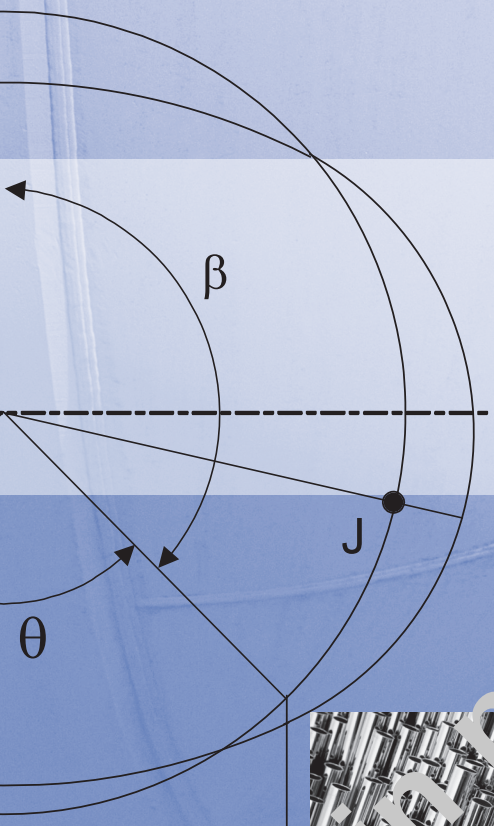
2010 ASME Boiler and Pressure Vessel Code

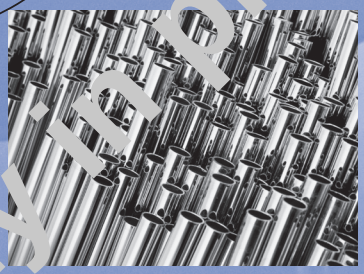
AN INTERNATIONAL CODE

VIII

Division 1

Rules for Construction of Pressure Vessels





ASME
SETTING THE STANDARD

AN INTERNATIONAL CODE

2010 ASME Boiler & Pressure Vessel Code

2010 Edition July 1, 2010

VIII

Division 1

RULES FOR CONSTRUCTION OF PRESSURE VESSELS

ASME Boiler and Pressure Vessel Committee on Pressure Vessels

ASME SETTING THE STANDARD

Three Park Avenue • New York, NY • 10016 USA

Date of Issuance: July 1, 2010
(Includes all Addenda dated July 2009 and earlier)

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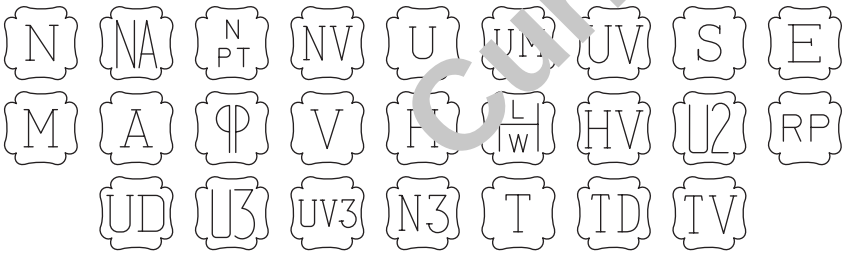

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The American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

AN INTERNATIONAL CODE

2010 ASME Boiler & Pressure Vessel Code

2011a Addenda **July 1, 2011**

VIII

Division 1

RULES FOR CONSTRUCTION OF PRESSURE VESSELS

ASME Boiler and Pressure Vessel Committee on Pressure Vessels

The American Society of Mechanical Engineers

Three Park Avenue • New York, NY • 10016 USA

X08111

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2010 ASME
BOILER AND PRESSURE VESSEL CODE

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ADDENDA

Addenda, which include additions and revisions to individual Sections of the Code, will be sent automatically to purchasers of the applicable Sections up to the publication of the 2013 Code. The 2010 Code is available only in the loose-leaf format; accordingly, the Addenda will be issued in the loose-leaf 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. Interpretations of Section III, Divisions 1 and 2, will be included with the update service to Subsection NCA.

Interpretations of the Code are posted in January and July at http://cstools.asme.org/interpretations.cfm.

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 that have been adopted will appear in the appropriate 2010 Code Cases book: "Boilers and Pressure Vessels" and "Nuclear Components." Supplements will be sent automatically to the purchasers of the Code Cases books up to the publication of the 2013 Code.

FOREWORD

(10)
(a)

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, relating only to pressure integrity, governing the construction[1] of boilers, pressure vessels, transport tanks and nuclear components, and inservice inspection for pressure integrity of nuclear components and transport tanks, and to interpret these rules when questions arise regarding their intent. This Code does not address other safety issues relating to the construction of boilers, pressure vessels, transport tanks and nuclear components, and the inservice inspection of nuclear components and transport tanks. The user of the Code should refer to other pertinent codes, standards, laws, regulations, or other relevant documents. 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 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 activities. The Code does not address all aspects of these activities and those aspects that 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 Submittal of Technical Inquiries to the Boiler and Pressure Vessel Committee). Proposed revisions to the Code resulting from inquiries will be presented to the Standards Committees for appropriate action. The action of the Standards Committees becomes effective only after confirmation by letter ballot of the Committees 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.

Proposed revisions to the Code approved by the Committee are submitted to the American National Standards Institute and published at *http://cstools.asme.org/csconnect/public/index.cfm?PublicReview=Revisions* to invite comments from all interested persons. After the allotted time for public review and final approval by ASME, revisions are published in updates to the Code.

Code Cases may be used in the construction of components to be stamped with the Certification Mark 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. Revisions, except for revisions to material specifications in Section II, Parts A and B, become mandatory six months after such date of issuance, except for boilers or pressure vessels contracted for prior to the end of the six-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 Guideline for Acceptable ASTM Editions and in the Guideline for Acceptable Non-ASTM Editions, in Section II, Parts A and B. These Guidelines list, for each specification, the latest edition adopted by ASME, and earlier and later editions considered by ASME to be identical for ASME construction.

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.

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.

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 the Certification Mark.

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 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 the Guidelines for Acceptable Editions in 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; Guidelines for Acceptable Editions in Section II, Parts A and 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 the Guidelines for Acceptable Editions in 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 the Guidelines for Acceptable Editions in 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.

STATEMENT OF POLICY ON THE USE OF THE CERTIFICATION MARK AND CODE AUTHORIZATION IN ADVERTISING

(10)
(a)

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 the Certification Mark for marking items or constructions that 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 Certification Mark for the benefit of the users, the enforcement jurisdictions, and the holders of the Certification Mark who comply with all requirements.

Based on these objectives, the following policy has been established on the usage in advertising of facsimiles of the Certification Mark, 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 that might so indicate. An organization holding the Certification Mark 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." An ASME corporate logo shall not be used by any organization other than ASME.

The Certification Mark 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 the Certification Mark who may also use the facsimile in advertising to show that clearly specified items will carry the Certification Mark. 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

(a)

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 Certification Mark described in the governing Section of the Code.

Markings such as "ASME," "ASME Standard," or any other marking including "ASME" or the Certification Mark shall not be used on any item that 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 that 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.

(a)

SUBMITTAL OF TECHNICAL INQUIRIES TO THE BOILER AND PRESSURE VESSEL COMMITTEE — MANDATORY

1 INTRODUCTION

(a) The following information provides guidance to Code users for submitting technical inquiries to the Committee. See Guideline on the Approval of New Materials Under the ASME Boiler and Pressure Vessel Code in Section II, Parts C and D for additional requirements for requests involving adding new materials to the Code. Technical inquiries include requests for revisions or additions to the Code rules, requests for Code Cases, and requests for Code interpretations, as described below.

(1) Code Revisions. Code revisions are considered to accommodate technological developments, address administrative requirements, incorporate Code Cases, or to clarify Code intent.

(2) Code Cases. Code Cases represent alternatives or additions to existing Code rules. Code Cases are written as a question and reply, and are usually intended to be incorporated into the Code at a later date. When used, Code Cases prescribe mandatory requirements in the same sense as the text of the Code. However, users are cautioned that not all jurisdictions or owners automatically accept Code Cases. The most common applications for Code Cases are:

(a) to permit early implementation of an approved Code revision based on an urgent need

(b) to permit the use of a new material for Code construction

(c) to gain experience with new materials or alternative rules prior to incorporation directly into the Code

(3) Code Interpretations. Code Interpretations provide clarification of the meaning of existing rules in the Code, and are also presented in question and reply format. Interpretations do not introduce new requirements. In cases where existing Code text does not fully convey the meaning that was intended, and revision of the rules is required to support an interpretation, an Intent Interpretation will be issued and the Code will be revised.

(b) The Code rules, Code Cases, and Code Interpretations established by the Committee are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or owners to choose any method of design or any form of construction that conforms to the Code rules.

(c) Inquiries that do not comply with these provisions or that do not provide sufficient information for the Committee's full understanding may result in the request being returned to the inquirer with no action.

2 INQUIRY FORMAT

Submittals to the Committee shall include:

(a) Purpose. Specify one of the following:

(1) revision of present Code rules

(2) new or additional Code rules

(3) Code Case

(4) Code Interpretation

(b) Background. Provide the information needed for the Committee's understanding of the inquiry, being sure to include reference to the applicable Code Section, Division, Edition, Addenda (if applicable), paragraphs, figures, and tables. Preferably, provide a copy of the specific referenced portions of the Code.

(c) Presentations. The inquirer may desire or be asked to attend a meeting of the Committee to make a formal presentation or to answer questions from the Committee members with regard to the inquiry. Attendance at a Committee meeting shall be at the expense of the inquirer. The inquirer's attendance or lack of attendance at a meeting shall not be a basis for acceptance or rejection of the inquiry by the Committee.

3 CODE REVISIONS OR ADDITIONS

Requests for Code revisions or additions shall provide the following:

(a) Proposed Revisions or Additions. For revisions, identify the rules of the Code that require revision and submit a copy of the appropriate rules as they appear in the Code, marked up with the proposed revision. For additions, provide the recommended wording referenced to the existing Code rules.

(b) Statement of Need. Provide a brief explanation of the need for the revision or addition.

(c) Background Information. Provide background information to support the revision or addition, including any data or changes in technology that form the basis for the request that will allow the Committee to adequately evaluate the proposed revision or addition. Sketches, tables, figures, and graphs should be submitted as appropriate. When applicable, identify any pertinent paragraph in the Code that would be affected by the revision or addition and identify paragraphs in the Code that reference the paragraphs that are to be revised or added.

(a) **4 CODE CASES**

Requests for Code Cases shall provide a Statement of Need and Background Information similar to that defined in 3(b) and 3(c), respectively, for Code revisions or additions. The urgency of the Code Case (e.g., project underway or imminent, new procedure, etc.) must be defined and it must be confirmed that the request is in connection with equipment that will bear the Certification Mark, with the exception of Section XI applications. The proposed Code Case should identify the Code Section and Division, and be written as a *Question* and a *Reply* in the same format as existing Code Cases. Requests for Code Cases should also indicate the applicable Code Editions and Addenda (if applicable) to which the proposed Code Case applies.

5 CODE INTERPRETATIONS

(a) Requests for Code Interpretations shall provide the following:

(1) Inquiry. Provide a condensed and precise question, omitting superfluous background information and, when possible, composed in such a way that a "yes" or a "no" *Reply,* with brief provisos if needed, is acceptable. The question should be technically and editorially correct.

(2) Reply. Provide a proposed *Reply* that will clearly and concisely answer the *Inquiry* question. Preferably, the *Reply* should be "yes" or "no," with brief provisos if needed.

(3) Background Information. Provide any background information that will assist the Committee in understanding the proposed *Inquiry* and *Reply*.

(b) Requests for Code Interpretations must be limited to an interpretation of a particular requirement in the Code or a Code Case. The Committee cannot consider consulting type requests such as the following:

(1) a review of calculations, design drawings, welding qualifications, or descriptions of equipment or parts to determine compliance with Code requirements;

(2) a request for assistance in performing any Code-prescribed functions relating to, but not limited to, material selection, designs, calculations, fabrication, inspection, pressure testing, or installation;

(3) a request seeking the rationale for Code requirements.

6 SUBMITTALS

Submittals to and responses from the Committee shall meet the following:

(a) Submittal. Inquiries from Code users shall be in English and preferably be submitted in typewritten form; however, legible handwritten inquiries will also be considered. They shall include the name, address, telephone number, fax number, and e-mail address, if available, of the inquirer and be mailed to the following address:

Secretary
ASME Boiler and Pressure Vessel Committee
Three Park Avenue
New York, NY 10016-5990

As an alternative, inquiries may be submitted via e-mail to: SecretaryBPV@asme.org.

(b) Response. The Secretary of the ASME Boiler and Pressure Vessel Committee or of the appropriate Subcommittee shall acknowledge receipt of each properly prepared inquiry and shall provide a written response to the inquirer upon completion of the requested action by the Code Committee.

(a)

PERSONNEL

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As of January 1, 2011

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SUMMARY OF CHANGES

The 2011 Code, which includes Addenda changes, is being issued in its entirety. While the pages of the Code are printed in loose-leaf format for the users' convenience, it is advisable that the existing 2010 pages be retained for reference. The next Edition of the Code will be published in 2013.

A Special Notice may be posted on the ASME Web site in advance of the next edition of the Boiler and Pressure Vessel Code to provide approved revisions to Code requirements. Such revisions may be used on the date posted and will become mandatory 6 months after the date of issuance in the next edition. A Special Notice may also include a revision to a Code Case. The superseded version of the Code Case shall not be used.

Errata to the BPV Code may be posted on the ASME Web site to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in BPV Codes. Such errata shall be used on the date posted.

Information regarding Special Notices and Errata is published on the ASME Web site under the Boiler and Pressure Vessel Code Resources Page at http://www.asme.org/kb/standards/publications/bpvc-resources.

Changes in this Addenda, given below, are identified on the pages by a margin note, **(a)**, placed next to the affected area. Revisions to the 2010 Edition are indicated by **(10)**. For the listing below, the *Page* references the affected area. A margin note, **(a)**, placed next to the heading indicates *Location*. Revisions are listed under *Change*.

The Record Numbers listed below are explained in more detail in "List of Changes in Record Number Order" following the Summary of Changes.

Page	*Location*	*Change (Record Number)*
xxvii, xxviii	Foreword	Tenth and fourteenth paragraphs revised *(10-1191)*
xxix	Statement of Policy on the Use of the Certification Mark and Code Authorization in Advertising	Revised *(10-1191)*
xxix	Statement of Policy on the Use of ASME Marking to Identify Manufactured Items	Revised *(10-1191)*
xxx, xxxi	Submittal of Technical Inquiries to the Boiler and Pressure Vessel Committee — Mandatory	(1) Moved from Appendix 16 and revised (2) Paragraph 4 revised *(10-1191)*
xxxii–xliv	Personnel	Updated
1, 2	U-1	(1) Subparagraph U-1(c)(2) revised *(10-1191)* (2) Subparagraph U-1(d) revised *(10-1191)*
3, 4	U-2	(1) First sentence in subpara. (b)(1) revised *(10-1191)* (2) Last sentence in subpara. (b)(2) revised *(10-1191)* (3) Subparagraph (f)(2) revised *(10-1191)* (4) Subparagraph (h)(3) revised *(10-1191)*
5	U-5	Added *(10-1964)*

Page	*Location*	*Change (Record Number)*
6, 7	Table U-3	(1) Revised *(10-878)* (2) "Year" entry for Pressure Relief Devices revised *(09-1328)* (3) Standard Guide for Preparation of Metallographic Specimens added *(10-882)*
11–14	UG-11	Revised in its entirety *(09-1912)*
15, 16	UG-19	Last sentence in subpara. (a) revised *(10-1517)*
	UG-20	Note added to subpara. (a) *(10-1211)*
21, 24	UG-28	Subparagraph (f) revised *(10-1191)*
30	UG-32	Subparagraph (b) deleted *(10-1525)*
34, 35	UG-34	In subpara. (c)(2), reference to Formula (3) corrected to Formula (4) by errata, and reference to Formula (4) corrected to Formula (5) by errata *(11-52)*
36	Figure UG-34	Illustration (g) revised *(09-2038)*
45	UG-39	Last sentence added to subpara. UG-39(a) *(01-389)*
47	UG-40	(1) Subparagraph (b)(2) revised *(09-1406)* (2) Subparagraph (e) revised *(09-1912)*
54, 55	UG-44	New subpara. (a) added, and subsequent subparagraphs redesignated *(09-1912)*
72–74	UG-90	(1) Subparagraphs (a) and (c)(1) revised *(10-1191)* (2) Last sentence added to subpara. (n) *(08-1192)*
	UG-93	Subparagraph (a)(1) revised *(08-1192)*
75, 76	UG-99	(1) Last sentence added to subpara. (b) *(07-1169)* (2) Subparagraph (f) revised *(08-1077)*
83–90	UG-102	First sentence in subpara. (a) revised *(07-1169)*
	Figure UG-116	Revised *(10-1191)*
	UG-116	(1) Subparagraphs (1)(a), (b), (b)(1), (e), (f)(1), (f)(2), (g), (g)(1), (g)(2), (h)(1)(a), (h)(1)(c), and (h)(2) revised *(10-1191)* (2) Subparagraphs (j) and (k) revised *(10-1517)*
	UG-117	(1) Revised *(10-1191)* (2) Fifth paragraph under subpara. UG-117(f) revised *(08-1192)*
	UG-119	Subparagraphs (c) and (f) revised *(10-1191)*
	Figure UG-118	Revised *(10-1191)*
	UG-120	(1) Subparagraphs (a), (a)(4), and (c) revised *(10-1191)* (2) Subparagraph (b) revised *(10-1517)*
	UG-125	Subparagraph (a) revised *(09-1915)*
94–97	UG-129	Subparagraphs (a)(7), (b), (e)(10), (f)(9), and (g) revised *(10-1191)*
	Figure UG-129.1	Revised *(10-1191)*
	Figure UG-129.2	Revised *(10-1191)*
	UG-130	Revised *(10-1191)*
	UG-131	(1) Subparagraphs (a) and (d)(2) revised *(10-1191)* (2) Footnote 59 revised *(10-1191)*

Page	*Location*	*Change (Record Number)*
103–109	UG-136	Subparagraphs UG-136(c)(3), (c)(3)(d), UG-136(c)(4), (c)(4)(1), UG-136(c)(5), and UG-136(d)(1) revised *(10-1191)*
	UG-137	Subparagraphs UG-137(c)(3), (c)(3)(d), and UG-137(d)(1) revised *(10-1191)*
	UG-138	Subparagraph (c)(3), (c)(3)(d), and (d)(1) revised *(10-1191)*
114, 115	UW-3	First paragraph revised *(10-545)*
	UW-5	Subparagraph (e) added; former subpara. (e) redesignated as (f) *(07-679)*
116	UW-11	Subparagraph (a) revised in its entirety *(08-659)*
117	UW-12	First sentence in subpara. (f) revised *(07-1760)*
	UW-13	In subpara. (b)(1), reference to Fig. UW-13.1, sketch (j) revised to sketch (i) by errata *(10-750)*
127, 134	UW-16	Subparagraph UW-16(f)(3)(a)(4) revised *(10-289)*
141–143	UW-21	Revised *(10-424)*
	Figure UW-21	Illustration (1) revised *(10-11)*
	UW-26	Subparagraph (d)(5) revised *(10-1191)*
	UW-27	(1) Subparagraph (a)(2) added; former (a)(2) redesignated as (a)(3) and revised *(07-1760)* (2) Subparagraphs (e) and (f) revised *(07-679)*
148, 149	UW-42	Revised *(10-41)*
	UW-50	Revised *(10-960)*
	UW-51	Subparagraph (a)(4) added *(04-698)*
162	UB-30	Subparagraphs (d) and (d)(5) revised *(09-367, 10-1191)*
165	UCS-5	Subparagraph (c) revised *(09-1092)*
166	UCS-6	Subparagraph (c) added *(07-679)*
167	Table UCS-23	(1) SA-841 added *(07-683)* (2) SA/AS 1548 revised *(09-1009)* (3) SA/EN 10028-2 revised *(08-1293)*
170	Table UCS-56	Note (2)(b) revised *(07-679)*
179, 184	UCS-66	(1) Subparagraph (a) revised *(10-1060)* (2) Subparagraph (j) revised *(10-1060)*
182	Figure UCS-66	Notes (2)(a) and (4) revised *(08-1293, 09-1009)*
184, 190	UCS-67	Revised *(10-1060)*
194, 195	UCS-85	Last sentence added to subpara. UCS-85(f) *(07-679)*
208	Table UHA-23	(1) Under SA-213, S34751 added *(07-683)* (2) Under SA-312, S34751 added *(07-683)* (3) SA-451 added *(07-793)*
210	UHA-32	In subpara. (c), the reference to UHA-105(b) corrected to UHA-105 by errata *(10-1104)*
213–215	UHA-51	Subparagraphs (a)(4)(a)(1) and (a)(4)(b) revised *(10-802)*
	Table UHA-44	(1) 304L added *(06-621)* (2) 347LN added *(07-683)* (3) Note (2) revised *(07-683)*

Page	*Location*	*Change (Record Number)*
221	UCI-35	Subparagraph (b)(3) revised *(09-1912)*
243	UHT-115	Last sentence revised *(10-1191)*
267	ULW-90	Revised *(10-1191)*
	ULW-115	Subparagraph (c) revised *(10-1191)*
277	ULT-115	Subparagraph (a)(1) revised *(10-1191)*
279, 281	UHX-4	Subparagraph UHX-4(d) revised *(10-355)*
	UHX-8	Added *(04-786)*
	Table UHX-8.1	Added *(04-786)*
286, 291	UHX-12.3	W_c, W_s, and W_{max} deleted; W^* added *(04-786)*
292, 293	UHX-12.5.6	Equations in Configurations b through f revised *(04-786)*
	UHX-12.5.8	Last paragraph deleted by errata *(10-1104)*
294, 296	UHX-13.3	W deleted; W^* added *(04-786)*
298	UHX-13.5.6	Equation beginning with P_w revised *(04-786)*
	UHX-13.5.7	Equation revised *(04-786)*
306	UHX-13.6.4	In subpara. UHX-13.6.4(e), "S_S" corrected to "S_s" by errata *(10-1737)*
307, 308	UHX-13.8.4	Equation in subpara. UHX-13.8.4(f) revised *(04-786)*
312, 313	UHX-14.3	W deleted; W^* added *(04-786)*
315	UHX-14.5.7	Equation revised *(04-786)*
317, 318	UHX-14.6.4	Equation in subpara. UHX-14.6.4(d) revised *(04-786)*
	UHX-14.8.1	Spelling of "using" in the last paragraph corrected by errata *(10-1737)*
319	UHX-14.8.3	(1) In subpara. UHX-14.8.3(c), in the last line, $E_s^* = E_s$ corrected to $E_c^* = E_c$ by errata *(10-1737)* (2) In subpara. 14.8.3(f), in the last paragraph, "<" corrected to "≤" by errata *(10-1737)*
344	Table UIG-6-1	First two entries under the "Block" column head revised *(10-777)*
347	Figure UIG-34-2	Title and "G_t" corrected by errata to read "G_c" *(10-679)*
359	Table UIG-84-1	(1) Spelling of "blocks" corrected by errata *(10-769)* (2) Sixth entry in Testing Frequency column revised *(10-774)*
361	UIG-112	Subparagraph (b) revised *(10-1191)*
	UIG-116	Subparagraphs (b) and (d) revised *(10-1191)*
	UIG-120	Subparagraph (a) revised *(10-1191)*
390, 394	1-10	(1) In subpara. (b)(1), Step 11, eq. (38), A_t corrected to A_T by errata *(10-1104)* (2) In subpara. (b)(2), reference to Fig. 1-10-5 corrected to Fig. 1-10-4 by errata *(10-1104)*
397, 398	2-3	(1) Definition of g_o revised *(08-1602)* (2) M_0 corrected to M_o by errata *(10-1737)*
399, 403	2-5	In subpara. (d), eq. (3), 2_a corrected to $2a$ by errata *(10-1737)*

Page	*Location*	*Change (Record Number)*
411	2-12	In subpara. (a), reference to subpara. UG-44(a) revised to subpara. UG-44(b) *(09-1912)*
413	Table 2-7.1	In the last sentence of the first column, g_i revised to g_1 by errata *(10-750)*
418–420	3-2	(1) Definitions of *acceptance by the Inspector*, *ASME Designee*, *certificate of compliance*, *material*, *material manufacturer*, *material supplier*, and *Material Test Report* revised *(08-1192)* (2) Definition of *vessel Manufacturer* revised *(10-1191)* (3) Definitions of *Certification of Authorization*, *Certification Mark*, *Certification Mark Stamp*, and *Certification Designator (Designator)* added *(10-1191)*
430–432	5-1	Subparagraph 5-1(f) added *(10-94)*
	5-3	In subpara. 5-3(f), t revised to t_f *(10-94)*
	5-4	Revised *(10-768)*
	Figure 5-1	Definition of t revised *(10-94)*
	5-5	Revised *(10-768)*
	Figure 5-2	The variable t revised to t_f *(10-94)*
433	6-1	Subparagraph (d) added *(10-1423)*
438	8-1	Subparagraph (d) added *(10-1423)*
449	10-1	Second sentence revised *(10-1191)*
450	10-13	(1) Subparagraph (b)(5) added and subsequent subparagraphs redesignated *(09-1912)* (2) Subparagraph (b)(7) revised *(08-1504)* (3) Subparagraphs (c) and (c)(1) revised *(10-1191)*
504	Appendix 16	Moved to the front matter and revised
516	19-5	Revised *(10-1191)*
521	23-4	Subparagraph (a)(1) revised *(10-448)*
523	24-1	Subparagraphs (a) and (f) revised *(07-1405)*
527	24-4	Subparagraph (d) revised; eq. (6) added and subsequent equations renumbered *(07-1405)*
528	Table 24-8	In first entry in the Allowable Stress column, S_{AM} corrected to S_{AH} by errata *(10-1737)*
531–535	26-1	First sentence revised *(10-680)*
	26-3	Definitions of L_f and P revised; definition of t_s added *(10-680)*
	Figure 26-1	Illustration (b) revised *(10-680)*
	26-4.1	Subparagraphs (a), (b), (g), and (i) revised; new subpara. (h) added and subsequent paragraph redesignated *(10-680)*
	26-4.2	Last paragraph in subpara. (b) revised *(10-680)*
546	26-9.5.2	Subparagraph (b) revised *(10-680)*
	26-9.5.3	Subparagraph (b) revised *(10-680)*
	Figure 26-10	Revised *(10-680)*
	Figure 26-11	Revised *(10-680)*
547	26-10	(1) Subparagraphs (a) and (b) revised *(10-680)* (2) Subparagraph (c) revised *(08-1206)*

Page	*Location*	*Change (Record Number)*
	26-11	Revised *(10-768)*
	26-12	Revised *(10-768)*
548	Figure 26-13	Revised *(08-1206)*
552	26-16	Deleted *(10-768)*
572	34-4	Minimum design metal temperature of –20°C corrected to –46°C by errata *(10-750)*
574, 575	35-1	Revised *(10-1191)*
	35-2	Revised *(10-1191)*
	35-4	(1) Subparagraphs (a) and (e) revised *(09-1462)* (2) Subparagraph (c) revised *(10-1191)*
579	37-6	In subpara. (c), reference to 4.2 corrected to subpara. 37-4(b) by errata *(10-769)*
586	Figure 40-6-1	On the *y*-axis, θ_m corrected to θ_M by errata *(10-769)*
588–592	Mandatory Appendix 41	Added *(01-389)*
593, 594	Mandatory Appendix 42	Added *(10-882)*
595, 596	A-1	In subpara. (e)(3)(b), commas inserted around $(P_o + P_t)$ by errata *(10-1737)*
598, 600	A-2	Definition of d_o corrected by errata *(10-1737)*
	A-3	In subpara. (a), "below" added after "(k)" by errata *(10-1737)*
	A-5	In the first sentence, "satisfied" replaced "met" by errata *(10-1737)*
620	L-1.6.1	Equations corrected by errata *(11-52)*
621	L-1.6.3	Equation corrected by errata *(11-52)*
660, 661	M-5.2	Under *valve operation controls*, subpara. (a) revised *(09-1459)*
662	M-5.7	First sentence revised *(09-1459)*
685	Table W-3	Note Nos. 59 and 67 revised *(10-1191)*
689	Form UD-1	Table in 2A revised *(06-906)*
690	Table W-3.2	Note Nos. 9, 20, 21, 22, and 24 revised *(06-906)*
704, 705	Nonmandatory Appendix DD	Items 2, 4, and 6 revised *(10-1191)*
744	MM-1	Subparagraphs (a) and (c) revised *(10-1191)*
	MM-2	Subparagraphs (d) and (e) revised *(10-1191)*
	MM-3	Note under subpara. (e) revised *(10-1191)*

NOTE:

Volume 61 of the Interpretations to Section VIII-1 of the ASME Boiler and Pressure Vessel Code follows the last page of this Addenda.

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
01-389	Added new Mandatory Appendix for Electric Immersion Heater Element Support Plates. Sentence added to UG-39 at the end of the paragraph.
04-698	Added para. 4 to UW-51, Radiographic Examination of Welded Joints.
04-786	Added UHX-8 for the tubesheet effective bolt load, W^*, to be used in the perforated region of the tubesheet. Revised the calculation procedures to incorporate the correct nomenclature and formulae.
06-621	Added 304L to Table UHA-44.
06-906	Changed the heading of column 8 in Form UD-1, Table 2A, to Marked Burst or Set Pressure. Deleted the heading of column 9, "disk," from Form UD-1, Table 2A. Added "or pin" after "rupture disk" in Form UD-1, Certificate of Shop Compliance. Added "as applicable" after "device" in Table W-3.2, Note (9). Added "or set" after "burst" in Table W-3.2, Note (20). Added "or pin" after "disk" in Table W-3.2, Note (20). Deleted "disk" after "specified" in Table W-3.2, Note (21). Added "or pin" after "disk" in Table W-3.2, Note (21). Added "or pin device as applicable" after "disk" in Table W-3.2, Note (22). Added "as applicable" after "identifier" in Table W-3.2, Note (24).
07-644	Revised UCS-67, UCS-67(a), and UCS-67(b); deleted UCS-67(c) and UCS-67(d), clarifying the requirements for impact testing of welds and welding procedure qualifications.
07-679	Added UW-5(e) and renumbered the previous UW-5(e) as UW-5(f). Added UCS-6(c). Added SA-841, Grade A, Class 1 and Grade B, Class 2 to Table UCS-23. Added a statement in Table UCS-56 at the end of Note (2)(b). Added a statement to UCS-85(f).
07-683	Revised UHA-23 and UHA-44 to add SA-213 TP347LN, UNS S34751, and SA-312 TP347LN, UNS S34751.
07-793	Revised Table UHA-23 to add SA-451 J92800 (CPF3M) and J92900 (CPF8M).
07-1169	Revised the first sentence of UG-102(a) to define the installation of a pressure gage by a pressure connection. Added static head considerations to UG-99(b).
07-1405	Added consideration of loads other than pressure, such as piping loads to 24-1(a). Modified retainer requirements in 24-1(f). Added alternative to eq. (5) in 24-1(d): a requirement to provide the User with controlled bolting procedure, if used, and a warning regarding overstressing the clamp.
07-1760	Added "(3)" after "UW-27(a)" in UW-12(f). Inserted new (a)(3).
08-103	Added new note to UG-20(a), which references WRC Bulletin 470, "Recommended Design Details for Elevated Temperature Service."
08-659	Clarified UW-11(a)(1), (2), (3), (4), and (5) on full radiographic examination requirements with exemptions for Categories B and C butt welds for nozzles and communicating chambers. Added full radiography requirement, UW-11(a)(4)(b), for unfired steam boilers with a design pressure not exceeding 50 psi but the wall thickness at the welded joint exceeding the thickness requiring full radiography.
08-1077	Revised UG-99(f) to allow for vacuum testing as an alternative for vacuum service vessels, and to impose leak testing requirements for performing vacuum testing.
08-1192	Revised definitions in Appendix 3. Deleted definition of material supplier in Appendix 3. Revised UG-90(c)(1)(n). Revised UG-93(a)(1). Added new UG-93(a)(1)(a) and UG-93(a)(1)(b). Revised UG-117(f).
08-1206	Clarified the requirement for circumferential welds attaching the bellows element to the shell or weld end.
08-1293	Revised Table UCS-23 and Fig. UCS-66, Notes (2)(a) and (4) to add SA/EN 10028-2 P235GH and P265GH.
08-1504	Added the phrase "for each welder who welded on the vessel" to the end of 10-13(b)(6).
08-1602	Revised the definition of g_0 in 2-3 of Appendix 2.
09-1009	Updated steel grade designations in Table UCS-23 and Note (4) for Fig. UCS-66. Added SA/AS 1548 Grades PT430NR, PT460NR, and PT490NR in Note (2)(a) for Fig. UCS-66.

Record Number	Change
09-1092	Revised the parenthetical statement in UCS-5(c) to focus attention on the alternative provisions of Part UF.
09-1328	Revised the edition of PTC 25 from 2001 to 2008 in Table U-3.
09-1367	Revised UB-30.
09-1406	Made the definition of R_n in UG-40(b)(2) consistent with UG-37(a).
09-1459	Enhanced the definition of "mechanical interlocks" in M-5.2 and clarified paragraph M-5.7 to state specifically that process control valves are not allowed in the relief path where there is normally process flow.
09-1462	Revised 35-4(a) and 35-4(e) to clarify that the Manufacturer is responsible for submitting the inspection and quality control procedure and the Quality Control System to the AIA of record, the legal jurisdiction, and the ASME Designee for review and acceptance.
09-1912	Revised UG-11. Revised reference in UG-40(e). Revised UG-44 to add ASME B16.1. Revised UCI-35(b)(3). Revised reference in 2-12. Revised 10-13.
09-1915	Modified UG-125 to clarify the pressure relief requirements for unfired steam boilers.
09-2038	Revised t_w to be not less than $1.25t_s$ instead of $1.2t_s$ in Fig. UG-34, illustration (g).
10-11	Revised Fig. UW-21, illustration (1).
10-41	Editorially revised UW-42.
10-94	Added a paragraph to permit the use of the operating metal temperature properties for the thermal loading cases. Separated the nomenclature for the flexible element thickness and the uncorroded straight flange thickness in Appendix 5.
10-289	Added the words "as required by (3) above" to UW-16(f)(3)(a)(4) to provide requirements for t_f such that it will accommodate the required fillet weld size.
10-355	Added UHX-4(d)(2) that addresses distributor belts where the shell is continuous across the belt.
10-424	Revised UW-21 to allow the use of ASME B16.5 socket and slip-on flanges for all vessel parts.
10-448	Revised Appendix 23, 23-4(2), to increase the design temperature limit for copper and copper alloys.
10-545	Added references to some weld joints in UW-3 not assigned a Category.
10-680	Editorially revised Appendix 26. Made effective length of one reinforcing fastener in Appendix 26 consistent with length as defined in PCC-1.
10-750	Corrected by errata. See Summary of Changes.
10-768	Revised 5-4, 5-5, 26-4, 26-10, 26-11, and 26-12 for consistency with Division 2 and deleted 26-16.
10-774	Revised Table UIG-84-1.
10-769	Corrected by errata. See Summary of Changes.
10-777	Revised Table UIG-6-1.
10-802	Revised UHA-51(a)(4) to permit the use of gas tungsten arc welding (GTAW) or gas metal arc welding (GMAW) with Type 308L weld filler metal, in addition to the Type 316L filler metal.
10-878	Revised Table U-3 to update "year of acceptable edition" for those standards that were reviewed.
10-882	Added new Mandatory Appendix on Diffusion Bonding and Qualification.
10-960	Revised UW-50 to clarify that the required NDE is to take place prior to pneumatic testing.
10-1060	Divided the content of UCS-67(a) into four subparagraphs (previously there were three), and reorganizaed the content of new subparagraph UCS-67(a)(3). Divided the content of UCS-67(b) into four subparagraphs (previously there were three). These editorial changes were made to improve clarity for Code users.
10-1104	Corrected by errata. See Summary of Changes.
10-1191	The following summarizes the changes made to words and phrases to accommodate the change to a single ASME Certification Mark from 28 different ASME Marks: (a) Revised "Code Symbol" and "ASME Code Symbol" to read "Certification Mark." (b) Revised "Code stamped" to read "stamped with the Certification Mark" or "Certification Marked stamped." (c) Revised "Code stamp holder" to read "Certificate holder." (d) Revised "Certificate of Authorization Holder" to read "Certificate holder." (e) Revised "U Certificate of Authorization" to read "Certificate of Authorization with the U Designator." (f) "Certificate of Authorization" is not revised. (g) Revised "holder of a valid U Certificate of Authorization" to read "Certificate Holder with the U Designator." (h) Revised "U Stamp" to read "Certification Mark with the U Designator." (i) Revised "Code U Symbol" to read "Certification Mark with the U Designator." (j) Revised "Code UV Symbol" or "Code UD Symbol" to read "Certification Mark with the UV Designator" or "Certification Mark with the UD Designator." (k) Revised "UM vessels" to read "vessels bearing the UM Designator." (l) Revised "UM Stamp" or "UM Code Symbol" to read "Certification Mark with the UM Designator." (m) Revised "appropriate Code Symbol" to read "Certification Mark with the appropriate Designator."
10-1211	Made editorial revisions for clarity.

Record Number	Change
10-1423	Inserted new 6-1(d) clarifying MT documentation requirements. Inserted new 8-1(d) clarifying PT documentation requirements.
10-1517	Clarified the marking and data report requirements for combination units and common elements adjacent to at least one Code chamber. Reorganized the paragraphs relating to the marking and MDR requirements for combination units. Renumbered UG-116(l) to UG-116(k).
10-1525	Deleted the text in UG-32(b) and replaced it with "Deleted."
10-1737	Corrected by errata. See Summary of Changes.
10-1964	Added new U-5 addressing tolerances formerly contained in the Foreword.
11-52	Corrected by errata. See Summary of Changes.

INTRODUCTION

SCOPE

(a) 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 A 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, ULT, and UIG 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, low temperature materials, and impregnated graphite, respectively. Section II, Part D also contains tables of maximum allowable stress values for these classes of materials, except for impregnated graphite.

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 Certification Mark with the U Designator:

(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 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 (2 MPa);

(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 (450 L);

(h) vessels not exceeding the design pressure (see 3-2), at the top of the vessel, limitations below, with no limitation on size [see UG-28(f), 9-1(c)]:

(1) vessels having an internal or external pressure not exceeding 15 psi (100 kPa);

(2) combination units having an internal or external pressure in each chamber not exceeding 15 psi (100 kPa) and differential pressure on the common elements not exceeding 15 psi (100 kPa) [see UG-19(a)];

(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 (20 MPa). For pressures above 3000 psi (20 MPa), 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 Certification Mark with the Designator.

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(h)];

(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 or handhole covers, and bolted covers with their attaching bolting and nuts;

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-137 and Appendix 11.

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

U-1(g)(2) The following pressure vessels in which steam is generated shall not be considered as unfired steam boilers, and shall be constructed in accordance with the rules of this Division:

U-1(g)(2)(a) vessels known as evaporators or heat exchangers;

U-1(g)(2)(b) 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)(2)(c) 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 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

[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 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.

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 (1.7 MPa) design pressure; or

U-1(j)(2) 3 cu ft (0.08 m^3) in volume and 350 psi (2.4 MPa) design pressure;

U-1(j)(3) 1½ cu ft (0.04 m^3) in volume and 600 psi (4.1 MPa) 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).

GENERAL

(a) 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.

(5) the degree of nondestructive examinations(s) and the selection of applicable acceptance standards, when such examinations are applied, are beyond the requirements of this Division.

Sample User Design Requirements forms and guidance on their preparation are found in Nonmandatory Appendix KK. This sample form might not be applicable to all pressure vessels that may be constructed in accordance with this Division. The user is cautioned that input from the Manufacturer may be necessary for completion of this form.

(b) Responsibilities[5]

(1) The Manufacturer of any vessel or part to be marked with the Certification Mark 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 stamped with the Certification Mark and Designator by the appropriate Certificate 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 Certification Mark;

(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

[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 that includes a pressure vessel as a part and that is purchased by the user, or an organization that 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.