ASME BOILER AND PRESSURE VESSEL CODE
AN AMERICAN NATIONAL STANDARD

ANSI/ASME BPV-VIII-2

SECTION VIII

Rules for Construction of Pressure Vessels

Division 2 — Alternative Rules

1977 EDITION

JULY 1, 1977

ASME BOILER AND PRESSURE VESSEL COMMITTEE
SUBCOMMITTEE ON PRESSURE VESSELS

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
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1977 ASME
BOILER AND PRESSURE VESSEL CODE

An American National Standard

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Code Cases

The Boiler and Pressure Vessel Committee meets regularly to consider proposed additions and revisions to the Code, and to formulate Cases to clarify the intent of existing requirements or provide, when the need is urgent, rules for materials or constructions not covered by existing Code rules. Those Cases which have been adopted appear in one or both of the 1977 Code Cases books—(1) Boilers and Pressure Vessels and (2) Nuclear Components. Supplements will be sent automatically to the purchasers of one or both of the Code Cases books up to the publication of the 1980 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 1980 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.

Addenda Color Legend

Pink	Summer 1977	Blue	Winter 1978
Green	Winter 1977	Salmon	Summer 1979
Yellow	Summer 1978	Gray	Winter 1979

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 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, and to develop new rules as dictated by technological development. Inquiries must be addressed to the Secretary in writing and must give full particulars in order to receive consideration and a written interpretation. Proposed revisions to the Code resulting from inquiries will be presented to the Main Committee for appropriate action. 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.

Proposed revisions to the Code approved by the Committee are submitted to the American National Standards Institute and published in *Mechanical Engineering* to invite comments from all interested persons. After the allotted time for public review and final approval by ASME Council, revisions are published semiannually in Addenda 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 or an Authorized Nuclear 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 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 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 used in lieu of the corresponding ASME Specification, provided that the requirements of the ASTM Specification are identical (excluding editorial differences) or more stringent than the ASME Specification for the Grade, Class, or Type produced and provided that the material is confirmed as complying with the ASTM Specification. Material produced to an ASTM specification with requirements different from the requirements of the corresponding ASME Specification may also be used in accordance with the above, provided the material manufacturer or vessel manufacturer certifies with evidence acceptable to the Authorized Inspector or Authorized Nuclear Inspector that the corresponding ASME Specification requirements have been met. Material produced to an ASME or ASTM Material Specification is not limited as to country of origin.

STATEMENT OF POLICY ON THE USE OF CODE SYMBOLS AND CODE AUTHORIZATION IN ADVERTISING

ASME has established procedures to authorize qualified organizations to perform various activities in accordance with the requirements of the ASME Boiler and Pressure Vessel Code. It is the aim of the Society to provide recognition of organizations so authorized. An organization holding authorization to perform various activities in accordance with the requirements of the Code may state this capability in its advertising literature.

Organizations that are authorized to use Code Symbols for marking items or constructions which have been constructed and inspected in compliance with the ASME Boiler and Pressure Vessel Code are issued Certificates of Authorization. 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 these objectives, the following policy has been established on the usage in advertising of facsimiles of the symbols, Certificates of Authorization, and reference to Code construction. The American Society of Mechanical Engineers does not "approve," "certify," "rate," or "endorse" any item, construction, or activity and there shall be no statements or implications which might so indicate. An organization holding a Code Symbol and/or a Certificate of Authorization may state in advertising literature that items, constructions, or activities "are built (produced or performed) or activities conducted 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 nameplates 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 items will carry the symbol. General usage is permitted only when all of a manufacturer's items are constructed under the Rules.

STATEMENT OF POLICY ON THE USE OF ASME MARKING TO IDENTIFY MANUFACTURED ITEMS

The ASME Boiler and Pressure Vessel Code provides rules for the construction of boilers, pressure vessels, and nuclear components. This includes requirements for materials, design, fabrication, examination, inspection, and stamping. Items constructed in accordance with all of the applicable rules of the Code are identified with the official Code Symbol Stamp described in the governing Section of the Code.

Markings such as "ASME," "ASME Standard," or any other marking including "ASME" or the various Code Symbols shall not be used on any item which is not constructed in accordance with all of the applicable requirements of the Code.

Items shall not be described on ASME Data Report Forms nor on similar forms referring to ASME which tend to imply that all Code requirements have been met when in fact they have not been. Data Report Forms covering items not fully complying with ASME requirements should not refer to ASME or they should clearly identify all exceptions to the ASME requirements.

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R. J. Bosnak
F. W. Brady
F. W. Catudal
E. F. Gerwin
W. S. Gibbons, Jr.
R. E. Keever
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A. Breed
T. M. Brown
J. Bosco
R. B. Bremmer
J. B. Conyers
R. Davis
R. H. Jacobs
R. E. Jagger
F. W. Joyce
R. D. Kulchak
J. R. Lenardson
H. A. Manning
M. J. Meyer
J. Milhoan
W. J. Miller
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C. C. Simpson
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C. Glidewell
B. D. Hackney
N. I. Hyman
L. F. Lapan
A. S. Laurenson
W. L. Lowry
A. J. Moellenbeck
M. J. Morris
B. D. Rall
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D. W. Sher
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D. K. Croneberger
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R. F. Reedy
P. Reinhardt
R. A. Rohrbacher
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Working Group on Concrete (SG-M, C & E) (SC-3C)

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G. R. Murphy
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Working Group on Reinforcing and Prestressing Systems (SG-M, C, & E) (SC-3C)

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U. I. Gosts
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Working Group on Concrete Reactor Vessels (SG-D) (SC-3C)

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J. Mikulak
A. H. Miller
J. P. Myers (Alternate for McDonald)
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R. K. Sager
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R. Koester
R. A. Krauss
E. R. Kurtz
L. J. Kuzenski
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B. J. Milleville
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Special Working Group on Regulatory Guides (SG-WCS) (SC XI)

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Working Group on Evaluation (SG-WCS) (SC XI)

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W. C. Ham
J. T. Houstrup
J. M. Makepeace
J. G. Merkle
H. S. Palme
P. C. Riccardella
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Working Group on Nondestructive Examination (SG-WCS) (SC XI)

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C. D. Cowfer
F. J. Dodd
F. T. Duba
J. R. Frederick
D. F. Fox
K. J. Hannah
P. J. Herbert
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Working Group on Steam Generator Inspection (SG-WCS) (SC XI)

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L. Frank
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Working Group on Component Supports (SG-WCS) (SC XI)

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Working Group on Containment (SG-WCS) (SC XI)

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Special Working Group on Inspection of High Temperature Materials (SG-GCS) (SC XI)

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Special Working Group on Testing of Valves (SG-GCS) (SC XI)

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Special Working Group on Reactor Internals (SG-GCS) (SC XI)

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J. H. Parent (Alternate for Kime)
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J. W. Kime	J. H. Parent
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W. S. Gibbons	A. Breed
C. H. Harmsen	J. D. Lenardson
S. F. Harrison	J. G. Gillissie
J. F. Harvey	H. F. Dobel
E. L. Kemmler	J. A. Jagger
J. E. Lattan	T. F. Luga
G. W. Reinmuth (w/o vote)	U. Potapovs

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J. H. Faupel
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M. Gold
C. W. Lawton
C. F. Nash
W. J. O'Donnell
F. A. Sebring
L. K. Severud
G. V. Smith
A. L. Snow
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Working Group on Creep Fatigue (SG-ETD) (SC-D)

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J. M. Duke
G. R. Halford
C. E. Jaske
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Working Group on Creep Analysis (SG-ETD) (SC-D)

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Part A

GENERAL REQUIREMENTS

PART A

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ARTICLE A-1
SCOPE AND JURISDICTION

A-100 SCOPE[1]

(a) For the scope of this Division, pressure vessels are containers for the containment of pressure, either internal or external. This pressure may be obtained from an external source or by the application of heat from a direct or indirect source, or any combination thereof. The rules of this Division, taken as a whole, provide an alternative to the minimum construction requirements for the design, fabrication, inspection, and certification of pressure vessels falling within the scope of Division 1.

(b)(1) Except as provided in (2) below, these rules cover only vessels to be installed at a fixed (stationary)[2] location for a specific service where operation and maintenance control is retained during the useful life of the vessel by the user who prepares or causes to be prepared the Design Specifications required by A-301.1.

(2) These rules may also apply to human occupancy pressure vessels used by the diving industry, even though these pressure vessels sustain relative motion as a normal part of the diving operation and are relocated from work site to work site between pressurizations, and to pressure vessels permanently installed in ocean-going ships, barges, and other floating craft provided prior written agreement with the local jurisdictional authority[3] can be established covering operation and maintenance control for a specific service and where this operation and maintenance control is retained during the useful life of the pressure vessel by the user who prepares, or causes to be prepared, the Design Specifications required by A-301.1. Then, such a pressure vessel as described above may be constructed and stamped within the scope of this Division provided it meets all other requirements as specified with the following additional provisions:

(a) Loading conditions imposed by movement of the pressure vessel during operation and by relocation of the pressure vessel between work sites, or due to loading and discharge, as applicable, shall be considered as part of AD-100.

(b) The user's Design Specification shall include the agreements which resolve the problems of operation and maintenance control unique to the particular pressure vessel.

(c) Pressure vessels subject to direct firing but which are not within the scope of Sections I, III, or IV may be constructed in accordance with the general rules of Division 2.

(d) Except for vessels specifically prohibited in this Division, types of vessels which may be constructed in accordance with the rules of Division 1 may also be constructed in accordance with the rules of this Division.

(e) In relation to the rules of Division 1 of Section VIII, these rules of Division 2 are more restrictive in the choice of materials which may be used but permit higher design stress intensity values to be employed in the range of temperatures over which the design stress intensity value is controlled by the ultimate strength or the yield strength; more precise design procedures are required and some common design details are prohibited; permissible fabrication procedures are specifically delineated and more complete examination testing and inspection are required.

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[1]In those applications where there are laws or regulations issued by Municipal, State, Provincial or Federal Authorities covering pressure vessels; these laws or regulations should be reviewed to determine size or service limitations of the coverage which may be different or more restrictive than those given in this paragraph.

[2]These rules shall not be used for fabrication of cargo tanks mounted on transport vehicles.

[3]The local jurisdictional authority consists of the Municipal, State, Provincial, Federal, or other governmental agency enforcing laws or regulations applicable to these pressure vessels.