ASME BOILER AND PRESSURE VESSEL CODE
AN INTERNATIONAL CODE

VIII

RULES FOR CONSTRUCTION OF PRESSURE VESSELS

Division 1

2001 Edition
July 1, 2001

ASME BOILER AND PRESSURE VESSEL COMMITTEE SUBCOMMITTEE ON PRESSURE VESSELS

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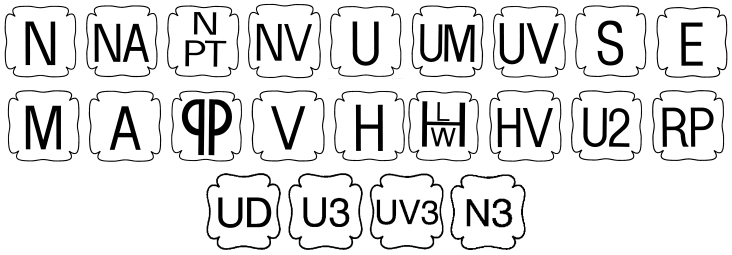
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2001 ASME
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ADDENDA

Colored-sheet Addenda, which include additions and revisions to individual Sections of the Code, are published annually and will be sent automatically to purchasers of the applicable Sections up to the publication of the 2004 Code. The 2001 Code is available only in the loose-leaf format; accordingly, the Addenda will be issued in the loose-leaf, replacement-page format.

INTERPRETATIONS

ASME issues written replies to inquiries concerning interpretation of technical aspects of the Code. The Interpretations for each individual Section will be published separately and will be included as part of the update service to that Section. They will be issued semiannually (July and December) up to the publication of the 2004 Code. Interpretations of Section III, Divisions 1 and 2, will be included with the update service to Subsection NCA.

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 will appear in the appropriate 2001 Code Cases book: (1) Boilers and Pressure Vessels and (2) Nuclear Components. Supplements will be sent automatically to the purchasers of the Code Cases books up to the publication of the 2004 Code.

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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 deemed necessary for the new construction[1] of pressure vessels that will perform in a safe and reliable manner, and to interpret these rules when questions arise regarding their intent. With few exceptions, the rules do not, of practical necessity, reflect the likelihood and consequences of deterioration in service related to specific service fluids or external operating environments. Recognizing this, the Committee has approved a wide variety of construction[1] rules in this Section to allow the user or his designee to select those which will provide a pressure vessel having a margin for deterioration in service so as to give a reasonably long, safe period of usefulness. Accordingly, it is not intended that this Section be used as a design handbook; rather, engineering judgment must be employed in the selection of those sets of Code rules suitable to any specific service or need.

This Code contains mandatory requirements, specific prohibitions, and nonmandatory guidance for construction[1] activities. The Code does not address all aspects of these activities and those aspects which are not specifically addressed should not be considered prohibited. The Code is not a handbook and cannot replace education, experience, and the use of engineering judgment. The phrase *engineering judgment* refers to technical judgments made by knowledgeable designers experienced in the application of the Code. Engineering judgments must be consistent with Code philosophy and such judgments must never be used to overrule mandatory requirements or specific prohibitions of the Code.

The Committee recognizes that tools and techniques used for design and analysis change as technology progresses and expects engineers to use good judgment in the application of these tools. The designer is responsible for complying with Code rules and demonstrating compliance with Code equations when such equations are mandatory. The Code neither requires nor prohibits the use of computers for the design or analysis of components constructed to the requirements of the Code. However, designers and engineers using computer programs for design or analysis are cautioned that they are responsible for all technical assumptions inherent in the programs they use and they are responsible for the application of these programs to their design.

The Code does not fully address tolerances. When dimensions, sizes, or other parameters are not specified with tolerances, the values of these parameters are considered nominal and allowable tolerances or local variances may be considered acceptable when based on engineering judgment and standard practices as determined by the designer.

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 revisions of the rules, new rules as dictated by technological development, Code Cases, and requests for interpretations. Only the Boiler and Pressure Vessel Committee has the authority to provide official interpretations of this Code. Requests for revisions, new rules, Code Cases, or interpretations shall be addressed to the Secretary in writing and shall give full particulars in order to receive consideration and action (see Mandatory Appendix covering preparation of technical inquiries). 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 ASME.

[1] *Construction*, as used in this Foreword, is an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and pressure relief.

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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, revisions are published annually 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 ASME.

After Code revisions are approved by ASME, they may be used beginning with the date of issuance shown on the Addenda. Revisions, except for revisions to material specifications in Section II, Parts A and B, become mandatory 6 months after such date of issuance, except for boilers or pressure vessels contracted for prior to the end of the 6 month period. Revisions to material specifications are originated by the American Society for Testing and Materials (ASTM) and other recognized national or international organizations, and are usually adopted by ASME. However, those revisions may or may not have any effect on the suitability of material, produced to earlier editions of specifications, for use in ASME construction. ASME material specifications approved for use in each construction Code are listed in the Appendices of Section II, Parts A and B. These Appendices list, for each specification, the latest edition adopted by ASME, and earlier and later editions considered by ASME to be identical for ASME construction.

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 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, methods 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 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.

The Code Committee does not rule on whether a component shall or shall not be constructed to the provisions of the Code. The Scope of each Section has been established to identify the components and parameters considered by the Committee in formulating the Code rules. Laws or regulations issued by municipality, state, provincial, federal, or other enforcement or regulatory bodies having jurisdiction at the location of an installation establish the mandatory applicability of the Code rules, in whole or in part, within their jurisdiction. Those laws or regulations may require the use of this Code for vessels or components not considered to be within its Scope or may establish additions or deletions in that Scope. Accordingly, inquiries regarding such laws or regulations are to be directed to the issuing enforcement or regulatory body.

Questions or issues regarding compliance of a specific component with the Code rules are to be directed to the ASME Certificate Holder (Manufacturer). Inquiries concerning the interpretation of the Code are to be directed to the ASME Boiler and Pressure Vessel Committee. ASME is to be notified should questions arise concerning improper use of an ASME Code symbol.

The specifications for materials given in Section II are identical with or similar to those of specifications published by ASTM, AWS, and other recognized national or international organizations. When reference is made in an ASME material specification to a non-ASME specification for which a companion ASME specification exists, the reference shall be interpreted as applying to the ASME material specification. Not all materials included in the material specifications in Section II have been adopted for Code use. Usage is

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limited to those materials and grades adopted by at least one of the other Sections of the Code for application under rules of that Section. All materials allowed by these various Sections and used for construction within the scope of their rules shall be furnished in accordance with material specifications contained in Section II or referenced in Appendices A of Section II, Parts A and B 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; Appendix A to Section II, Part A and Appendix A to Section II, Part B list editions of ASME and year dates of specifications that meet ASME requirements and which may be used in Code construction. Material produced to an acceptable specification with requirements different from the requirements of the corresponding specifications listed in Appendix A of Part A or Part B may also be used in accordance with the above, provided the material manufacturer or vessel manufacturer certifies with evidence acceptable to the Authorized Inspector that the corresponding requirements of specifications listed in Appendix A of Part A or Part B have been met. Material produced to an acceptable material specification is not limited as to country of origin.

When required by context in this Section, the singular shall be interpreted as the plural, and vice-versa; and the feminine, masculine, or neuter gender shall be treated as such other gender as appropriate.

Publication of the SI (Metric) Edition of the ASME Boiler and Pressure Vessel Code was discontinued with the 1986 Edition. Effective October 1, 1986, the SI Edition was withdrawn as an ASME Boiler and Pressure Vessel Code document.

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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.

The ASME logo, which is the cloverleaf with the letters ASME within, shall not be used by any organization other than ASME.

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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Special Working Group on Bolted Flanged Joints (SC-D)

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A. Selz

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INTRODUCTION

SCOPE

U-1 SCOPE

U-1(a)

U-1(a)(1) The Foreword provides the basis for the rules described in this Division.

U-1(a)(2) 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.

U-1(a)(3) This Division contains mandatory requirements, specific prohibitions, and nonmandatory guidance for pressure vessel materials, design, fabrication, examination, inspection, testing, certification, and pressure relief. The Code does not address all aspects of these activities, and those aspects which are not specifically addressed should not be considered prohibited. Engineering judgment must be consistent with the philosophy of this Division, and such judgments must never be used to overrule mandatory requirements or specific prohibitions of this Division. See also informative and nonmandatory guidance regarding metallurgical phenomena in Appendix 6 of Section II, Part D.

U-1(b) This Division is divided into three Subsections, Mandatory Appendices, and Nonmandatory Appendices. Subsection A consists of Part UG, covering the general requirements applicable to all pressure vessels. Subsection B covers specific requirements that are applicable to the various methods used in the fabrication of pressure vessels. It consists of Parts UW, UF, and UB dealing with welded, forged, and brazed methods, respectively. Subsection C covers specific requirements applicable to the several classes of materials used in pressure vessel construction. It consists of Parts UCS, UNF, UHA, UCI, UCL, UCD, UHT, ULW, and ULT dealing with carbon and low alloy steels, nonferrous metals, high alloy steels, cast iron, clad and lined material, cast ductile iron, ferritic steels with properties enhanced by heat treatment, layered construction, and low temperature materials, respectively. Section II, Part D also contains tables of maximum allowable stress values for these classes of materials.

The Mandatory Appendices address specific subjects not covered elsewhere in this Division, and their requirements are mandatory when the subject covered is included in construction under this Division. The Nonmandatory Appendices provide information and suggested good practices.

U-1(c)

U-1(c)(1) The scope of this Division has been established to identify the components and parameters considered in formulating the rules given in this Division. Laws or regulations issued by municipality, state, provincial, federal, or other enforcement or regulatory bodies having jurisdiction at the location of an installation establish the mandatory applicability of the Code rules, in whole or in part, within their jurisdiction. Those laws or regulations may require the use of this Division of the Code for vessels or components not considered to be within its Scope. 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 here.

U-1(c)(2) Based on the Committee's consideration, the following classes of vessels are not included in the scope of this Division; however, any pressure vessel which meets all the applicable requirements of this Division may be stamped with the Code U Symbol:

(a) those within the scope of other Sections;

(b) fired process tubular heaters;

(c) pressure containers which are integral parts or components of rotating or reciprocating mechanical devices, such as pumps, compressors, turbines, generators, engines, and hydraulic or pneumatic cylinders where the primary design considerations and/or stresses are derived from the functional requirements of the device;

(d) except as covered in U-1(f), structures whose primary function is the transport of fluids from one location to another within a system of which it is an integral part, that is, piping systems;

(e) piping components, such as pipe, flanges, bolting, gaskets, valves, expansion joints, fittings, and the pressure containing parts of other components, such as strainers and devices which serve such purposes as mixing, separating, snubbing, distributing, and metering

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or controlling flow, provided that pressure containing parts of such components are generally recognized as piping components or accessories;

(f) a vessel for containing water[1] under pressure, including those containing air the compression of which serves only as a cushion, when none of the following limitations are exceeded:

(1) a design pressure of 300 psi (2070 kPa);

(2) a design temperature of 210°F (99°C);

(g) a hot water supply storage tank heated by steam or any other indirect means when none of the following limitations is exceeded:

(1) a heat input of 200,000 Btu/hr (58.6 kW);

(2) a water temperature of 210°F (99°C);

(3) a nominal water containing capacity of 120 gal;

(h) vessels having an internal or external operating pressure (see 3-2) not exceeding 15 psi (103 kPa) with no limitation on size [see UG-28(f)];

(i) vessels having an inside diameter, width, height, or cross section diagonal not exceeding 6 in. (152 mm), with no limitation on length of vessel or pressure;

(j) pressure vessels for human occupancy.[2]

U-1(d) The rules of this Division have been formulated on the basis of design principles and construction practices applicable to vessels designed for pressures not exceeding 3000 psi (20685 kPa). For pressures above 3000 psi (20685 kPa), deviations from and additions to these rules usually are necessary to meet the requirements of design principles and construction practices for these higher pressures. Only in the event that after having applied these additional design principles and construction practices the vessel still complies with all of the requirements of this Division may it be stamped with the applicable Code symbol.

U-1(e) In relation to the geometry of pressure containing parts, the scope of this Division shall include the following:

U-1(e)(1) where external piping; other pressure vessels including heat exchangers; or mechanical devices, such as pumps, mixers, or compressors, are to be connected to the vessel:

(a) the welding end connection for the first circumferential joint for welded connections [see UW-13(g)];

(b) the first threaded joint for screwed connections;

(c) the face of the first flange for bolted, flanged connections;

(d) the first sealing surface for proprietary connections or fittings;

U-1(e)(2) where nonpressure parts are welded directly to either the internal or external pressure retaining surface of a pressure vessel, this scope shall include the design, fabrication, testing, and material requirements established for nonpressure part attachments by the applicable paragraphs of this Division;[3]

U-1(e)(3) pressure retaining covers for vessel openings, such as manhole and handhole covers;

U-1(e)(4) the first sealing surface for proprietary fittings or components for which rules are not provided by this Division, such as gages, instruments, and nonmetallic components.

U-1(f) The scope of the Division includes provisions for pressure relief devices necessary to satisfy the requirements of UG-125 through UG-136 and Appendix 11.

U-1(g) Unfired steam boilers as defined in Section I shall be constructed in accordance with the rules of Section I or this Division [see UG-125(b) and UW-2(c)].

The following pressure vessels in which steam is generated shall be constructed in accordance with the rules of this Division:

U-1(g)(1) vessels known as evaporators or heat exchangers;

U-1(g)(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;

U-1(g)(3) vessels in which steam is generated but not withdrawn for external use.

U-1(h) Pressure vessels or parts subject to direct firing from the combustion of fuel (solid, liquid, or gaseous), which are not within the scope of Sections I, III, or IV may be constructed in accordance with the rules of this Division [see UW-2(d)].

U-1(i) Gas fired jacketed steam kettles with jacket operating pressures not exceeding 50 psi (345 kPa) may be constructed in accordance with the rules of this Division (see Appendix 19).

U-1(j) Pressure vessels exclusive of those covered in U-1(c), U-1(g), U-1(h), and U-1(i) that are not

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[1] The water may contain additives provided the flash point of the aqueous solution at atmospheric pressure is 185°F or higher. The flash point shall be determined by the methods specified in ASTM D 93 or in ASTM D 56, whichever is appropriate.

[2] Requirements for pressure vessels for human occupancy are covered by ANSI/ASME PVHO-1.

[3] These requirements for design, fabrication, testing, and material for nonpressure part attachments do not establish the length, size, or shape of the attachment material. Pads and standoffs are permitted and the scope can terminate at the next welded or mechanical joint.

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required by the rules of this Division to be fully radiographed, which are not provided with quick actuating closures (see UG-35), and that do not exceed the following volume and pressure limits may be exempted from inspection by Inspectors, as defined in UG-91, provided that they comply in all other respects with the requirements of this Division:

U-1(j)(1) 5 cu ft (0.14 m^3) in volume and 250 psi (1720 kPa) design pressure; or

U-1(j)(2) 3 cu ft (0.08 m^3) in volume and 350 psi (2410 kPa) design pressure;

U-1(j)(3) $1\frac{1}{2}$ cu ft (0.04 m^3) in volume and 600 psi (4140 kPa) design pressure.

In an assembly of vessels, the limitations in (1) through (3) above apply to each vessel and not the assembly as a whole. Straight line interpolation for intermediate volumes and design pressures is permitted. Vessels fabricated in accordance with this rule shall be marked with the "UM" Symbol in Fig. UG-116 sketch (b) and with the data required in UG-116. Certificates of Compliance shall satisfy the requirements of UG-120(a).

U-1(k) The degree of nondestructive examination(s) and the acceptance standards beyond the requirements of this Division shall be a matter of prior agreement between the Manufacturer and user or his designated agent.

GENERAL

U-2 GENERAL

(a) The user or his designated agent[4] shall establish the design requirements for pressure vessels, taking into consideration factors associated with normal operation, such other conditions as startup and shutdown, and abnormal conditions which may become a governing design consideration (see UG-22).

Such consideration shall include but shall not be limited to the following:

(1) the need for corrosion allowances;

(2) the definition of lethal services. For example, see UW-2(a).

(3) the need for postweld heat treatment beyond the requirements of this Division and dependent on service conditions;

(4) for pressure vessels in which steam is generated, or water is heated [see U-1(g) and (h)], the need for piping, valves, instruments, and fittings to perform the functions covered by PG-59 through PG-61 of Section I.

(b) Responsibilities[5]

(1) The Manufacturer of any vessel or part to be marked with the Code Symbol has the responsibility of complying with all of the applicable requirements of this Division and, through proper certification, of assuring that all work done by others also complies. The vessel or part Manufacturer shall have available for the Inspector's review the applicable design calculations. See 10-5 and 10-15(d).

(2) Some types of work, such as forming, nondestructive examination, and heat treating, may be performed by others (for welding, see UW-26 and UW-31). It is the vessel or part Manufacturer's responsibility to ensure that all work so performed complies with all the applicable requirements of this Division. After ensuring Code compliance, the vessel or part may be Code stamped by the appropriate Code stamp holder after acceptance by the Inspector.

(c) A vessel may be designed and constructed using any combination of the methods of fabrication and the classes of materials covered by this Division provided the rules applying to each method and material are complied with and the vessel is marked as required by UG-116.

(d) When the strength of any part cannot be computed with a satisfactory assurance of safety, the rules provide procedures for establishing its maximum allowable working pressure.

(e) It is the duty of the Inspector to make all of the inspections specified by the rules of this Division, and of monitoring the quality control and the examinations made by the Manufacturer. He shall make such other inspections as in his judgment are necessary to permit him to certify that the vessel has been designed and constructed in accordance with the requirements. The Inspector has the duty of verifying that the applicable calculations have been made and are on file at Manufacturer's plant at the time the Data Report is signed. Any questions concerning the calculations raised by the Inspector must be resolved. See UG-90(c)(1).

(f) The rules of this Division shall serve as the basis for the Inspector to:

(1) perform the required duties;

(2) authorize the application of the Code Symbol;

[4] For this Division, the user's designated agent may be either a design agency specifically engaged by the user, the Manufacturer of a system for a specific service which includes a pressure vessel as a part and which is purchased by the user, or an organization which offers pressure vessels for sale or lease for specific services.

[5] See UG-90(b) and UG-90(c)(1) for summaries of the responsibilities of the Manufacturer and the duties of the Inspector.

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(3) sign the Certificate of Shop (or Field Assembly) Inspection.

(g) This Division of Section VIII 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 acceptance of the Inspector, shall provide details of design and construction which will be as safe as those provided by the rules of this Division.

01 *(h)* Field assembly of vessels constructed to this Division may be performed as follows.

(1) The Manufacturer of the vessel completes the vessel in the field, completes the Form U-1 or U-1A Manufacturer's Data Report, and stamps the vessel.

(2) The Manufacturer of parts of a vessel to be completed in the field by some other party stamps these parts in accordance with Code rules and supplies the Form U-2 or U-2A Manufacturer's Partial Data Report to the other party. The other party, who must hold a valid U Certificate of Authorization, makes the final assembly, required NDE, final pressure test; completes the Form U-1 or U-1A Manufacturer's Data Report; and stamps the vessel.

(3) The field portion of the work is completed by a holder of a valid U Certificate of Authorization other than the vessel Manufacturer. The stamp holder performing the field work is required to supply a Form U-2 or U-2A Manufacturer's Partial Data Report covering the portion of the work completed by his organization (including data on the pressure test if conducted by the stamp holder performing the field work) to the Manufacturer responsible for the Code vessel. The vessel Manufacturer applies his U Stamp in the presence of a representative from his Inspection Agency and completes the Form U-1 or U-1A Manufacturer's Data Report with his Inspector.

In all three alternatives, the party completing and signing the Form U-1 or U-1A Manufacturer's Data Report assumes full Code responsibility for the vessel. In all three cases, each Manufacturer's Quality Control System shall describe the controls to assure compliance for each Code stamp holder.

(i) For some design analyses, both a chart or curve and a formula or tabular data are given. Use of the formula or tabular data may result in answers which are slightly different from the values obtained from the chart or curve. However, the difference, if any, is within practical accuracy and either method is acceptable.

U-3 STANDARDS REFERENCED BY THIS DIVISION

(a) Throughout this Division references are made to various standards, such as ANSI standards, which cover pressure–temperature rating, dimensional, or procedural standards for pressure vessel parts. These standards, with the year of the acceptable edition, are listed in Table U-3.

(b) Rules for the use of these standards are stated elsewhere in this Division.

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TABLE U-3 01
YEAR OF ACCEPTABLE EDITION OF REFERENCED STANDARDS IN THIS DIVISION

Title	Number	Year
Seat Tightness of Pressure Relief Valves	API Std. 527	1991
Unified Inch Screw Threads (UN and UNR Thread Form)	ASME B1.1	1989
Pipe Threads, General Purpose (Inch)	ANSI/ASME B1.20.1	1983 (R1992)(2)
Cast Iron Pipe Flanges and Flanged Fittings, Classes 25, 125, 250, and 800	ASME/ANSI B16.1	1989
Pipe Flanges and Flanged Fittings	ASME B16.5	1996(1)
Factory-Made Wrought Steel Buttwelding Fittings	ASME B16.9	1993
Forged Fittings, Socket-Welding and Threaded	ASME B16.11	1991
Cast Bronze Threaded Fittings Classes 125 and 250	ANSI/ASME B16.15	1985
Metallic Gaskets for Pipe Flanges — Ring-Joint, Spiral Wound, and Jacketed	ASME B16.20	1993
Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500, and 2500	ASME B16.24	1991
Wrought Steel Buttwelding Short Radius Elbows and Returns	ASME/ANSI B16.28	1986
Ductile Iron Pipe Flanges and Flanged Fittings, Class 150 and 300	ASME/ANSI B16.42	1987
Large Diameter Steel Flanges, NPS 26 Through NPS 60	ASME B16.47	1996
Square and Hex Nuts (Inch Series)	ASME/ANSI B18.2.2	1987
Welded and Seamless Wrought Steel Pipe	ANSI/ASME B36.10M	1985 (R1994)(2)
Pressure Relief Devices	ASME PTC 25	1994
Qualifications for Authorized Inspection	ASME QAI-1	(3)
ASNT Central Certification Program	ACCP	Rev 3, November 1997
ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel	CP-189	1995
Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing	SNT-TC-1A	1996, A98
Standard Test Methods for Flash Point by Tag Closed Tester	ASTM D 56	1987
Standard Test Methods for Flash Point by Pensky-Martens Closed Tester	ASTM D 93	1990

(continued)

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TABLE U-3
YEAR OF ACCEPTABLE EDITION OF REFERENCED STANDARDS IN THIS DIVISION
(CONT'D)

Title	Number	Year
Methods of Tension Testing of Metallic Materials	ASTM E 8	1990
Methods of Verification and Classification of Extensometers	ASTM E 83	1990
Reference Photographs for Magnetic Particle Indications on Ferrous Castings	ASTM E 125	1963 (R1985)(2)
Hardness Conversion Tables for Metals	ASTM E 140	1988
Standard Reference Radiographs for Heavy-Walled (2 to $4\frac{1}{2}$-in. (51 to 114-mm)) Steel Castings	ASTM E 186	1998
Method of Conducting Drop Weight Test to Determine Nil Ductility Transition Temperature of Ferritic Steel	ASTM E 208	1987a
Standard Reference Radiographs for Heavy-Walled ($4\frac{1}{2}$ to 12-in. (114 to 305-mm)) Steel Castings	ASTM E 280	1998
Standard Reference Radiographs for Steel Castings up to 2 in. (51 mm) in Thickness	ASTM E 446	1998
Marking and Labeling Systems	ANSI/UL-969	1991

NOTES:
(1) See UG-11(a)(2).
(2) R — Reaffirmed.
(3) See UG-91.

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