ASME BOILER AND PRESSURE VESSEL CODE

An American National Standard

SECTION I

Rules For Construction Of Power Boilers

1974 EDITION

July 1, 1974

ASME BOILER AND PRESSURE VESSEL COMMITTEE
SUBCOMMITTEE ON POWER BOILERS

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
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*Available in bound and loose-leaf versions. The bound version is necessary for ASME Certification.

Code Cases

The Boiler and Pressure Vessel Committee meets regularly to consider requests for interpretations of the Code and to consider rulings for conditions encountered requiring special provisions. Those which have been adopted are in the 1974 Case Book. Modifications will be sent automatically to the purchasers of the Case Book up to the publication of the 1977 Edition.

Addenda

Colored-sheet Addenda, which include additions and revisions to individual Sections of the Code, are published twice a year and will be sent automatically to purchasers of the applicable Sections up to the publication of the 1977 Code. Purchasers of the bound versions of the Sections will receive bound Addenda. Purchasers of the loose-leaf versions of the Sections will receive replacement pages approximately 3 months after the bound version is published.

Addenda Color Legend

Pink	Summer 1974	Blue	Winter 1975
Green	Winter 1974	Salmon	Summer 1976
Yellow	Summer 1975	Gray	Winter 1976

FOREWORD

The American Society of Mechanical Engineers set up a committee in 1911 for the purpose of formulating standard rules for the construction of steam boilers and other pressure vessels. This committee is now called the Boiler and Pressure Vessel Committee.

The Committee's function is to establish rules of safety governing the design, fabrication, and inspection during construction of boilers and unfired pressure vessels, and to interpret these rules when questions arise regarding their intent. In formulating the rules, the Committee considers the needs of users, manufacturers, and inspectors of pressure vessels. The objective of the rules is to afford reasonably certain protection of life and property and to provide a margin for deterioration in service so as to give a reasonably long safe period of usefulness. Advancements in design and material, and the evidence of experience have been recognized.

The Boiler and Pressure Vessel Committee deals with the care and inspection of boilers and pressure vessels in service only to the extent of providing suggested rules of good practice as an aid to owners and their inspectors.

The rules established by the Committee are not to be interpreted as approving, recommending, or endorsing any proprietary or specific design or as limiting in any way the manufacturer's freedom to choose any method of design or any form of construction that conforms to the Code rules.

The Boiler and Pressure Vessel Committee meets regularly to consider requests for interpretations and revisions of the rules. Inquiries must be in writing and must give full particulars in order to receive consideration. Requests for interpretations which are of a routine nature may be executed by the Secretary of the Boiler and Pressure Vessel Committee without reference to a subcommittee. All other requests are first referred to the proper subcommittee for consideration and for recommendation of action by the Main Committee. The action of the Main Committee becomes effective only after confirmation by letter ballot of the Committee and approval by the Council of the Society.

Committee rulings of general interest are published in *Mechanical Engineering* as Code Cases, and inquirers are advised of the action taken. Code revisions approved by the Committee are published in *Mechanical Engineering* as proposed addenda to the Code to invite comments from all interested persons. After final approval by the Committee and adoption by the ASME Council, they are printed in the addenda supplements to the Code.

Code Cases may be used in the construction of components to be stamped with the ASME Code symbol beginning with the date of their approval by the ASME Council.

After Code revisions are approved by Council they may be used beginning with the date of issuance shown on the addenda. Revisions become mandatory as minimum requirements six months after such date of issuance, except for boilers or pressure vessels contracted for prior to the end of the six-month period.

Manufacturers and users of components are cautioned against making use of revisions and Cases that are less restrictive than former requirements without having assurance that they have been accepted by the proper authorities in the jurisdiction where the component is to be installed.

Each state and municipality in the United States and each province in the Dominion of Canada that adopts or accepts one or more Sections of the Boiler and Pressure Vessel Code is invited to appoint a representative to act on the Conference Committee to the Boiler and Pressure Vessel Committee. Since the members of the Conference Committee are in active contact with the administration and enforcement of the rules, the requirements for inspection in this Code correspond with those in effect in their respective jurisdictions. The required qualifications for an Authorized Inspector under these rules may be obtained from the administrative authority of any

state, municipality, or province which has adopted these rules.

The Boiler and Pressure Vessel Committee in the formulation of its rules and in the establishment of maximum design and operating pressures considers materials, construction, method of fabrication, inspection, and safety devices. Permission may be granted to regulatory bodies and organizations publishing safety standards to use a complete Section of the Code by reference. If usage of a Section, such as Section IX, involves exceptions, omissions, or changes in provisions, the intent of the Code might not be attained.

Where a state or other regulatory body, in the printing of any Section of the ASME Boiler and Pressure Vessel Code, makes additions or omissions, it is recommended that such changes be clearly indicated.

The National Board of Boiler and Pressure Vessel Inspectors is composed of chief inspectors of states and municipalities in the United States and of provinces in the Dominion of Canada that have adopted the Boiler and Pressure Vessel Code. This Board, since its organization in 1919, has functioned to uniformly administer and enforce the rules of the Boiler and Pressure Vessel Code. The cooperation of that organization with the Boiler and Pressure Vessel Committee has been extremely helpful. Its function is clearly recognized and, as a result, inquiries received which bear on the administration or application of the rules are referred directly to the National Board. Such handling of this type of inquiry not only simplifies the work of the Boiler and Pressure Vessel Committee, but action on the problem for the inquirer is thereby expedited. Where an inquiry is neither clearly an interpretation of the rules nor a problem of application or administration, it may be considered both by the Boiler and Pressure Vessel Committee and the National Board.

It should be pointed out that the state or municipality where the Boiler and Pressure Vessel Code has been made effective has definite jurisdiction over any particular installation. Inquiries dealing with problems of local character should be directed to the proper authority of such state or municipality. Such authority may, if there is any question or doubt as to the proper interpretation, refer the question to the Boiler and Pressure Vessel Committee.

The Specifications for base materials given in Section II, Parts A and B, are identical with or similar to those of The American Society for Testing and Materials. The Specifications for welding materials given in Section II, Part C, are identical with or similar to those of The American Welding Society. Use of the materials described in these Specifications is covered by the rules in one or more Sections of the ASME Boiler and Pressure Vessel Code. All materials allowed by these various Sections and used for construction within the scope of their rules shall be furnished in accordance with ASME Materials Specifications contained in Section II except where otherwise provided in Code Cases or in the applicable Section of the Code. Materials covered by these Specifications are acceptable for use in items covered by the Code Sections only to the degree indicated in the applicable Section. Materials for Code use should preferably be ordered, produced, and documented on this basis; however, material produced under an ASTM Specification may be designated as complying with the corresponding ASME Specification, provided the latter Specification is indicated to be identical with the ASTM Specification for the Grade, Class, or Type produced, and provided the material is confirmed as complying with the ASTM Specification by material test report or certification of compliance from the material manufacturer.

STATEMENT OF POLICY ON THE USE OF CODE SYMBOLS IN ADVERTISING

The American Society of Mechanical Engineers established a series of symbols for the marking of boilers, pressure vessels, and nuclear power plant components, such as vessels, piping, pumps and valves, and certain appurtenances which have been constructed and inspected in compliance with the ASME Boiler and Pressure Vessel Code. It is the aim of the Society to maintain the standing of the Code Symbols for the benefit of the users, the enforcement jurisdictions and the holders of the symbols who comply with all requirements. Based on that objective, the following policy has been established on the usage in advertising of facsimiles of the symbols and reference to Code construction.

The American Society of Mechanical Engineers does not "approve," "certify," "rate," or "endorse" any product or construction and there shall be no statements or implications which might so indicate. A manufacturer holding a Code Symbol and a Certificate of Authorization may state in advertising literature that its products "are built in accordance with the requirements of the ASME Boiler and Pressure Vessel Code," or "meet the requirements of the ASME Boiler and Pressure Vessel Code."

The ASME Symbol shall be used only for stamping and name plates as specifically provided in the Code. However, facsimiles may be used for the purpose of fostering the use of such construction. Such usage may be by an association or a society, or by a holder of a Code Symbol who may also use the facsimile in advertising to show that clearly specified products will carry the symbol. General usage is permitted only when *all* of a manufacturer's products are constructed under the Rules.

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CONTENTS

PREAMBLE

This Code covers rules for construction of power boilers,[1] electric boilers,[2] miniature boilers[3] and high-temperature water boilers[4] to be used in stationary service and includes those power boilers used in locomotive, portable, and traction service. Reference to a paragraph includes all the subparagraphs and subdivisions under that Paragraph.

The Code does not contain rules to cover all details of design and construction. Where complete details are not given, it is intended that the manufacturer, subject to the approval of the Authorized Inspector, shall provide details of design and construction which will be as safe as otherwise provided by the rules in the Code.

The scope of the jurisdiction of Section I applies to the boiler proper and to the boiler external piping.

Superheaters, economizers, and other pressure parts connected directly to the boiler without intervening valves shall be considered as parts of the boiler proper, and their construction shall conform to Section I rules.

Boiler external piping shall be considered as that piping which begins where the boiler proper terminates at (1) the first circumferential joint for welding end connections; or (2) the face of the first flange in bolted flanged connections; or (3) the first threaded joint in that type of connection; and which extends up to and including the valve or valves required by this Code.

ASME Code Certification (including Data Forms and Code Symbol Stamping), and/or inspection by the Authorized Inspector, when required by this Code, is required for the boiler proper and the boiler external piping.

Construction rules for materials, design, fabrication, installation, and testing of the boiler external piping are contained in ANSI B31.1—Power Piping. Piping beyond the valve or valves required by Section I is not within the scope of Section I, and it is not the intent that the Code Symbol Stamp be applied to such piping or any other piping.

The material for forced-circulation boilers, boilers with no fixed steam and water line, and high-temperature water boilers shall conform to the requirements of the Code. All other requirements shall also be met except where they relate to special features of construction made necessary in boilers of these types, and to accessories that are manifestly not needed or used in connection with such boilers, such as water gages, water columns, and gage cocks.

Reheaters receiving steam which has passed through part of a turbine or other prime mover and separately fired steam superheaters which are not integral with the boiler are considered fired pressure vessels and their construction shall comply with Code requirements for superheaters, including safety devices. Piping between the reheater connections and the turbine or other prime mover is not within the scope of the Code.

A pressure vessel in which steam is generated by the application of heat resulting from the combustion of fuel (solid, liquid, or gaseous) shall be classed as a fired steam boiler.

Unfired pressure vessels in which steam is generated shall be classed as unfired steam boilers with the following exceptions:

(1) Vessels known as evaporators or heat exchangers.

(2) Vessels in which steam is generated by the use of heat resulting from operation of a processing system containing a number of pressure vessels such as used in the manufacture of chemical and petroleum products.

Unfired steam boilers shall be constructed under the provisions of Section I or Section VIII.

Expansion tanks required in connection with high-temperature water boilers shall be constructed to the requirements of Section I or Section VIII.

A pressure vessel in which an organic fluid is vaporized by the application of heat resulting from the combustion of fuel (solid, liquid, or gaseous) shall be constructed under the provisions of Section I. Vessels in which vapor is generated incidental to the operation of a processing system, containing a number of pressure vessels such as used in chemical and petroleum manufacture, are not covered by the rules of Section I.

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[1] *Power boiler—a boiler in which steam or other vapor is generated at a pressure of more than fifteen (15) psi.*

[2] *Electric boiler—a power boiler or a high- temperature water boiler in which the source of heat is electricity.*

[3] *Miniature boiler—a power boiler or a high-temperature water boiler in which the limits specified in PMB-2 are not exceeded.*

[4] *High-temperature water boiler—a water boiler intended for operation at pressures in excess of 160 psi and/or temperatures in excess of 250 F.*

PART PG

GENERAL REQUIREMENTS FOR ALL METHODS OF CONSTRUCTION

GENERAL

PG-1 SCOPE

The requirements of Part PG apply to power boilers and high pressure, high-temperature water boilers and to parts and appurtenances thereto and shall be used in conjunction with the specific requirements in the applicable parts of this Section that pertain to the methods of construction used.

PG-2 SERVICE LIMITATIONS

2.1 The rules of this Section of the Code are applicable to the following services:

(a) Boilers in which steam or other vapor is generated at a pressure of more than fifteen (15) psig.

(b) High-temperature water boilers intended for operation at pressures exceeding 160 psig and/or temperatures exceeding 250 F.

2.2 For services below those specified in PG-2.1 it is intended that rules of Section IV of the Code apply; however, boilers for such services may be constructed and stamped in accordance with this Section of the Code provided all applicable requirements are met.

MATERIALS

PG-5 GENERAL

5.1 Material subject to stress due to pressure shall conform to one of the specifications given in Section II of the Code and shall be limited to those that are listed in Tables PG-23.1 and PG-23.2 except as otherwise permitted in PG-8.2 and 8.3, PG-10, and PG-11. Materials shall not be used at temperatures above those for which stress values are given in Tables PG-23.1 and 23.2.

5.2 Material covered by specifications in Section II of the Code are not restricted as to the method of production unless so stated in the specification, and as long as the product complies with the requirements of the specification.

5.3 If, in the development of the art of boiler construction, it is desired to use materials other than those herein described, data should be submitted to the Boiler and Pressure Vessel Committee in accordance with A-75 to A-80. Material not completely identified with any approved Code specifications may be used in the construction of boilers under the conditions outlined in PG-10.

5.4 Materials outside the limits of size or thickness given in the title or scope clause of any specification in Section II of the Code may be used if the material is in compliance with the other requirements of the specification, and no similar limitation is given in the rules for construction.

5.5 When the maximum allowable working pressure (see PG-21) exceeds 160 psi, crosspipes connecting the steam and water drums of watertube boilers, headers, cross boxes, and all pressure parts of the boiler proper shall be made of a wrought or cast steel listed in Table PG-23.1. The several forms of cast iron may be used only for those parts listed in PG-8.2 and 8.3.

PG-6 PLATE

6.1 Steel plates for any part of a boiler subject to pressure, whether or not exposed to the fire or products of combustion, shall be of pressure vessel