer, he shall be responsible for sending one copy of the manufacturers data sheet directly to the Boiler Inspection Bureau of the North Carolina Department of Labor and one copy to the purchaser. If the boilers are of special design, blue prints showing details of construction must be submitted to the North Carolina Department of Labor for approval.

Rule 2. Inspection of Boilers.

All power boilers shall be regularly inspected internally at least once every year. An external inspection shall be made annually approximately six months from the date of the internal.

All heating boilers shall be internally inspected biennially (every two years), where construction permits.

Rule 3. Examinations for Certificate of Competency.

Examinations for Certificates of Competency as Inspectors of boilers shall be at the office of the Commissioner of Labor for the State of North Carolina, or at any location to be selected by the Board, four (4) times each year, namely, the first Wednesday of the months of March, June, September and December. Application for examinations shall be submitted fifteen days prior to examination date. Special Examinations will be held when considered necessary by the Board.

Applicants for examination shall be at least twenty-five (25) years of age, and shall have had at least three (3) years' practical experience in the construction or operation of high pressure boilers as a mechanical engineer, steam engineer or boilermaker, or shall have had at least three (3) years inspection experience as an inspector of high pressure boilers. A credit of two (2) years of the required experience will be given to applicants holding a mechanical engineering degree from a recognized college of engineering.

Application for examination for Certificate of Competency shall be in writing upon a form to be furnished by the Commissioner stating the education of the applicant, a list of his employers, his period of employment and position held with each employer. Applications containing willful falsification or untruthful statements shall be rejected. If the applicant's history and experience meet with the approval of the Board of Boiler Rules, he shall be given a written examination dealing with the construction, installation, operation, maintenance and repair of boilers 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 Examining Board, a Certificate of Competency will be issued by the Chief Inspector. After expiration of ninety (90) days, an applicant who fails to pass the examination will be permitted to

take another written examination, and his acceptance or rejection will be determined by the Board on the basis of this examination.

Rule 4. Insurance Companies to Notify the Chief Inspector of Cancelled or Suspended Risks.

All Insurance Companies shall notify the Chief Inspector within thirty (30) days of all boiler risks cancelled, not renewed or suspended because of unsafe conditions.

Rule 5. Insurance Companies to Notify Chief Inspector of Defective Boilers.

If a Special Inspector, upon the first inspection of a new risk finds that the boiler or any of the appurtenances are in such condition that his company refuses insurance, the company shall immediately notify the Chief Inspector and submit a report of the defects.

Rule 6. Defective Conditions Disclosed at Time of External Inspections.

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

Rule 7. Owner to Notify Chief Inspector in Case of Accident.

When an accident occurs which serves to render a boiler inoperative, the owner or user shall immediately notify the Chief Inspector, and submit a detailed report of the accident. In case of serious accident, such as explosion, notice shall be given immediately by telephone, telegraph, or messenger and neither the boiler nor any of the parts thereof shall be removed or distributed before an inspection has been made by the Chief Inspector, Deputy Inspector, or Special Inspector, unless for the purpose of saving human life.

Rule 8. Restamping of Boilers.

When the stamping on a boiler becomes indistinct the Inspector shall instruct the owner or user to have it restamped. Request for permission to restamp the boiler shall be made to the Chief Inspector and proof of the original stamping shall accompany the request authorized by the Chief Inspector. Restamping authorized by the Chief Inspector shall be done only by an Inspector, and shall be identical with the original stamping except that it will not be required to restamp the ASME symbol. Notice of completion of such restamping shall be filed with the Commissioner by the Inspector who stamped the boiler together with a facsimile of the stamping applied.

Rule 9. Condemned Boilers.

Any boiler having been inspected and declared unsafe by the Chief or Deputy Inspector or Special Inspector shall be stamped by the Inspector as shown by the following facsimile, which will designate a condemned boiler.

X---X

Rule 10. Non-Code Boilers.

A non-code boiler now in use in this State, if removed outside the boundaries of the State, cannot be brought in and reinstalled.

Shipment of non-code boilers into this State for use, is prohibited.

Rule 11. Installing Used or Secondhand Boilers.

Before a used or secondhand boiler can be reinstalled or shipped into this State, an inspection must be made by an Inspector, and data submitted by him shall be filed by the owner or user of the boiler with the Chief Inspector for his approval.

Rule 12. Reinstalled Boilers.

In any case where a stationary boiler is moved and reinstalled, the fittings and appliances must comply with the ASME Code for New Installations.

Rule 13. Inspection of Drum Heads.

For new installations, provision shall be made to permit making inspections of the drum heads of all boilers. For existing installations, heads of lower drums shall be thoroughly examined at the annual inspection, and either a sufficient amount of brickwork shall be removed or inspection doors provided to enable this examination to be made or drilled to determine remaining thickness.

Rule 14. Repairs by Fusion Welding.

When repairs are to be made wherein fusion welding is to be used, permission shall be obtained from the Chief Inspector, a Deputy Inspector or a Special Inspector and the welding shall be done in accordance with the rules recommended by the National Board of Boiler and Pressure Vessel Inspectors.

Rule 15. Riveted Patches.

In applying riveted patches the design of the patch and method of installation shall be in accordance with the rules for riveted patches recommended by the National Board of Boiler and Pressure Vessel Inspectors.

Rule 16. Removal of Safety Appliances.

No person, except under the direction of an Inspector, shall attempt to remove or shall do any work upon any safety appliance, prescribed by these rules while a boiler is in operation. Should any of these appliances be repaired during an outage of a boiler, they must be reinstalled and in proper working order before the object is again placed in service.

No person shall in any manner load the safety valve or valves to maintain a working pressure in excess of that stated on the Certificates of Inspection.

BOILER RULES AND REGULATIONS

PART III

CONSTRUCTION, INSTALLATION, INSPECTION, MAINTENANCE AND USE

SECTION 1—NEW POWER BOILER INSTALLATION

Rule 1. All steam boilers brought into this State after November 7, 1935, except those exempt under Section 95-60 of the General Statutes of North Carolina, shall be constructed and installed in accordance with the rules and regulations of the Power Boiler Code of the American Society of Mechanical Engineers, together with the Appendix and any amendments thereto. Also said boilers must be inspected and stamped by a National Board of Boiler and Pressure Vessel Inspector as provided in Paragraph 332 of the Power Boiler Code of the American Society of Mechanical Engineers, said letters and figures to be not less than 5/16 in. in height.

Upon completion of installation, such boilers shall be inspected by the Chief Inspector, Deputy Inspector or an inspector of an authorized insurance company, commissioned to inspect boilers in this State, and shall be subject to a regular internal and external inspection, at least once each year.

All steam boilers manufactured for use in this State after December 1, 1949, shall be subject to the same requirements and Regulations set forth in this Section for and applicable to boilers brought into this State.

Rule 2. Boiler manufacturers shall furnish to the district agent, or distributor of their boilers, two copies of the manufacturers data sheet; one of which shall be sent by the district agent, or distributor, directly to the Boiler Inspection Bureau of the North Carolina Department of Labor; the other to be given to the purchaser of the boiler.

Where a manufacturer sells direct to a customer, he shall be responsible for sending one copy of the manufacturers data sheet

directly to the Boiler Inspection Bureau of North Carolina Department of Labor and one copy to the purchaser. If the boilers are of special design, blue prints showing details of construction must be submitted to the North Carolina Department of Labor for approval.

Rule 8. Inspections.

Upon completion of the installation, all boilers shall be inspected by the Chief Inspector, a Deputy Inspector, or a Special Inspector. At the time of this inspection, each boiler shall be stamped with a serial number of the State of North Carolina, said figures to be not less than 5/16 in. in height. The stamping shall not be concealed by lagging or paint and shall be exposed at all times.

SECTION 2—EXISTING INSTALLATIONS—POWER BOILERS

The following rules and regulations are hereby adopted by the Board of Boiler Rules created under Section 95-55 of the General Statutes of North Carolina and apply to boilers installed previous to July 6, 1935:

Rule 1. Maximum Allowable Working Pressure.

The maximum allowable working pressure on the shell of a boiler or drum shall be determined by the strength of the weakest SECTION OF THE STRUCTURE, computed from the thickness of the plate, the tensile strength of the plate, the efficiency of the longitudinal joint, OR TUBE LIGAMENTS, the inside diameter of the outside course and the factor of safety allowed by these rules.

$$\frac{TS \times t \times E}{R \times FS} = \text{Maximum allowable working pressure in lb. per sq. in. gage.}$$

Where
TS=ultimate tensile strength of shell plates, lb. per sq. in.
t=minimum thickness of shell plate, in weakest course, in in.
E=efficiency of longitudinal joint.
For riveted construction, E shall be determined by rules given in Paragraph P-181, of ASME Boiler Construction for Power Boilers.

For fusion welded construction, E shall be determined by rules in Paragraph P-102, of ASME Boiler Construction Code for Power Boilers.

For tube ligaments, E shall be determined by rules in Paragraph P-192 and P-193, of ASME Boiler Construction Code for Power Boilers.

For seamless construction, E shall be considered 100%.

R=one-half the inside diameter of the weakest course of shell or drum in inches.

FS=factor of safety permitted.

(a) Tensile Strength

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

(b) Crushing strength of Mild Steel

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

(c) Strength of Rivets in Shear

When computing the ultimate strength of rivets in shear the following values in lbs. per sq. in. of the cross sectional area of the rivet shanks shall be used:

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

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

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

Rule 2. **Factor of Safety.** Boiler which do not comply with the rules for new installations, in service one year after these rules become effective, shall have a factor of safety of not less than 4.5. Five years after these rules become effective, the factor of safty shall be at least 5.

Provided, however, that one year after these rules become effective all fire tube, flue and cylinder boilers with longitudinal joints of lap seam construction shall have factors of safety as follows:

a. Five for boilers not over ten years old.
b. Five and five-tenths for boilers over ten and not over fifteen years old.
c. Five and seventy-five hundredths for boilers over fifteen and not over twenty years old.
d. Six for boilers over twenty years old.

At the beginning of each five year period thereafter the factors of safety shall be increased by not less than five-tenths.

Provided, however, that if the longitudinal joints of a boiler of lap seam construction were subjected to a special inspection and investigation, which has included an examination of the walls of rivet holes, slotting of the seams and application of a hydrostatic test equal to 150% of the maximum safe working pressure, and the results indicate a reduction of pressure may be deferred for a limited length of time, the Board of Boiler Rules may authorize the chief

inspector to defer applying the greater factor of safety for such specific limited length of time as may be determined upon.

The lowest factors of safety for the Non-Code Boilers of the Water Tube Type, the longitudinal joints of which are of lap riveted construction shall be not less than the following:

a. Five for boilers not over twenty years old.
b. Five and five-tenths for boilers over twenty years old and not over twenty-five years old.
c. Six for boilers over twenty-five and not over thirty years old.

At the beginning of each five-year period thereafter the factors of safety shall be increased by not less than five-tenths.

All boilers, which do not comply with the rules for new installations, reinstalled after these rules become effective, if of lap seam construction, shall have a factor of safety of not less than 5.5 and shall be equipped with appurtenances required by the rules applying to new installations, but no structural changes in the boiler shall be required.

Boilers which do not comply with the rules for new installation and which were in this State on November 7, 1935, and which change ownership and location shall have the following factors of safety:

a. Not less than six for boilers of lap seam construction.
b. Not less than five for boilers of butt strap construction not over ten years old.
c. Not less than five and five-tenths for boilers of butt strap construction over ten years old.

In the case of boilers of the horizontal tubular type of butt joint construction, having domes over 24" diameter of lap seam construction and which change ownersrip and location, the allowable working pressure will be based on the efficiency of the dome seam and the same factors of safety shall be used as applying to boilers of lap seam construction where ownership and location have been changed. On an existing installation the allowable working pressure will be based on the longitudinal seam of the shell.

In no case shall the maximum allowable working pressure of old boilers be increased to a greater pressure than would be allowed for a new boiler of similar construction.

Rule 3. Working Pressure for Lap Seams.

The maximum allowable working pressure of a horizontal tubular boiler having a longitudinal lap joint and thirty years old or over shall be 50 pounds five years after these rules become effective. A horizontal return tubular boiler having a continuous lap seam more than 12' in length, when removed from an existing setting shall not be reinstalled and operated at a pressure in excess of fifteen pounds per sq. in.

Rule 4. Cast Iron Headers and Mud Drums.

a. 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 pounds per sq. in.

b. The maximum steam pressure on any boiler in which steam is generated, if constructed of cast iron, shall be fifteen pounds per sq. in.

Rule 5. Safety Valves.

(a) After July 1, 1951 the use of weighted-lever valves shall be prohibited and these valves shall be replaced by direct spring-loaded pop type valves that conform to the requirements of the ASME Boiler Construction Code for Power Boilers.

Safety valves having either the seat or disc of cast iron shall not be used.

Each boiler shall have at least one safety valve and if it has more than 500 sq. ft. of water heating surface or the generating capacity exceeds 2,000 lbs. per hr., it shall have two (2) or more safety valves. 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 unneccessary intervening pipe or fittings.

(b) No valve of any description shall be placed between the safety valve and the boiler nor on the escape pipe (if used) between the safety valve and the atmosphere. When an escape pipe is used, it shall be full size and fitted with an open drain to prevent lodging in the upper part of the safety valve or 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 securely anchored and supported. All safety valve discharges shall be so located or piped as to be carried clear from walkways or platforms used to control the main stop valves of boilers or steam headers.

(c) The safety valve capacity of each boiler shall be such that the safety valve or valves will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 6 per cent above the highest pressure to which any valve is set, and in no case to more than 6 per cent above the maximum allowable working pressure.

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

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

(f) In those cases where a boiler is supplied with feed water directly from pressure mains without the use of feeding apparatus (not to include return traps), no safety valve shall be set at a pressure greater than 94 per cent of the lowest pressure obtained in the supply main feeding the boilers.

(g) 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 insnfficient, additional valves shall be provided.

1. By making the 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 pressure in excess of 6 per cent above the maximum allowable working pressure.
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 valve of this fuel. These computation shall be made as outlined in the Appendix of the ASME: Boiler Construction Code for Power Boilers.
3. By determining the maximum evaporative capacity by measuring the feed water.

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

Rule 6. Boiler Feeding and Feed Piping.

All boilers shall have a feed supply which will permit the boilers being fed at any time while under pressure.

A boiler having more than 500 sq. ft. of water heating surface shall have at least two means of feeding, one of which shall be an approved feed pump, injector or inspirator. Where a source of feed directly from pressure mains is available at sufficient pressure to feed the boiler against a pressure six (6) per cent greater than the release pressure of the safety valve with the highst release setting, this may be considered one of the means.

The feed water shall be introduced into the boiler in such manner that it will not be discharged close to riveted joints of shell or furnace sheets or directly against surfaces exposed to gases at high temperature, or direct radiation from the fire.

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 volve on the branch to each boiler between the check valve and a source of supply. Whenever a globe valve is used on feed piping, the inlet shall be under the disc of the valve.

In all cases where returns are fed back to the boiler by gravity, there shall be a check valve and stop valve on 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.

Where deaereating heaters are not employed, it is recommended that the temperature of the feed water be not less than 120F to avoid the possibility of setting up localized stress. Where deaerating heat-

ers are employed, it is recommended that the minimum feedwater temperature be not less than 215F so that dissolved gases may be thoroughly released.

Rule 7. Fusible Plugs.

Fire-actuated fusible plugs if used shall conform to the requirements of the ASME Boiler Construction Code for Power Boilers.

Rule 8. Water Columns, Gage Glasses and Gage Cocks.

No outlet connections (except for damper regulator, feedwater regulator, low water fuel cut-out, drains, steam gages, or such apparatus that does not permit the escape of an appreciable amount of steam or water therefrom), shall be placed on the piping that connects the water column to the boiler. The water column shall be provided with a valved drain of at least ¾ in. pipe size, the drain to be piped to a safe location.

Each boiler shall have three or more gage cocks, located within the range of the visible length of the water glass, except when such boiler has two water glasses with independent connections to the boiler, located on the same horizontal line and net less than 2 feet apart.

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

Rule 9. Steam Gages.

Each boiler shall have a steam gage, with dial range not less than one and one-half (1½) times the maximum allowable working pressure, connected to the steam space or to the steam connection to the water column. The steam gage shall be connected to a siphon or equivalent device of sufficient capacity to keep the gage filled with water and so arranged that the gage cannot be shut off from the boiler except by a cock placed near the gage and provided with a tee or level handle arranged to be parallel to the pipe in which it is located when the cock is open.

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

Each boiler shall be provided with a ¼ in. nipple and globe valve connected to the steam space for the exclusive purpose of attaching a test gage when the boiler is in service so that the accuracy of the boiler steam gage may be ascertained.

Rule 10. Stop Valves.

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

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

When boilers provided with manholes are connected to a common steam main, the steam connection from each boiler shall be fitted with two stop valves having an ample free blow drain between them. The discharge of this drain shall be visible to the operator while manipulating the 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 to be installed in accordance with the ASME Power Boiler Code.

Rule 11. Blow-Off Piping.

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

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

Each boiler shall hhave a blow-off pipe, fitted with a valve or cock, in direct connection with the lowest water space. Cocks shall be of the gland or guard type and suitable for the pressure allowed. The use of globe valves shall not be permitted. When the maximum allowable working pressure exceeds 100 lbs. per sq. in. gage, each blow-off shall be provided with two valves or a valve and cock, such valves and cocks to be the extra heavy type.

When the maximum allowable working pressure exceeds 100 lbs. per sq. in. gage, blow-off piping shall be extra heavy from the boiler to the valve or valves, and shall be run full size without use of reducer or bushings. The piping shall be extra heavy wrought iron or steel and shall not be galvanized.

All fittings between the boiler and blow-off valve shall be steel or extra heavy fittings of malleable iron. In case of renewal of blow-off pipe or fittings, they shall be installed in accordance with the rules and regulations for new installations.

Rule 11(b) Piping.

Piping connected to the outlet of a boiler which comes within the Code requirement, shall be attached by:

(1) Screwing into a tapped opening with a screwed fitting or a valve at the other end;
(2) Screwing each end into tapered flanges, fittings, or valves with or without rolling or peening;
(3) Bolted joints including those of the Van Stone type;
(4) Expanding into grooved holes, seal welding if desired. Pipe which is expanded, rolled, or peened shall be made from open-hearth of electric-furnace steel.

Blow-off piping of fire-tube boilers shall be attached by (1) if exposed to products of combustion, or by (1), (2), or (3) if not so exposed.

Fusion welding for sealing purposes at the junction of bolted joints may be used.

Welding may be used to attach piping to nozzlzes or fittings if the rules for fusion welding or forge welding are followed.

All welded piping external to the boiler, from the boiler out to the first stop valve in a single installation, and out to the second stop valve when two or more boilers are connected to a common steam main or header, shall be installed by a Manufacturer or Contractor authorized to use any one of the ASME Code symbol stamps for pressure piping, power boilers or assembly stamps. The piping or fitting, adjacent to the welded joint farthest from the boiler shall be stamped with pressure pipe, power boiler or assembly ASME Code symbol Stamp, when approved by the Inspector.

The piping Contractor shall be responsible for the quality of the welding done by his organization and for the qualification of the procedure and of the welding operators used on the work. An authorized boiler inspector shall inspect the work and witness the final hydrostatic test and signe the data sheets if in his opinion it complies with these Rules and the ASME Code.

Rule 11(c) Gas Fired Boilers.

Gas fired boilers shall be equipped with a furnace flame control so located and connected that in the case of a flame failure the gas fuel will be completely cut off and require manual reset and purging time delay that will purge the system thoroughly before relighting.

Rule 12. 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 Code for New Installments.

Rule 13. Stamping of Existing Boilers.

Each existing boiler shall be identified by a Serial Number of the State of North Carolina. The number shall be applied by an authorized Inspector. The stamping shall be kept free of paint and lagging so that it will be plainly visible and easily read by the Inspectors.

Rule 14. Suggestions for Operation.

It is recommended that Section VII of the ASME Boiler Construction Code, covering suggested rules for the care of Power Boilers be used as a guide for proper and safe operating practices.

Rule 15. Conditions Not Covered by Rules and Regulations.

All cases not specifically covered by these rules and regulations shall be treated as New Installations or may be referred to the Chief Inspector for instructions concerning the requirements.

SECTION 3—NEW INSTALLATIONS

MINIATURE BOILERS

Miniature boilers and appurtenances installed after September 1, 1937, shall conform to the ASME Boiler Construction Code covering Miniature Boilers. Also said boilers must be inspected and stamped by a National Board of Boiler and Pressure Vessel Inspector as provided in Paragraph M-20 of the Boiler Construction Code of the American Society of Mechanical Engineers covering miniature boilers, together with the serial number of the State of North Carolina followed by the letters N.C., said letters and figures to be not less than 5/16" in height.

Upon completion of installation, such boilers shall be inspected by the Chief Inspector, Deputy Inspector, or an inspector of an authorized insurance company, commissioned to inspect boilers in this State, and shall be subjected to a regular internal and external inspection, at least once each year.

SECTION 4—EXISTING INSTALLATIONS

MINIATURE BOILERS

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

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

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

Where

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

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

E=efficiency of longitudinal joint, method of determining which is given in Pa. P-181, Page 27, ASME Code Book. See Note.

E=for seamless boilers shall be 100%.

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

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

FS=factor of safety allowed by these rules.

Note: To be used as given above for longitudinal joints, riveted

construction or if for fusion welded joints, E. shall be taken as per efficiency specified in Par. P-102, ASME Boiler Code.

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

Rule 2. The construction of miniature boilers, except where otherwise specified, shall conform to that required for power boilers. The flat surfaces of boilers or pressure parts shall be stayed in accordance with Par. P-203 of Section 1 of the ASME Code.

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

Rule 4. Every miniature boiler shall be fitted with suitable washout plugs of 1 in. iron pipe size, which shall be screwed into openings in the shell near the bottom. In miniature boilers of the closed-system type heated by removable internal electrical heating elements, the openings for these elements when suitable for cleaning purposes, may be substituted for washout openings. All threaded openings in the boiler shall be provided with a riveted or welded reinforcement if necessary to give four full threads therein.

Rule 5. Every miniature boiler shall be provided with at least one feed pump or other feeding device, except where it is connected to a water main carrying sufficient pressure to feed the boiler, or where the steam generator is operated with no extraction of steam (closed system). In the latter case, in lieu of a feeding device, a suitable connection or opening shall be provided to fill the generator when cold. Such connection shall be not less than ½" pipe size.

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

Rule 6. Each miniature boiler shall be fitted with feedwater and bolw-off connections, which shall not be less than ½ in. iron-pipe size unless operated on a closed system as provided in Rule 5. The feed pipe shall be provided with a check valve and a stop valve. The feedwater may be delivered to the boiler through the blow-off connection, if desired. The blowoff shall be fitted with a valve or cock in direct connection with the lowest water space practicable.

Rule 7. Each miniature boiler for operation with a definite water level shall be equipped with a glass water gauge for determining the water level. The lowest permissible water level shall be at a point one-third of the height of the shell, except where the boiler is

equipped with internal furnace, when it shall be not less than one-third of the length of the tubes above the top of the furnace. In the case of small generating units operated on the closed system where there is insufficient space for the usual glass water gauge water level indicator of the glass bull's-eye type may be used.

Rule 8. Each miniature boiler shall be equipped with a steam gauge having its dial graduated to not less than 1½ times the maximum allowable working pressure. The gauge shall be connected to the steam space or to the steam connection to the water column by a brass or bronze composition siphon tube, or equivalent device that will keep the gauge tube filled with water.

Rule 9. Each miniature boiler shall be equipped with a sealed spring-loaded pop safety valve, not less than ½ inch in diameter, connected directly to the boiler. Where there is no extraction of steam (closed system) a fracturing disk safety valve may be used in addition to the spring-loaded pop safety valve. The safety valve shall be plainly marked by the manufacturer with a name or an identifying trademark, the nominal diameter, and the steam pressure at which it is to set to blow. The safety valve capacity of each boiler shall be such that the safety valve or valves will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 6 per cent above the maximum allowable working pressure, or more than 6 per cent above the highest pressure to which any valve is set.

Rule 10. Each steam line from a miniature boiler shall be provided with a stop valve located as close to the boiler shell or drum as is practicable, except when the boiler and steam receiver are operated as a closed system.

Rule 11. Where miniature boilers are gas-fired, the burners used shall conform to the requirements of the American Gas Association, as given in Par. M-18 of the ASME Code. The burners shall in such cases be equipped with a fuel-regulating governor, which shall be automatic and regulated by the steam pressure. This governor shall be so constructed that in the event of its failure, there can be no possibility of steam from the boiler entering the gas chamber or supply pipe.

Rule 12. Gas Burners.
For installations which are gas-fired, the burners used shall conform to the requirements of the American Gas Association, as stated in the ASME Boiler Construction Code, Section V.

Rule 13. Flue Connection.
Each gas-fired boiler shall be equipped with a four-inch vent pipe or flue extended to an approved location outside the building or connected to a chimney flue. Where the horizontal run is more than ten feet the vent shall be increased to six inches. A draft hood of approved design shall be provided on each boiler.

SECTION 5—NEW INSTALLATION

HEATING BOILERS

Rule 1. Requirements.

After January 1, 1952, no heating boiler, except reinstalled boilers and those exempted under Section 95-60 of the General Statutes of North Carolina, shall hereafter be installed in this State unless it has been constructed, inspected and stamped in conformity with Section IV of the ASME Boiler Construction Code and is approved, registered and inspected in accordance with the requirements of these Rules and Regulations.

All new heating boiler installations, including reinstalled boilers, must be installed in accordance with the requirements of the latest revision of the ASME Boiler Construction Code and these Rules and Regulations, and Rules A.C. of Section 6.

A hot water vessel which is directly fired with oil, gas, coal or electricity exceeding any one of the following limitations is a hot water boiler and is to be built in accordance with the ASME Low Pressure Heating Boiler Code:

(a) A heat input of 100,000 BTU per hour.

(b) A water temperature of 200 degrees Fahrenheit.

(c) A nominal water containing capacity of 120 gallons.

Boilers which do not exceed any of the above limitations shall be protected by an ASME and NB approved type safety relief valve set at or below the working pressure of the vessel and of proper size.

Copper or steel coil tube type water heaters which are not covered by the ASME Boiler Code that have been designed and constructed as safe as otherwise provided in the ASME Code and are A.G.A. approved, equipped with approved safety devices and are equipped with an ASME and NB approved type safety relief valve of proper size to relieve the total capacity of the BTU input, set to relieve at not more than 125 pounds psi and in no case more than the working pressure of the Heater or vessel. Will be accepted by the North Carolina Board of Boiler Rules.

Rule 2. Inspections.

Upon completion of the installation, all boilers shall be inspected biennially (every two years) by the Chief Inspector, a Deputy Inspector or a Special Inspector. At the time of this inspection, all steel heating boilers must be stamped with the serial number of the State of North Carolina, preceded by the letters N.C., said letters and figures to be not less than 5/16 inch in height. All cast iron heating boilers shall have securely attached to the boiler in a conspicuous location a metal tag not less than one (1) inch in height, which shall have the serial number of the State of North Carolina stamped thereon.

It is recommended that the return water connections to all low pressure steam heating boilers supplying a gravity return heating

system be so arranged as to form what is known as the "Water Line Return" so that the water cannot be forced out of the boiler below the safe water level. This connection is shown in Figure H-3, Section IV, ASME Boiler Construction Code, Section IV.

SECTION 6—EXISTING INSTALLATIONS

HEATING BOILERS

The following rules and regulations are hereby adopted by the Board of Boiler Rules created under Section 95-55 of the General Statutes of North Carolina and apply to boilers installed previous to July 1, 1951:

Rule 1. ASME Code Boilers.
The maximum allowable working pressure of a boiler built in accordance with the ASME Code shall in no case exceed the pressure indicated by the manufacturer's identification stamped or cast upon the boiler or upon a plate secured to it.

Rule 2. Non-Code Riveted Boilers.
The maximum allowable working pressure on the shell of a non-code riveted heating boiler shall be determined in accordance with Section 2, Rule 1, covering Existing Installations, Power Boilers, except that in no case shall the maximum allowable working pressure of a steam heating boiler exceed 15 pounds, or a hot water boiler exceed 160 pounds at a temperature not exceeding 250 degrees fahrenheit.

Rule 3. Non-Code Welded Boilers.
upper part of the valve or in the pipe. When an elbow is placed
The maximum allowable working pressure of a non-code steel or wrought iron heating boiler of welded construction shall not exceed 15 pounds. For other than steam service the maximum allowable working pressure shall be calculated in accordance with Section IV of the ASME Code.

Rule 4. Non-Code Cast Iron Boilers.
The maximum allowable working pressure of a non-code boiler composed principally of cast iron shall not exceed 15 pounds for steam service or 30 pounds for hot water service.

The maximum allowable working pressure of a non-code boiler having cast iron shell or heads and steel or wrought iron tubes shall not exceed 15 pounds for steam service or 30 pounds for water service.

Rule 5. Fired Radiators.
A radiator in which steam pressure is generated at a pressure of 15 pounds or less is considered a low pressure boiler.

Rule 6. General.

If in the judgment of the Inspector a steam heating boiler is unsafe for operation at the pressure previously approved, the pressure shall be reduced, proper repair made, or the boiler retired fom service.

Rule 7. Safety Valves. (Connections for)

The area of the opening shall be at least equal to the aggregate area based on the nominal diameters of all of the safety valves with which it connects. A screwed connection may be used for attaching a safety valve.

Rule 8. Safety Valves. (a) Each steam boiler shall have one or more officially rated safety valves of the spring-pop type adjusted and sealed to discharge at 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 of the boiler.

(b) Each safety valve ¾ in. or over, used on a steam heating boiler, shall have a substantial device which will positively lift the disk from its seat at least 1/16 in. when there is no pressure on the boiler. The seats and disks shall be of suitable material to resist corrosion.

(c) No safety valve for a steam boiler shall be smaller than ¾ in. except in case the boiler and radiating surfaces are a self-contained unit. No safety valve shall be larger than 4½ in. The inlet opening shall have an inside diameter approximately equal to, or greater than, the seat diameter.

(d) The minimum size of valve or valves shall be governed by the capacity marking on the boiler called for in Par. H-68.

(e) The minimum valve capacity in pounds per hour shall be determined by dividing the maximum Btu output at the boiler nozzle obtained by the firing of any fuel, for which the unit is designed, by 1000 or by multiplying the square feet of heating surface by 5. 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 (f) shall be met.

(f) The steam safety valve capacity for each boiler shall be such that with the fuel-burning equipment installed, the pressure cannot rise more than 5 lbs. above the maximum allowable working pressure of a steam boiler.

(g) 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 (f). The additional valves required, on account of changed conditions, may be installed on the outlet piping provided there is no intervening valve.

Rule 9. **Relief Valves.** (a) Each hot water heating boiler shall have AT LEAST one officially rated ASME and NB approved type pressure 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 officially rated ASME and NB approved type relief valve OR AT LEAST ONE OFFICIALLY RATED ASME AND NB APPROVED TYPE PRESSURE-TEMPERATURE RELIEF VALVE OF THE AUTOMATIC RESEATING TYPE SET TO RELIEVE AT OR BELOW THE MAXIMUM ALLOWABLE PRESSURE OF THE BOILER. WHEN MORE THAN ONE RELIEF VALVE IS USED ON EITHER HOT WATER HEATING OR HOT WATER SUPPLY BOILERS, THE ADDITIONAL VALVE OR VALVES SHALL BE OFFICIALLY RATED ASME & NB APPROVED TYPE AND MAY BE SET WITHIN A RANGE NOT TO EXCEED 20% OF THE LOWEST PRESSURE TO WHICH ANY VALVE IS SET UP TO 30 psi and 10% FOR PRESSURES OVER 30 psi. Relief valves shall be spring loaded without disc guides on the pressure side of the valve. Relief valves shall be so arranged that they cannot be reset to relieve at a higher pressure than the maximum PERMITTED BY THIS PARAGRAPH.

(b) No relief valve shall be smaller than ¾ in. nor larger than 4½ 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 ¼ in. diameter or its equivalent area.

(c) The REQUIRED steam relieving capacity, in pounds per hour OF THE PRESSURE RELIEVING DEVICE OR DEVICES ON A BOILER shall be determined by dividing the maximum Btu output at the boiler nozzle obtained by the firing of any fuel for which the unit is designed by 1000 or by multiplying the square feet of heating surface by 5. In many cases a greater relieving capacity of valves will have to be provided than the minimum specified by these rules. In every case, this requirement shall be met by installing additional safety relief valves.

(d) 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. The additional valves required, on account of changed conditions, may be installed on the outlet piping provided there is no intervening valve.

Rule 10. (a) SAFETY VALVES shall be connected to the top of boilers, with the spindle vertical, either directly to a tapped or flanged opening in the boiler or to a fitting connected to the boiler by a close nipple, to a Y base or to a valveless steam pipe between adjacent boilers, or to a valveless header connecting outlets on the same boiler.

(b) RELIEF VALVES shall be connected to the top of boilers, with the spindle vertical, either directly to a tapped or flanged opening in the boiler or to a fitting connected to the boiler by a close nipple, to a Y base or to a valveless hot water pipe between

adjacent boilers, or to a valveless header connecting water outlets on the same boiler.

(c) When a Y base is used the inlet area shall be not less than the combined outlet areas. When the size of the boiler requires a safety valve or relief valve larger than 4½ in. diameter, two or more valves having the required combined capacity shall be used.

Rule 11. NO SHUTOFF of any description shall be placed between the safety or relief valve and the boiler, nor on discharge pipes between such valves and the atmosphere. Safety and relief valves shall not be connected to an internal pipe in the boiler.

Rule 12. Relief or Safety Valve Discharge.
When a discharge pipe is used, its area shall be not less than the area of the valve or aggregate area based on the nominal diameters of the valves with which it connects, and the discharge pipe shall be fitted with an open drain to prevent water from lodging in the on a safety- or relief-valve discharge pipe, it shall be located close to the valve outlet. The pipe shall be supported so that no undue stress is placed on the valve body. The discharge from safety or relief valves shall be so arranged that there will be no danger of scalding attendants.

Rule 13. Steam Gage.
Each steam boiler shall have a steam pressure gage connected to the steam space of the boiler itself or on steam pipe near the boiller. The graduations of the steam gage shall not be less than 30 pounds on a compound gage, effective stops shall be set at the limits of the gage readings on both the pressure and vacuum sides.

Rule 14. Pressure or Altitude Gages. Each hot-water heating 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.

The scale on the dial of the pressure or altitude gage shall be graduated to not less than 1½ times the maximum allowable working pressure. The gage shall be provided with effective stops for the indicating pointer at the zero-point and at the maximum pressure point.

Pressure- or altitude gage connections shall be of nonferrous composition when smaller than 1-in. pipe size and longer than 5 ft. between the gage and point of connection of pipe to boiler, and also when smaller than ½-in. pipe size and shorter than 5 ft. between the gage and point of connection of pipe to boiler.

Rule 15. Thermometers. Each hot-water heating 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.

Rule 16. Temperature Combustion Regulators. A temperature combustion regulator, which will control the rate of combustion to prevent the temperature of the water from rising above 250F at or near the outlet, or a thermostatic device which will relieve the pressure on the boiler when the temperature exceeds 250F, shall be used on all hot-water heating and hot-water supply boilers automatically fired.

Rule 17. Bottom Blow-off and/or Bottom Drain.

Each boiler shall have a bottom blow-off pipe connection fitted with a gate or "Y" type valve, connected with the lowest water space practicable, size of blow-off piping and valves as follows:

¾"—up through a Net SBI rating steam	1300 sq. ft.
and/or boiler heating surface	100 sq. ft.
1"—from a Net SBI rating steam	1301 sq. ft.
and/or boiler heating surface	101 sq. ft.
up through	
a Net SBI rating steam	3500 sq. ft.
and/or boiler heating surface	250 sq. ft.
1½"—from a Net SBI rating steam	3501 sq. ft.
and/or boiler heating surface	251 sq. ft.
up through	
a Net SBI rating steam	16,000 sq. ft.
and/or boiler heating surface	1200 sq. ft.
2"—from a Net SBI rating steam	16,001 sq. ft.
and/or boiler heating surface	1201 sq. ft.
UP	

Hose bib valve may be installed in addition to the above required blow-off valves.

All blow-off valves are to be piped full size without reducing to a drain, sump or outside building so as to prevent injury to personnel.

Rule 18. Water Gage Glass and Gage Cocks.

Each steam boiler shall have at least one water gage glass with the lowest visible part above the heating surfaces in the primary combustion chamber. When, in the judgment of an Inspector, the heating surfaces above the low water line may be injured by contact with gases of high temperature the water gage glass shall be raised until the lowest visible part of the gage glass is above such heating surface.

Each steam boiler shall have two or more gage cocks located within the visible length of the water gage glass; except when such boiler is provided with two water gage glasses.

WATER LEVELS

Steel Boilers

The water glass, water column and water level control and cut off on steel fire tube boilers shall be installed with the bottom nut on the water glass not less than 1" above the top row of tubes, and the cut out control installed so it will cut off the firing mechanism with not less than 1" of water showing in the water glass.

Cast Iron Boilers

The front section of cast iron boilers have marked in the casting the normal water level line and the gauge glass, water column and water level control and cut-out shall be so located that this is the normal operating level. The water control and the low water cut-out should operate in relation to the gauge glass as mentioned above and so the water does not fall more than 2" below the normal water level mark on the boiler casting before the cut-out control cuts off the firing mechanism.

Rule 19. Stop Valves and Check Valves.

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

If any part of a reverse flow hot water heating boiler may be isolated from the remainder of the system by closing a stop valve, there shall be a check valve in the return pipe between the boiler and the system.

Rule 20. Feed Water Connections.

Feed water or make-up water shall not be discharged directly into any part of a boiler exposed to the direct radiant heat from the fire.

Feed water shall not be introduced through the opening or connections used for the safety valves, relief valves, water column, pressure gauge and control fittings or the water gauge glass.

The feed or make-up water shall be connected to the piping system and not directly to the boiler and shall have a stop valve and a check valve in the feed water line at the boiler.

Rule 21. Return Pump.

Each condensate return pump where practicable shall be provided with an automatic water level control set to maintain the water level within the limits of two gage cocks.

Rule 22. Repairs and Renewals of Fittings and Appliances.

Whenever repairs are made to fittings or appliances or it becomes necessary to replace them, the work must comply with the Code for New Installations.

Rule 23. Gas Fired Boilers.

Gas fired boilers shall be equipped with a furnace flame control so located and connected that in the case of a flame failure the gas fuel will be completely cut off and require manual reset and purging time delay that will purge the system thoroughly before relighting.

Rule 24. Expansion or Cushion Tanks.

When any one of the following limitations are exceeded expansion or cushion tanks shall be constructed for a working pressure not less than that of the boiler and stamped in accordance with the ASME Unfired Pressure Vessel Code.

(a) A water temperature of 200 degrees Fahrenheit

(b) A safety relief valve setting or a water working pressure of 30 psi.

All hot-water heating systems shall be so installed that there will be no opportunity for the fluid-relief column to freeze or to be accidentally shut off.

If the system is equipped with an open expansion tank, an indoor overflow from the upper portion of the expansion tank must be provided in addition to the open vent, the indoor overflow to be carried within the building to a suitable plumbing fixture or to the basement. If the system is of the closed type, an airtight tank or other suitable air cushion must be installed that will be consistent with the volume and capacity of the system. The required minimum capacity of the cushion tank may be determined from the following table or from the formula in the next paragraph. Provisions must be made for draining the tank without emptying the system.

Sq. Ft. of Equivalent Direct Radiation Installed	*Gallon Tank*
Up to 350	18
Up to 450	21
Up to 650	24
Up to 900	30
Up to 1100	35
Up to 1400	40
Up to 1600	2-30
Up to 1800	2-30
Up to 2000	2-35
Up to 2400	2-40

For systems with more than 2400 sq. ft. of installed equivalent direct water radiation, the required capacity of the cushion tank shall be increased on the basis of one gallon tank capacity per 33 sq. ft. of additional equivalent direct radiation.

The following formula may be used when the necessary information is available.

$$V_t = \frac{(0.00041\ T - 0.0466)\ V_s}{\frac{P_a}{P_f} - \frac{P_a}{P_o}}$$

where V_t = minimum volume of tanks, gal.

V_s = volume of system, not including tanks, gal.

T = average operating temperature, deg. F.

P_a = atmospheric pressure, psia

P_f = fill pressure, psia

P_o = maximum operating pressure, psia.

SECTION 7—NEW INSTALLATIONS

HOT WATER SUPPLY TANKS (Fired or Unfired)

Rule 1. After January 1, 1952, no hot water supply tank (fired or unfired) larger than any one of the following conditions:

(a) A heat input of 200,000 BTU's

(b) A water temperature of 200°F

(c) A nominal water containing capacity of 120 gallons

Except reinstalled tanks and those exempted under Section 95-60 of the General Statutes of North Carolina, shall hereafter be installed in this State unless it has been constructed, inspected by a National Board of Boiler and Pressure Vessel Inspector and stamped in conformity with the ASME Boiler Construction Code and is approved and inspected in accordance with the requirements of these Rules and Regulations A.C. and Section 8. Tanks of 120 gallons capacity and less, shall be protected by ASME and National Board approved type safety devices.

Rule 2. **Inspections.**

Upon completion of the installation, all tanks shall be inspected by the Chief Inspector, a Deputy Inspector, or a Special Inspector biennially (every two years). At the time of this inspection, all tanks must be stamped with the serial number of the State of North Carolina, preceded by the letters N. C. said letters and figrues to be not less than 5/16 inch in height, or shall have securely attached to the tank in a conspicuous place, a metal tag not less than one (1) inch in height which shall have the serial number of the State of North Carolina stamped thereon.

SECTION 8—EXISTING INSTALLATIONS

HOT WATER SUPPLY TANKS

No hot water supply tank larger than 120 gallons capacity except reinstalled tanks and those exempted under Section 95-60 of the General Statutes of North Carolina shall hereafter be installed in this State unless it is approved and inspected in accordance with the requirements of these Rules and Regulations for existing installations. Tanks of 120 gallons capacity and less, shall be protected by ASME and National Board approved type safety devices.

Rule 1. The maximum allowable working pressure of a tank built in accordance with the ASME Code shall in no case exceed the pressure indicated by the manufacturer's identification stamped or cast upon the tank or upon a plate secured to it.

Rule 2. **Non-Code Riveted Tanks.**

The maximum allowable working pressure on the shell of a non-code riveted tank shall be determined in accordance with Section 2, Rule 1, covering Existing Installations, Power Boilers except that in no case shall the maximum allowable working pressure of a hot water supply tank exceed the working pressure figured on the strength of the weakest section of the structure.

Rule 3. **Non-Code Welded Tanks.**

The maximum allowable working pressure of a non-code tank of welded or brazed construction shall not exceed the allowable working pressure calculated in accordance with Section 2, Rule 1 using the following joint efficiencies:

For fusion welded joints—

Single lap weld	40%	Forge weld	70%
Double lap weld	60%	Brazed steel	80%
Single butt weld	50%	Brazed copper	90%
Double butt weld	70%		

Rule 4. **General.**

If in the judgment of the Inspector a hot water supply tank is unsafe for operation at the pressure previously approved, the pressure shall be reduced, proper repair made, or the tank retired from service.

Rule 5. **Water Relief Valves.**

Each hot water supply tank shall have at LEAST ONE OFFICIALLY RATED ASME AND NATIONAL BOARD APPROVED TYPE RELIEF VALVE or at least one officially rated ASME and National Board approved type pressure temperature relief valve of the automatic reseating type set to relieve at or below the maximum allowable working pressure of the tank. When more than one relief valve is used on either hot water heating or hot water storage tanks or boilers, the additional valve or valves shall be of officially rated ASME and National Board approved type and may be set within the range not to exceed 20% of the lowest pressure at which any valve is set. Relief valves shall be spring loaded without disc guides on the pressure side of the valve. RELIEF VALVES shall be so arranged that they CANNOT be RESET TO RELIEVE at a HIGHER PRESSURE than the MAXIMUM PERMITTED by this paragraph.

No relief valve shall be smaller than ¾ in., nor larger than 4½ in. standard pipe size. All relief valves are to be ASME and NB APPROVED TYPE AND SO STAMPED.

When a hot water supply or storage tank is HEATED INDIRECTLY by STEAM IN A COIL OR PIPE, the pressure of the steam used shall not EXCEED THE SAFE WORKING PRESSURE OF THE HOT WATER TANK, AND A RELIEF VALVE OF AT LEAST 1 IN. DIAMETER, PIPE SIZE, SET TO RELIEVE AT OR BELOW THE MAXIMUM ALLOWABLE WORKING PRESSURE OF THE TANK, SHALL BE INSTALLED ON TOP OF THE TANK.

PRESSURE REDUCING VALVES may be used in the city feed lines where city pressure or water pressure is more than 75% of the safe working pressure of tank or boiler.

Relief valves shall be connected to the top of the tank, with the spindle vertical, if possible, either directly to a tapped or flanged opening in the tank, to a fitting connected to the tank by a close nipple, to a valveless hot water pipe between the relief valve and the top of the tank.

Rule 6. Factors of Safety.

The minimum factor of safety shall in no case be less than four (4) for vessels up to and including twenty (20) years of age and shall be not less than 4½ where the age of the vessel is more than twenty years. These factors of safety may be increased when deemed necssary by the Inspector to insure the operation of the vessel within safe limits. The condition of the vessel and the particular service it is being subject to will be the determining factor.

Rule 7. Inspection of Inaccessible Parts.

Where in the opinion of the Inspector, as the result of conditions disclosed at an inspection, it is advisable to remove interior or exterior lining, covering or brick work to expose certain parts of the vessel not normally visible, the owner or user shall remove such material to permit proper inspection and the drilling of any part of the vessel where necessary to ascertain thickness.

Rule 8. Safety Appliances.

Each hot water tank shall be protected by such relief valves and devices as will insure its safe operation. These valves and devices shall be so constructed, located and installed that they cannot readily be rendered inoperative.

Rule 9. Stop and Check Valve.

There shall be a stop and check valve in the feed water supply line to the tank.

Rule 10. Flue Connection.

Each fired tank or fired coil heater shall be equipped with a three-inch vent pipe or flue extended to an approved location outside the building or connected to a chimney flue. Where the horizontal run is more than ten feet the vent shall be increased to six inches. A draft hood of approved design shall be provided on each tank.

SECTION 9—GENERAL REQUIREMENTS

Rule 1. Inspection of Boilers.

All boilers, unless otherwise exempt by these Rules and Regulations, and which are subject to regular inspections as provided for in General Statutes 95-64 and 95-64.1, shall be prepared for such inspection or hydrostatic tests whenever necessary, by the owner or user when notified by the Chief Inspector, Deputy Inspector, or Special Inspector.

The owner or user shall prepare each boiler for internal inspection, and shall prepare for and apply the hydrostatic test whenever necessary, on the date specified by the Chief Inspector, Deputy Inspector, or Special Inspector, which date shall be not less than seven (7) days after the date of notification.

Rule 2. Package Type Boiler—Coil Type.

A thorough inspection shall be made each year with the boiler in service, and shall be reported on the regular internal inspection forms. It will be known as a "General Inspection" and will be re-

quired each year and certificate will be issued upon receipt of this inspection report.

Rule 3. Preparation for Internal Inspection.

The owner or used shall prepare a boiler for internal inspection in the following manner:

(a) Water shall be drawn off and the boiler thoroughly washed.
(b) All manhole and handhole plates, wash-out plugs, and plugs in water column connections shall be removed, the furnace and combustion chambers thoroughly cooled and cleaned.
(c) All grates of internally fired boilers shall be removed.
(d) At each annual inspection brickwork shall be removed as required by the Inspector in order to determine the condition of the boiler, headers, furnace, supports or other parts.
(e) The steam gage shall be removed for testing.
(f) Any leakage of steam or hot water into the boiler shall be cut off by disconnecting the pipe or valve at the most convenient point.

Rule 4. Boilers Improperly Prepared for Inspection.

If a boiler or tank has not been properly prepared for an internal inspection or the owner or user fails to comply with the requirements for hydrostatic test as set forth in these rules, the Inspector may decline to make the inspection or test and the Certificate of Inspection shall be withheld until the owner or user complies with the requirements.

Rule 5. Removal of Covering to Permit Inspection.

If the boiler is jacketed so that the longitudinal seams of sheels, drums, or domes cannot be seen, enough of the jacketing, setting wall, or other form of casting or housing shall be removed so that the size of the rivets, pitch of the rivets, and other data necessary to determine the safety of the boiler may be obtained, provided such information cannot be determined by other means.

Rule 6. Lap Seam Crack.

The shell or drum of a boiler in which a lap seam crack is discovered along a longitudinal riveted joint shall be immediately discontinued from use. If the boiler is not more than fifteen (15) years of age, a complete new course of the original thickness may be installed at the discretion of the Inspector (and after approval by the Chief Inspector). Patching is prohibited. (By "lapseam crack" is meant the typical crack frequently found in lap seams, extending parallel to the longitudinal joint and located either between or adjacent to rivet holes).

Rule 7. Hydrostatic Pressure Tests.

A hydrostatic pressure test, when applied to boilers of riveted or welded construction, except locomotive boilers, shall not exceed one ane one-half (1½) times the maximum allowable working pressure. Hydrostatic pressure applied to locomotive boilers shall not exceed one and one-quarter (1¼) times the maximum allowable working

pressure. During the hydrostatic pressure test, the safety valve or valves shall be removed or each valve disc shall be held down by means of a testing clamp and not by applying additional load to the spring with the compression screw. It is suggested that the minimum temperature of the water used to apply a hydrostatic test be not less than 70F. but the maximum temperature shall not exceed 160F.

Note: When hydrostatic test is to be applied to existing installations, the pressure shall be as follows:

(a) For all cases involving the question of tightness the pressure shall be equal to the relieving pressure of the safety valve or valves having the lowest relief setting.

(b) For all cases involving the question of safety, the pressure shall be equal to one and one-half (1½) times the maximum allowable working pressure, except for locomotive boilers, in which case it shall be one and one-quarter (1¼) times the maximum allowable working pressure.

Rule 8. Low Water Fuel Cut-offs.

All automatically-fired steam or vapor boilers, excepting boilers having a constant attendant who has no other duties while the boiler is in operation, shall be equipped with an automatic low-water fuel cut-off and/or waterfeeding device so constructed that the water inlet valve cannot feed water into the boiler through the float chamber, and so located as to automatically cut off the fuel supply and/or supply requisite feedwater when the surface of the water falls to the lowest safe water line. This point should be not lower than the bottom of the water glass.

Such a fuel or feedwater control device may be attached direct to a boiler or 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 ½ inch 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 straight-way tapping of the Y or tee to take the water glass fittings, the side outlet of the Y or the tee to take the fuel cut-off or waterfeeding device. The ends of all nipples shall be reamed to full size diameter.

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.

Rule 9. Safety Appliances.

No person shall remove or tamper with any safety appliance prescribed by these rules except for the purpose of making repairs. The resetting of safety appliances shall be done in the presence of an authorized Inspector.

Rule 10. Location of Blow-offs.

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

Rule 11. Supports.

Each boiler shall be supported by masonry or structural supports of sufficient strength and rigidity to safely support the boiler and its contents. There shall be no excessive vibration in either the boiler or its connecting piping.

Rule 12. Pressure Reducing Valves.

Where pressure reducing valves are used one or more relief or safety valves shall be provided on the low pressure side of the reducing valve in case the pipe or equipment on the low pressure sides does not meet the requirements for the full initial pressure. The relief or safety valves shall be located adjoining to or as close as possible to the reducing valve. Proper protection shall be provided to prevent injury or damage caused by the escaping steam from the discharge or relief or safety valves if vented to the atmosphere. The combined discharge capacity of the 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 sticks open.

The use of hand-controlled by-passes around reducing valves is permissible. The by-pass if used around a reducing valve shall not be greater in capacity than the reducing valve unless the piping or equipment is adequately protected by relief valves or meets the requirements of the high pressure system.

It is mandatory that a pressure gage be installed on the low pressure side of a reducing valve.

Rule 13. Electric Steam Generators.

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

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

A suitable screen or guard shall be provided around high tension bushings and a sign posted warning of high voltage. This screen or guard shall be so located that it will be impossible for anyone working around the generator to accidentally come in contact with the high tension circuits. When adjusting safety valves, the power circuit to the generator shall be open. The generator may be under steam pressure but the power line shall be open while the operator is making the necessary adjustments.

Each kw of electrical energy consumed by an electrical steam generator operating at maximum rating shall be considered the equivalent of 1 sq. ft. of heating surface of a fire tube boiler when determining the required amount of safety valve capacity.

Rule 14. Major Repairs.

Repairs to all boilers and appurtenances thereof shall conform to the latest revision of the ASME Boiler Construction Code. Where a repair affecting the safety of the boiler is necessary, an authorized

Inspector shall be called for consultation and advice as to the best method of making the repair and the completed work shall be subject to his approval.

Rule 15. Repairs by Fusion Welding.

When repairs are to be made involving the use of welding, permission to proceed with the work must be obtained from the Chief Inspector, Deputy Inspector or Special Inspector. All repairs by welding shall be completed in accordance with Recommended Rules for Repairs by Fusion Welding to Power Boilers and Unfired Pressure Vessels issued by the National Board of Boiler and Pressure Vessel Inspectors.

Rule 16. Riveted Patches.

In applying riveted patches the design of the patch and method of installation must be in accordance with the rules for riveted patches recommended by the National Board of Boiler and Pressure Vessel Inspectors.

Rule 17. Clearance.

When high pressure boilers are replaced or new boilers are installed which have manhole openings on top of the boiler, in either existing or new buildings, A MINIMUM HEIGHT OF AT LEAST FIVE (5) FEET SHALL BE PROVIDED BETWEEN THE TOP OF THE BOILER PROPER AND ANY OVERHEAD OBSTRUCTION EXCEPT IN SINGLE INSTALLATIONS OF SELF-CONTAINED BOILERS WHICH DO NOT have MANHOLE OPENINGS such as STEAM GENERATORS and similar PACKAGE TYPE BOILERS which can be operated, inspected and maintained from the floor level, shall have three (3) FEET MINIMUM CLEARANCE FROM THE BOILER PROPER AND THE CEILING.

LOW PRESSURE BOILERS, cast iron or steel, shall have a MINIMUM HEIGHT from the BOILER PROPER to the CEILING of not less than THREE (3) FEET, and if a MANHOLE OPENING is provided ON TOP of the BOILER ADEQUATE HEIGHT above the THREE (3) FEET MINIMUM shall be ALLOWED for the proper operating maintenance and inspection of these boilers.

All boilers shall be SO LOCATED that ADEQUATE SPACE WILL BE PROVIDED for proper operation of the boiler and its appurtenances, for the inspection of all surfaces, tubes, water walls, economizers, piping, valves and other equipment and for their necessary maintenance and repair.

Rule 18. Shop Inspection.

Any new boiler being constructed for installation in the State of North Carolina shall be shop inspected by an inspector holding a North Carolina Commission, a National Board Commission or a commission issued by a State that has adopted the ASME Boiler Construction Code. This shall not apply to low pressure heating

where shop inspection is not required by the ASME Boiler Construction Code.

Inspections made at the request of a boiler or tank or pressure pipe manufacturer by the Chief Inspector or any Deputy Inspector, shall be charged for at the rate of $20.00 for one-half day and $35.00 for one day plus all expenses to include traveling, hotel and incidentals. This charge shall not void the regular charge or fee for inspection or certificate when the boiler or tank is installed.

Rule 19. Inspection of Secondhand Equipment and Special Inspections. Charges for inspection of secondhand equipment shall be at the rate provided for in Rule 18 for "Shop Inspection."

Rule 20. The fees for inspections shall be paid to the Chief or deputy inspector and a receipt stating the amounts collected by said inspector shall be given to the owner or user of such boiler or boilers, tank or tanks. If the owner or user of any boiler or tank required to be inspected under this Act by the Department of Labor refuses to allow a boiler to be inspected or refuses to pay the fee as provided for in Section 95-68 of General Statutes of North Carolina, then such boilers, tank or tanks shall not be operated until after a valid inspection has been made by either the chief inspector or any deputy inspector or by a special inspector as provided in the before mentioned Act.

Rule 21. An inspection certificate issued in accordance with Section 95-65 of the General Statutes of North Carolina, shall not be valid after INSURANCE CEASES TO BE CARRIED BY A COMPANY HAVING QUALIFIED INSPECTORS.

Rule 22. Conditions Not Covered By These Rules.

In any condition not covered by these rules, the ASME Code for new installations shall apply.

Should any section, sub-section, sentence, clause, phrase, provision or exemption of these rules be declared unconstitutional or invalid for any reason, such invalidity shall not affect the remaining portion of provisions hereof.

The foregoing Rules and Regulations have been drawn, read and approved by the Board of Boiler Rules and Regulations.