

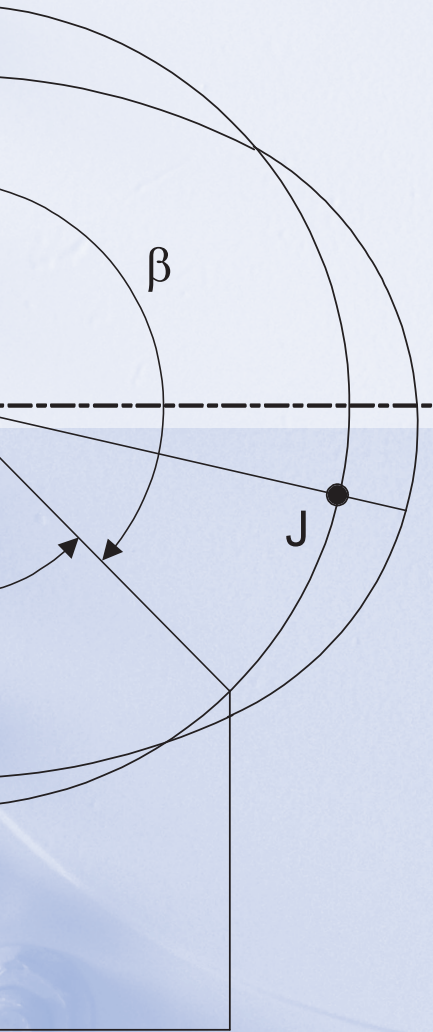
2013 ASME Boiler and Pressure Vessel Code

AN INTERNATIONAL CODE

VIII

Rules for Construction of Pressure Vessels

Division 1



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July 1, 2013

VIII RULES FOR CONSTRUCTION OF PRESSURE VESSELS

Division 1

ASME Boiler and Pressure Vessel Committee
on Pressure Vessels



The American Society of
Mechanical Engineers

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INTERPRETATIONS

ASME issues written replies to inquiries concerning interpretation of technical aspects of the Code.

Interpretations of the Code are posted in January and July at <http://cstools.asme.org/interpretations.cfm>. Any Interpretations issued during the previous two calendar years are included with the publication of the applicable Section of the Code. Interpretations of Section III, Divisions 1 and 2 and Section III Appendices are included with Subsection NCA.

CODE CASES

The Boiler and Pressure Vessel Code committees meet 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 2013 Code Cases book: “Boilers and Pressure Vessels” or “Nuclear Components.” Supplements will be sent automatically to the purchasers of the Code Cases books up to the publication of the 2015 Code.

FOREWORD

(This Foreword is provided as an aid to the user and is not part of the rules of this Code.)

In 1911, The American Society of Mechanical Engineers established the Boiler and Pressure Vessel Committee to formulate standard rules for the construction of steam boilers and other pressure vessels. In 2009, the Boiler and Pressure Vessel Committee was superseded by the following committees:

- (a) Committee on Power Boilers (I)
- (b) Committee on Materials (II)
- (c) Committee on Construction of Nuclear Facility Components (III)
- (d) Committee on Heating Boilers (IV)
- (e) Committee on Nondestructive Examination (V)
- (f) Committee on Pressure Vessels (VIII)
- (g) Committee on Welding, Brazing, and Fusing (IX)
- (h) Committee on Fiber-Reinforced Plastic Pressure Vessels (X)
- (i) Committee on Nuclear Inservice Inspection (XI)
- (j) Committee on Transport Tanks (XII)

Where reference is made to “the Committee” in this Foreword, each of these committees is included individually and collectively.

The Committee's function is to establish rules of safety relating only to pressure integrity, which govern the construction^{*} of boilers, pressure vessels, transport tanks, and nuclear components, and the inservice inspection of nuclear components and transport tanks. The Committee also interprets 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, or nuclear components, or the inservice inspection of nuclear components or transport tanks. Users of the Code should refer to the pertinent codes, standards, laws, regulations, or other relevant documents for safety issues other than those relating to pressure integrity. Except for Sections XI and XII, and with a few other 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. In formulating the rules, the Committee considers the needs of users, manufacturers, and inspectors of pressure vessels. The objective of the rules is to afford reasonably certain protection of life and property, and to provide a margin for deterioration in service to give a reasonably long, safe period of usefulness. Advancements in design and materials and evidence of experience have been recognized.

This Code contains mandatory requirements, specific prohibitions, and nonmandatory guidance for construction activities and inservice inspection and testing 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 judgement* refers to technical judgments made by knowledgeable engineers 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 the application of these programs to their design.

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

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 Committee meets regularly to consider revisions of the rules, new rules as dictated by technological development, Code Cases, and requests for interpretations. Only the 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 Standards Committees). Proposed revisions to the Code resulting from inquiries will be presented to the Committee for appropriate action. The action of the Committee becomes effective only after confirmation by ballot of the Committee and approval by ASME. Proposed revisions to the Code approved by the Committee are submitted to the American National Standards Institute (ANSI) and published at <http://cstools.asme.org/csconnect/public/index.cfm?PublicReview=Revisions> to invite comments from all interested persons. After public review and final approval by ASME, revisions are published at regular intervals in Editions of the Code.

The 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 Committee. ASME is to be notified should questions arise concerning improper use of an ASME Certification Mark.

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

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

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.

(13) SUBMITTAL OF TECHNICAL INQUIRIES TO THE BOILER AND PRESSURE VESSEL STANDARDS COMMITTEES

1 INTRODUCTION

(a) The following information provides guidance to Code users for submitting technical inquiries to the committees. 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 committees 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 a committee's full understanding may result in the request being returned to the inquirer with no action.

2 INQUIRY FORMAT

Submittals to a 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.

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 committees 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

Two 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 appropriate committee 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 committee.

PERSONNEL

ASME Boiler and Pressure Vessel Standards Committees, Subgroups, and Working Groups

January 1, 2013

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SUMMARY OF CHANGES

The 2013 Edition of this Code contains revisions in addition to the 2010 Edition with 2011 Addenda.

After publication of the 2013 Edition, 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 the BPV Code. Such Errata shall be used on the date posted.

Information regarding Special Notices and Errata is published on the ASME Web site under the BPVC Resources page at <http://www.asme.org/kb/standards/publications/bpvc-resources>.

Changes given below are identified on the pages by a margin note, **(13)**, placed next to the affected area.

The Record Numbers listed below are explained in more detail in “List of Changes in Record Number Order” following this Summary of Changes.

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
xxv	List of Sections	Revised (12-749)
xxvii	Foreword	Revised in its entirety (09-760)
xxx	Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees	Revised (12-1641)
xxxii	Personnel	Updated
lx	Cross-Referencing and Stylistic Changes in the Boiler and Pressure Vessel Code	Added
1	U-1	Subparagraph(c)(2)(-d) revised (12-526)
3	U-2	Subparagraph (a) revised (06-788)
4	U-3	First sentence of subpara. (a) revised (09-1148)
5	Table U-3	Revised (11-1240)
8	UG-6	Subparagraph (c) added (12-2051)
10	UG-11	Subparagraphs (a) and (c)(5) revised (11-253, 11-987, 12-370)
13	UG-16	Subparagraph (f) added (12-904)
14	UG-20	Subparagraph (f)(2) revised (11-2185)
18	UG-27	In subpara. (c)(2), endnote 20 revised (12-904)
19	UG-28(c)	In subpara. (1), last sentence of Step 8 deleted (12-904)
21	Figure UG-28.1	Note (1) revised (11-442)
22	UG-28(d)	Last sentence of Step 6 deleted (12-904)
22	UG-29	In subpara. (a), last sentence of Step 8 deleted (12-904)
24	UG-30	Last sentence of subpara. (e) deleted (12-904)
28	UG-32	(1) In subpara. (a), endnote 23 revised (12-904) (2) In subpara. (e), second paragraph revised (11-1898)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
29	UG-33	(1) In subparas. (c) and (e); subpara. (d), Step 2; and subpara. (f)(1), Step 8, last sentence deleted (12-904) (2) Subparagraph (f) revised (11-442)
36	UG-35.2	Subparagraphs (c)(1) and (e) revised (06-788)
37	“Openings and Reinforcements”	In-text Note deleted (12-904)
41	UG-37(g)	Revised (08-1428)
48	UG-41	In subparas. (b)(1) and (b)(2), references to L-7 examples deleted (12-904)
54	UG-47	Subparagraph (f) revised (10-288)
61	UG-79	(1) Title and subpara. (a) revised (12-237) (2) Subparagraph (d) added (10-631)
61	Table UG-79-1	Added (12-237)
61	UG-80(b)	Subparagraph (10) deleted (12-904)
68	Figure UG-84.5	Added (00-211)
68	Table UG-84.6	Added (00-211)
68	UG-84(f)(2)	Revised (11-83)
69	UG-84(g)(2)	Revised (00-211)
69	UG-84(h)	(1) Subparagraph (3) revised (00-211) (2) Subparagraph (4) corrected by errata (11-2242)
70	UG-84(i)(3)(-a)(-1)	Revised (11-2183)
75	UG-99(k)	Revised (04-349)
75	UG-100	Subparagraphs (d) and (e) revised (04-349, 07-260)
76	UG-101	Subparagraph (a)(1)(-a) corrected by errata (11-1680)
81	UG-116	(1) Subparagraph (a)(3) revised (07-225) (2) Subparagraph (a)(4) deleted, and subsequent subparagraphs renumbered (07-225)
81	Figure UG-116	Certification Mark corrected by errata (11-1676)
83	UG-117	Subparagraphs (a), (a)(2)(-c), and (a)(3) revised (11-1398, 12-735)
85	UG-118	Revised in its entirety (11-861)
86	Figure UG-118	(1) Certification Mark corrected by errata (11-1676) (2) General Note revised (07-225) (3) Note (2) added (07-225)
86	UG-120	Subparagraph (a)(4) revised (12-735)
88	UG-125	Subparagraph (a) revised (12-1132)
89	UG-126	Subparagraph (c) revised (08-488)
91	UG-129	Subparagraphs (a), (a)(7), (d), (e), (e)(8), (e)(9), (e)(10), (f), and (f)(9) revised (09-2013, 12-401)
92	Figure UG-129.1	Corrected by errata (11-1676)
92	Figure UG-129.2	Corrected by errata (11-1676)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
96	UG-131(e)(7)	Revised (08-487)
101	UG-136(b)	In-text Note following subpara. (2) revised (06-788)
107	UG-140	Subparagraph (b)(2) revised (12-403)
109	UW-2	(1) Subparagraphs (a)(1)(-a), (b)(1), (b)(4)(-a), and (b)(4)(-b) revised (04-1635, 10-1702) (2) Last sentence of subpara. (a)(2) deleted (04-1635)
110	UW-3	Subparagraph (b) corrected by errata (12-1736)
112	UW-6	Added (04-690)
125	Figure UW-16.1	Sketch (a-4) added (11-06)
131	UW-16(f)(4)	Corrected by errata (13-130)
135	UW-19	Subparagraphs (a)(2), (c), and (c)(2) revised (09-279, 10-288)
139	Figure UW-21	(1) Label for sketches (1), (2), and (3) revised (10-1796) (2) Sketch (1) corrected by errata (11-1680)
140	UW-27	Subparagraph (a)(3) revised (09-991)
141	UW-34	First sentence revised (11-475)
142	UW-35	SI Units in in-text table of subpara. (d) revised (11-471)
145	UW-40(f)(5)(-h)	Added (04-1628)
146	UW-51	Subparagraph (a)(4) revised (11-1158)
146	UW-52	Subparagraph (c) corrected by errata (11-733)
164	Table UCS-23	(1) Revised (08-1609, 08-1790, 09-299, 09-739, 10-286, 11-877, 12-482) (2) "Type/Grade" entry for SA/EN 10028-2 corrected by errata (11-1680)
164	UCS-28	Subparagraph (b) deleted, and subpara. (c) redesignated (12-904)
165	UCS-29	Last sentence deleted (12-904)
165	UCS-33	Last sentence deleted (12-904)
165	UCS-56	(1) Subparagraph (f)(4)(-a) corrected by errata (13-130) (2) Subparagraph (g) added (07-563)
170	Table UCS-56-4	General Notes revised (07-563)
175	Table UCS-56-11	General Notes revised (07-563)
176	UCS-66	Subparagraph (a) revised (11-1244)
177	Figure UCS-66	(1) Revised (11-1244) (2) In Note (3), SA-533 Grade E added (12-482) (3) In Notes (2)(a) and (4), Grades for SA/EN 10028-2 corrected by errata (11-1680)
180	Figure UCS-66M	(1) Revised (11-1244) (2) In Note (3), SA-533 Grade E added (12-482) (3) In Notes (2)(a) and (4), Grades for SA/EN 10028-2 corrected by errata (11-1680)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
185	Figure UCS-66.1	Cross-references in Figure nomenclature revised (11-1245)
186	Figure UCS-66.1M	Cross-references in Figure nomenclature revised (11-1245)
191	UCS-68	Subparagraph (c) revised (01-193, 09-1229)
192	UCS-79	(1) Title and subparas. (d) and (d)(5) revised (09-819) (2) Subparagraphs (e) and (f) added (09-819)
193	Table UCS-79-1	Added (09-819)
194	UCS-160	In-text Note added following subpara. (b) (12-974)
198	Table UNF-23.3	Revised (08-1609)
199	UNF-28	Revised (12-904)
199	UNF-33	Last sentence deleted (12-904)
199	Table UNF-23.4	(1) Revised (08-1609) (2) Entry for SB-367 inserted by errata (11-1513)
199	UNF-56(e)	Subparagraph (1) revised (06-788)
201	UNF-79	Subparagraph (a)(2) revised (12-237)
202	Table UNF-79	Entry for UNS N06230 added (09-1440)
206	UHA-28	Revised (12-904)
206	UHA-29	Last sentence deleted (12-904)
206	UHA-31	Last sentence deleted (12-904)
207	Table UHA-23	Revised (03-1421, 07-695, 08-1609, 11-678)
209	Table UHA-32-1	(1) Cross-reference for “Minimum Holding Time at Normal Temperature for Nominal Thickness” corrected by errata (11-2242) (2) General Note (a) revised (12-1547)
211	Table UHA-32-4	Table in General Note revised (07-695, 11-678, 12-1306)
212	UHA-44	Subparagraph (a)(2) revised (12-237)
214	UHA-51	(1) First paragraph and subparas. (a)(1), (a)(4)(-a), (a)(4)(-b), (b), (d), and (h)(2) revised (09-1920, 10-1702, 12-83) (2) Subparagraph (a)(4)(-c) added (10-1702) (3) Subparagraph (d)(1)(-a) deleted, and subparas. (d)(1)(-b) through (d)(1)(-d) redesignated (10-1702)
215	Figure UHA-51-1	Redesignated from Figure ULT-82 (12-83)
220	UCI-28	Revised (12-904)
222	UCI-99	Revised (04-349)
225	UCL-34	Last sentence of subpara. (a) deleted (04-1628)
228	UCD-28	Revised (12-904)
230	UCD-99	Revised (04-349)
237	UHT-27	Revised (12-904)
238	Table UHT-56	Note (1) revised (04-1330)
239	UHT-79	Title and subpara. (a)(1) revised (12-237)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
240	UHT-82	Revised (04-1330)
248	Figure ULW-17.2	Sketch (a) corrected by errata (13-958)
267	ULT-28	Revised (12-904)
267	ULT-30	First line of subpara. (a) revised (12-83)
271	Table ULT-82	"Thickness, in." entries for SB-209, SB-221, and SB-241 revised (09-10)
272	Table ULT-82M	"Thickness, mm" entries for SB-209, SB-221, and SB-241 revised (09-10)
272	Figure ULT-82	Moved from Part ULT to Part UHA and redesignated as Figure UHA-51-1 (12-83)
274	UHX-4	(1) Subparagraph (b) deleted, and subsequent subparagraphs redesignated (12-532) (2) In-text Note added (12-532)
276	UHX-9	Revised (11-1186)
277	UHX-10	Revised (06-886, 09-2162, 11-1186)
284	UHX-12.3	Revised (06-886, 11-1186)
284	UHX-12.4	Revised (06-886, 12-532)
288	UHX-12.5.9	Revised (08-1524)
290	UHX-13.3	Revised (06-886, 11-1186)
295	UHX-13.4	Revised (06-886, 12-532)
297	UHX-13.5.1	Revised (06-886)
299	UHX-13.5.5	Subparagraph (a) revised (06-886)
299	UHX-13.5.7	Subparagraph (b) revised (06-886)
300	UHX-13.5.8	Revised (08-1524)
300	UHX-13.5.9	Subparagraph (a)(2) revised (06-886)
301	UHX-13.5.10	Subparagraph (a) revised (06-886)
301	UHX-13.5.11	Subparagraph (c) revised (06-886)
302	UHX-13.7.1	Second paragraph revised (06-886)
302	UHX-13.7.2	Subparagraph (b) revised (06-886)
303	UHX-13.7.3	First paragraph and subparas. (c) and (g) revised (06-886)
303	UHX-13.8.1	Subparagraph (c) revised (06-886)
303	UHX-13.8.3	Revised (06-886)
303	UHX-13.8.4	First paragraph revised, and second paragraph added (06-886)
304	Table UHX-13.8.4-1	Added (06-886)
305	UHX-13.9.3	First paragraph and subpara. (d) revised (06-886)
305	UHX-14.3	Revised (06-886, 11-1186)
308	UHX-14.4	Revised (06-886, 12-532)
310	Table UHX-14.4-1	Added (06-886)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
310	UHX-14.5.1	Revised (06-886)
312	UHX-14.5.7	Subparagraph (b) revised (06-886)
312	UHX-14.5.8	Revised (08-1524)
312	UHX-14.5.9	Subparagraph (a)(2) revised (06-886)
313	UHX-14.5.10	Revised (06-886)
314	UHX-14.6.1	Subparagraph (c) revised (06-886)
314	UHX-14.6.3	Revised (06-886)
314	UHX-14.6.4	First paragraph revised, and second paragraph added (06-886)
315	Table UHX-14.6.4-1	Added (06-886)
315	UHX-14.7.3	Subparagraph (d) revised (06-886)
317	UHX-19.2	Revised (11-754)
318	UHX-19.2.2	Revised (11-754)
318	UHX-19.3	Revised (11-754)
318	UHX-20	Revised in its entirety (12-904)
352	1-4	(1) Examples 1 and 2 in subpara. (c) deleted (12-904) (2) Subparagraph (d) deleted, and subsequent subparagraphs redesignated (12-904) (3) Endnote 90 revised (11-1898)
355	1-5	Subparagraphs (a), (c), (d), and (e) revised (10-1212)
358	Figure 1-6	Sketch (d) corrected by errata (11-1680)
360	1-7	Subparagraphs (b)(1)(-a), (b)(1)(-b), (b)(3), and (b)(5) revised (11-11)
361	1-8	Title and subparas. (b) and (c) revised (10-1212)
377	Figure 2-4	Sketch (1) editorially revised (08-1641)
392	2-12	Subparagraph (a)(1) revised (12-1282)
395	2-14	Subparagraph (d) revised (08-970)
396	3-2	(1) Definition for <i>construction</i> added (09-1148) (2) Definition for <i>Material Test Report</i> revised (11-601)
414	7-4	Subparagraph (d) revised (06-788)
420	9-5(c)	Subparagraph (5) revised (10-871)
421	Figure 9-5	Sketch (b-1) corrected by errata (12-1286)
428	10-13	Subparagraph (b)(7) revised (10-1250)
445	13-7	Subparagraphs (a)(4), (b)(4), and (c)(4) deleted (12-904)
447	13-8	(1) Equations (e)(2)(5) through (e)(2)(8) corrected by errata (12-1286) (2) In subparas. (e)(3) and (f)(3), last sentence deleted (12-904)
455	13-10	Subparagraph (d) deleted (12-904)
455	13-11	Subparagraph (e)(4) deleted (12-904)
456	13-12	Subparagraph (d) deleted (12-904)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
457	13-13	Subparagraphs (b)(4) and (c)(4) deleted (12-904)
461	13-17	Revised in its entirety (12-904)
466	Figure 14-2	Deleted (12-904)
467	14-5	Deleted (12-904)
468	Figure 14-3	Deleted (12-904)
469	Mandatory Appendix 16	Deleted (12-911)
472	17-5	Subparagraph (a)(2) revised (09-279)
494	24-4	Equation (d)(6) revised (12-1551)
498	26-2	Subparagraph (g) added (12-891, 12-1834)
498	26-3	Revised (11-755, 12-890)
499	Figure 26-1-1	(1) Redesignated from Figure 26-1 (12-1834) (2) Sketches (b) and (c) revised (11-755, 12-890)
500	Figure 26-1-2	Added (12-1834)
502	Figure 26-2	Editorially renumbered from previous Figure 26-3
502	26-4.1	Subparagraph (f) revised (11-755)
502	26-4.2	Subparagraphs (a) and (b) redesignated as 26-4.2.1 and 26-4.2.2, respectively (11-755)
503	26-6.2	Subparagraphs (b) and (c) revised (11-755, 12-1834)
504	Figure 26-3	Editorially renumbered from previous Figure 26-2
504	26-6.3.3(d)	Revised (11-755)
507	26-6.6.3.2	Subparagraph (b) revised (11-755)
508	26-7.2	Subparagraphs (b) and (c) revised (11-755, 12-1834)
508	26-7.3	Equations in 26-7.3.1, 26-7.3.2, and 26-7.3.3(b), 26-7.3.3(c), and 26-7.3.3(d) revised (11-755)
510	26-7.6.1	Equations in subparagraphs (a) and (b) revised (11-755)
510	26-7.6.3.2	Subparagraph (b) revised (11-755)
511	26-7.7	Equation revised (11-755)
511	26-8.1	Revised (12-890)
511	26-8.2	Revised in its entirety (12-890)
511	26-8.3	(1) Paragraphs 26-8.3.1 and 26-8.3.2 revised (11-755, 12-890) (2) Paragraph 26-8.3.4 added (11-755)
513	26-8.6.3.2	Subparagraph (b) revised (11-755)
515	26-10	Subparagraphs (d) and (e) added (09-1452)
516	Table 26-10-1	Added (09-1452)
517	26-12.1	Revised (12-650)
518	26-14	Revised in its entirety (12-904)
519	Figure 26-14	Added (09-1452)
525	28-2	Subparagraph (b)(6) revised (05-458)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
538	34-2	In first and second paragraphs, “1150°C” revised to “1170°C” (12-661)
542	35-7	Added (11-860)
561	Mandatory Appendix 43	Added (09-1148)
562	Mandatory Appendix 44	Added (10-2041)
581	Nonmandatory Appendix L	(1) Title revised (12-904) (2) L-1.5 through L-10 deleted (12-904) (3) L-11 added (07-225)
601	W-1	(1) Subparagraph (d) revised (11-754) (2) New subpara. (e) added, and previous subpara. (e) redesignated as subpara. (f) (11-754)
602	Form U-1	All pages revised (09-741, 10-1787)
605	Form U-1A	Front and back revised (09-741, 10-1787, 11-2101)
607	Form U-1B	Revised (10-1547, 10-1787)
608	Form U-2	All pages revised (09-741, 10-1787)
611	Form U-2A	Front and back revised (09-741, 10-1787)
613	Form U-3	Added (12-735)
615	Form U-3A	Redesignated from previous Form U-3 and revised (09-741, 12-735)
617	Form U-4	Revised (10-1787)
618	Form U-5	Added (11-754)
619	Table W-3	(1) Columns “U-1B,” “U-3,” and “U-5” added (10-1547, 11-754, 12-735) (2) Previous “U3” column redesignated as “U-3A” (12-735) (3) Reference Nos. (12), (23), (25), (26), (35), (53), (55), (62), and (63) revised (06-788, 10-1547, 10-1787, 11-754, 11-2101) (4) Reference Nos. (53) and (55) corrected by errata (11-2242) (5) Reference No. (61) deleted (10-1787) (6) Reference No. (72) added (11-754)
625	Figure W-3.1	Revised (10-1787)
627	Form UV-1	Line 2 corrected by errata (11-1676)
628	Form UD-1	Lines 2A and 2B corrected by errata (11-1676)
646	Nonmandatory Appendix DD	Item (3) corrected by errata (11-1676)
646	Figure DD-1	The term “Code symbol” corrected by errata to “Certification Mark” (11-1676)
647	EE-3	Example and subparas. (a) through (c) deleted (12-904)
652	Nonmandatory Appendix FF	The term “User” editorially revised to “user” throughout (06-788)
653	FF-7	Second paragraph corrected by errata (11-1274)
667	Nonmandatory Appendix JJ	Revised in its entirety (10-875)
678	Table KK-1	Reference No. (36) revised (11-861)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
682	MM-2	Title corrected by errata (11-1676)
683	Nonmandatory Appendix NN	Added (04-349, 06-788)

NOTE: Volume 62 of the Interpretations to Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code follows the last page of Section VIII, Division 1.

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
00-211	Revised UG-84(g)(2) and UG-84(h)(3). Added Figure UG-84.5 and Table UG-84.6 to specify the HAZ impact test specimen removal location and number of specimens required.
01-193	Modified UCS-68(c).
03-1421	Revised Table UHA-23 to incorporate Code Case 2127-3.
04-349	Revised UG-99(k) and UG-100(e) to prohibit painting of pressure-retaining welds of pressure vessels prior to pressure testing unless first completing a leak test per Section V, Article 10. Revised UCI-99 and UCD-99 to prohibit painting of pressure vessels or pressure vessel parts prior to pressure testing. Revised Table NN-6.2 to include permitting of painting or coating prior to pressure testing as a matter of agreement between the user and the Manufacturer.
04-690	Added new paragraph UW-6.
04-1330	Revised Note 1 of Table UHT-56. Added new subparagraph UHT-82(b) to give the requirement for the use of electrodes having the H4 supplemental diffusible hydrogen designator and to list the correct filler metal specifications for the various welding processes. Revised UHT-82(e)(6) to clarify essential variables regarding an increase in the diffusible hydrogen designator. Redesignated subparagraphs within UHT-82 accordingly.
04-1628	Revised UCL-34(a) and added new subparagraph UW-40(f)(5)(-h).
04-1635	Revised UW-2(a)(1)(-a) for clarity, and deleted the last sentence of UW-2(a)(2) to eliminate an apparent contradiction with UW-2(a)(3).
05-458	Added “±” before “25 amps” and “3 V” in 28-2(b)(6) to approve the following intent interpretation: “Question: Is it the intent of Section VIII Division 1, Appendix 28-2(b)(6) to limit electrical characteristic variability during fill pass welding of ±3 volts and ±25 amps?”
06-788	Added new Nonmandatory Appendix NN. Deleted endnote 4 referenced in U-2(a) and incorporated the information from this endnote in Nonmandatory Appendix NN as NN-3(a) and NN-3(b). Added reference to Nonmandatory Appendix NN in U-2(a). Added reference to Nonmandatory Appendix FF in UG-35.2(c)(1). Editorially revised UG-35.2(e); UG-136(b)(2); UNF-56(e)(1); 7-4(d); Table W-3, Reference No. (12); and FF-1, FF-2, FF-3, FF-5, FF-6, and FF-7 to promote consistency of terms relative to “user” and “designated agent.”
06-886	Changed “loading cases 1, 2, and 3” to “design loading cases” and “loading cases 4, 5, 6, and 7” to “operating loading cases” throughout Part UHX. Revised the definitions of pressure, <i>P</i> , throughout Part UHX.
07-225	Deleted the term “maximum allowable external working pressure” (MAEWP) in Section VIII-1, and added clarification that maximum allowable working pressure (MAWP) can be either an internal or external pressure. Added nameplate marking examples to Appendix L.
07-260	Revised UG-100(d).
07-563	Added new subparagraph UCS-56(g) describing capacitor discharge and electric resistance welding requirements. Revised the General Notes of Tables UCS-56-4 and UCS-56-11 to include the exemption of PWHT for electric resistance welding of thermocouple wires and to include the requirements of UCS-56(g).
07-695	Revised Tables UHA-23 and UHA-32-4 to incorporate Code Case 2245-1 allowing the use of duplex stainless steel corresponding to UNS S32760 in various product forms for temperatures up to 600°F (316°C).
08-487	Changed the phrase “direct spring loaded” to “pressure relief” in UG-131(e)(7) to cover all types of pressure relief valves, and editorially revised the word “providing” in the third sentence to “provided.”
08-488	Revised first sentence of UG-126(c).
08-970	Revised 2-14(d) to clarify that rigidity index calculations are required to be performed for both gasket seating and operating conditions.
08-1428	Deleted from UG-37(g) the specific test to be used for leak tightness testing.
08-1524	Revised UHX-12.5.9, UHX-13.5.8, and UHX-14.5.8 to have one equation for the shear calculation.
08-1609	Revised Tables UCS-23, UNF-23.3, UNF-23.4, and UHA-23 to add materials that have allowable stresses in Section II, Part D, and editorially revised some entries.

Record Number	Change
08-1641	Editorially revised Figure 2-4, sketch (1).
08-1790	Updated Table UCS-23 to remove the old Chinese material designation and replace it with the new designation.
09-10	Revised Tables ULT-82 and ULT-82M.
09-279	Modified UW-19(c), and added the following sentence to UW-19(c)(2) and 17-5(a)(2): "The representative panel shall utilize the same weld details as will be used in the final construction."
09-299	Added SA/EN 10222-2 (forgings) Grades P280GH, P305GH, 13CrMo4-5, and 11CrMo9-10 to Table UCS-23.
09-739	Added SA/CSA-G40.21 Grades 44W and 50W to Table UCS-23.
09-741	Revised Forms U-1, U-1A, U-2, U-2A, and U-3.
09-760	Added an introductory subtitle clarifying the purpose and limitations of the Foreword. Revised history paragraph to recognize the realignment of the BPV into several BPVs. Deleted the paragraph on tolerances. Made editorial changes to recognize the new committee structure. Deleted words addressing governing code editions. Deleted the paragraph concerning materials. Deleted the paragraph dealing with what the committee considers in the formulation of these rules.
09-819	Revised UCS-79 title and UCS-79(d), and added UCS-79(e), UCS-79(f), and Table UCS-79-1, all to define when post-forming heat treatment is required for Grade 91.
09-991	Revised UW-27(a)(3) to add friction stir welding (FSW) as an acceptable welding process for Division 1 construction.
09-1148	Modified U-3(a), added definition of "construction" to 3-2 of Mandatory Appendix 3, and added new Mandatory Appendix 43.
09-1229	Revised last sentence of UCS-68(c).
09-1440	Added specifications for UNS N06230 to Table UNF-79.
09-1452	Added new subparagraphs 26-10(d) and 26-10(e), Table 26-10-1, and Figure 26-14 to Mandatory Appendix 26.
09-1920	Revised UHA-51 to require that UNS S17400 materials be CVN tested.
09-2013	Added capacity units to UG-129(e) for disks certified for flow capacity instead of flow resistance.
09-2162	Added new subparagraph UHX-10(e) specifying a condition of applicability for fully assembled heat exchangers. Redesignated the previous UHX-10(e) as UHX-10(f).
10-286	Revised Table UCS-23 to show both Grades A and B for SA-299.
10-288	Revised UW-19(a)(2) to eliminate the maximum thickness limit of 1½ in. for sketches (e), (g), and (h) of Figure UW-19.1.
10-631	Added new subparagraph UG-79(d) addressing reductions of weld thickness due to forming operations.
10-871	Revised 9-5(c)(5) in Mandatory Appendix 9 to provide rules to determine the minimum dimensions for the weld sizes <i>a</i> and <i>b</i> in Figure 9-5, sketches (f-1), (f-2), and (f-3).
10-875	Revised Nonmandatory Appendix JJ in its entirety.
10-1212	Revised 1-5 and 1-8 of Mandatory Appendix 1.
10-1250	Changed "Welders Qualification Records" to "Welder / Welding Operator Performance Qualification Records" in 10-13(b)(7).
10-1547	In Form U-1B: added explanatory subscripts to lines 1 through 6; corrected Reference No. (6) to Reference No. (7) in the "Graphite components" table (line 6); added Reference No. (54); and deleted Reference letter (B). In Table W-3: inserted new column "U-1B," and changed cross-reference "UG-98" to "UG-118" in Reference No. (35).
10-1702	In UHA-51, added a cross-reference to the flowcharts of Nonmandatory Appendix JJ. Revised UHA-51(a)(1), abbreviating "HAZ." Revised UHA-51(a)(4)(-a) and UHA-51(a)(4)(-b), and added UHA-51(a)(4)(-c). Deleted UHA-51(d)(1)(-a) and cross-references to it in UHA-51(d)(1)(-b). Renumbered UHA-51(d)(1)(-b) through UHA-51(d)(1)(-d) as UHA-51(d)(1)(-a) through UHA-51(d)(1)(-c). Revised UHA-51(h)(2). Revised cross-reference to UHA-51(d)(1)(-a) in UW-2(b)(1). Deleted cross-reference to UHA-51(d)(1)(-b) in UW-2(b)(4)(-a). Revised cross-reference to UHA-51(d)(1)(-c) in UW-2(b)(4)(-b).
10-1787	Revised Forms U-1, U-1A, U-1B, U-2, U-2A, and U-4; Table W-3; and Figure W-3.1.
10-1796	Revised Figure UW-21 to clarify that the label for illustrations (1), (2), and (3) refers to the weld dimension and not the setback dimension for the location of the weld.
10-2041	Added Mandatory Appendix 44.

Record Number	Change
11-06	Added sketch (a-4) to Figure UW-16.1.
11-11	Deleted the word “internal” from 1-7(b)(3) and added the definition of <i>P</i> to 1-7(b)(5). Added SI Unit equivalents to 1-7(b)(1)(-a) and 1-7(b)(1)(-b).
11-83	Revised UG-84(f)(2).
11-253	Revised UG-11 title and UG-11(a).
11-442	Revised Figure UG-28.1, Note (1), and UG-33(f) to require the cone thickness to be the same as the adjacent cylindrical shell thickness when the junction is not a line of support.
11-471	Revised the SI Units table in UW-35(d) per the guidelines in Nonmandatory Appendix GG.
11-475	Revised UW-34.
11-601	Revised definition of “Material Test Report” in Mandatory Appendix 3.
11-678	Added UNS S32202 to Tables UHA-23 and UHA-32-4.
11-733	Errata correction. See Summary of Changes for details.
11-754	Added character requirements for supplemental heat exchanger markings to UHX-19.2, and added the requirement in UHX-19.3 that the pertinent fixed-tubesheet heat-exchanger operating data be indicated on new Manufacturer’s Data Report Form U-5.
11-755	Revised Mandatory Appendix 26 to bring it into alignment with EJMA, 9th Edition except coefficients taking into account the initial rotation of the bellows, and to incorporate Code Case 2587.
11-860	Added new paragraph 35-7 to Mandatory Appendix 35 to incorporate Code Case 2369.
11-861	Revised UG-118, and Table KK-1, Reference No. (36) to allow marking by electrochemical etching.
11-877	Deleted SA-695 from Table UCS-23.
11-987	Revised UG-11(a) to require the vessel Manufacturer be responsible for ensuring that post-forming heat treatment is conducted as required for parts that are supplied in a preformed condition by another organization.
11-1186	Added rules to UHX-9 for tubesheet edge extensions that are not extended for bolting. Added rules to UHX-10, UHX-12, UHX-13, and UHX-14 for modifying the tubesheet diameter of tubesheets having an edge thickness that is relatively thin compared to the center thickness.
11-1240	Revised Table U-3 to update “year of acceptable edition” for those standards that were reviewed. Editorially revised titles, and deleted and added standards as needed.
11-1244	Revised UCS-66(a) and Figures UCS-66 and UCS-66M to apply consistent terminology for “governing thickness.”
11-1245	Revised the nomenclature in Figures UCS 66.1 and UCS-66.1M to refer to Notes (2) and (3) of Figure UCS-66.2 rather than to General Notes (b) and (c).
11-1274	Errata correction. See Summary of Changes for details.
11-1398	Revised UG-117(a) to clarify that when oversight is provided by a Certified Individual in accordance with provisions of the Code, the qualification and duties for the Certified Individual shall meet the current requirements of ASME QAI-1.
11-1513	Errata correction. See Summary of Changes for details.
11-1558	Revised UW-51(a)(4) to allow for weld examinations of material $\frac{1}{4}$ in. (6 mm) and greater in thickness.
11-1676	Errata correction. See Summary of Changes for details.
11-1680	Errata correction. See Summary of Changes for details.
11-1898	Changed UG-32(e) conversion of 70,000 psi to 485 MPa from 500 MPa, and 20,000 psi to 138 MPa from 150 MPa using formula.
11-2101	Revised Form U-1A, line 5 to be consistent with all the other forms. Revised Table W-3 as follows: in Reference No. (23), added a joint type of W for autogenously welded pipe and tube; in Reference No. (25), added Types 7 and 8; and in Reference No. (26), added an explanation for the joint efficiency for the circumferential joint(s) of the shell.
11-2183	Added the word “machine” to UG-84(i)(3)(-a)(-1).
11-2185	Revised UG-20(f)(2) to allow pneumatic testing of pressure vessels that apply the UG-20(f) impact test exemption.
11-2242	Errata correction. See Summary of Changes for details.
12-83	Corrected cross-reference in ULT-30(a). Redesignated Figure ULT-82 as Figure UHA-51-1, and corrected the cross-reference to this figure in UHA-51(a)(4)(-a)(-1).

Record Number	Change
12-237	Added new Table UG-79-1, replacing the equations for forming strain and maximum fiber elongation strain in UNF-79(a)(2), UHA-44(a)(2), and UHT-79(a)(1).
12-370	Revised UG-11(c)(5) to provide an exemption to the requirement for a Material Test Report for ASME product standard parts, with an accompanying Intent Interpretation.
12-401	Revised UG-129(a), UG-129(a)(7), UG-129(d), and UG-129(e) to require secure attachment of nameplate, and added the word “metal” before “plate or plates.” In UG-129(a)(7), revised cross-reference regarding adhesive attachment, from “UG-119” to “Appendix 18,” and changed the word “tag” to “plate.” Revised UG-129(a)(7), UG-129(e)(10), and UG-129(f)(9) to specify the location of the Certification Mark designator; added an alternate method of applying the Certification Mark; and added a reference to acceptance by an ASME Designated organization.
12-403	Added a phrase to the second sentence of UG-140(b)(2) that includes the requirements of UG-125 through UG-138.
12-482	Added SA-533, Type E Cl. 1 and 2 to Table UCS-23 and Figures UCS-66 and UCS-66M.
12-526	Deleted the phrase “except as covered in U-1(f)” from the beginning of U-1(c)(2)(-d).
12-532	Deleted mandatory subparagraphs UHX-4(b), UHX-12.4(c), UHX-13.4(d), and UHX-14.4(e); redesignated subsequent subparagraphs accordingly; and added a cautionary Note to UHX-4.
12-650	In Mandatory Appendix 26, 26-12.1, corrected equations giving maximum allowable test pressure vs. instability.
12-661	Revised Celsius temperatures in Mandatory Appendix 34.
12-735	Added new Form U-3 (similar to Form U-1) for UM multichamber vessels. Redesignated former Form U-3 as Form U-3A to be used for single chamber vessels, and revised Table W-3 to reflect the new form. Revised UG-117 and UG-120 to cover both Forms U-3 and U-3A.
12-749	Changed the existing Section III, Division 1 Appendices to Section III Appendices.
12-890	Added new rules on minimum shell length for internally attached bellows to 26-3, and added new rules for internally attached bellows and for reinforcing collars to 26-8.
12-891	Added new requirement on minimum length of shell on each side of the bellows to 26-2.
12-904	Added paragraph UG-16(f). Removed numerical example problems from various sections. Deleted the numerical examples in Nonmandatory Appendix L and revised its title.
12-911	Deleted Mandatory Appendix 16.
12-974	Added a Note to UCS-160, following UCS-160(b).
12-1132	Revised UG-125(a) for clarity.
12-1282	Changed the dimension g_1 given in 2-12 as follows: “The minimum dimension g_1 must be the lesser of $2t$ (t from UG-27) or $4r$, but in no case less than $\frac{1}{2}$ in. (13 mm).”
12-1286	Errata correction. See Summary of Changes for details.
12-1306	Revised the heat treatment temperatures for P-No 10H Gr. 1 materials given in the General Note of Table UHA-32-4.
12-1547	Revised Table UHA-32-1, General Note (a) for greater consistency with UW-40(f).
12-1551	Editorially corrected S_a in equation 24-4(d)(6) to S_a (subscript a).
12-1641	Deleted the phrase “—Mandatory” from “Submittal of Technical Inquiries to the Boiler and Pressure Vessel Committee—Mandatory” in the front matter.
12-1736	Errata correction. See Summary of Changes for details.
12-1834	Added new Figure 26-1-2 showing the starting points for the measurement of the length of shell on each side of bellows, and showing the convolution pitch for U-shaped bellows no longer measured after the sidewalls of the convolution have been made parallel.
12-2051	Added new subparagraph UG-6(c) to address the use of certain forgings for tubesheets and pressure vessel shells.
13-130	Errata correction. See Summary of Changes for details.
13-958	Errata correction. See Summary of Changes for details.

(13) **CROSS-REFERENCING AND STYLISTIC CHANGES IN THE BOILER AND PRESSURE VESSEL CODE**

There have been structural and stylistic changes to BPVC, starting with the 2011 Addenda, that should be noted to aid navigating the contents. The following is an overview of the changes:

Subparagraph Breakdowns/Nested Lists Hierarchy

- First-level breakdowns are designated as (a), (b), (c), etc., as in the past.
- Second-level breakdowns are designated as (1), (2), (3), etc., as in the past.
- Third-level breakdowns are now designated as (-a), (-b), (-c), etc.
- Fourth-level breakdowns are now designated as (-1), (-2), (-3), etc.
- Fifth-level breakdowns are now designated as (+a), (+b), (+c), etc.
- Sixth-level breakdowns are now designated as (+1), (+2), etc.

Footnotes

With the exception of those included in the front matter (roman-numbered pages), all footnotes are treated as endnotes. The endnotes are referenced in numeric order and appear at the end of each BPVC section/subsection.

Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees

Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees has been moved to the front matter. This information now appears in all Boiler Code Sections (except for Code Case books).

Cross-References

It is our intention to establish cross-reference link functionality in the current edition and moving forward. To facilitate this, cross-reference style has changed. Cross-references within a subsection or subarticle will not include the designator/identifier of that subsection/subarticle. Examples follow:

- *(Sub-)Paragraph Cross-References.* The cross-references to subparagraph breakdowns will follow the hierarchy of the designators under which the breakdown appears.
 - If subparagraph (-a) appears in X.1(c)(1) and is referenced in X.1(c)(1), it will be referenced as (-a).
 - If subparagraph (-a) appears in X.1(c)(1) but is referenced in X.1(c)(2), it will be referenced as (1)(-a).
 - If subparagraph (-a) appears in X.1(c)(1) but is referenced in X.1(e)(1), it will be referenced as (c)(1)(-a).
 - If subparagraph (-a) appears in X.1(c)(1) but is referenced in X.2(c)(2), it will be referenced as X.1(c)(1)(-a).
- *Equation Cross-References.* The cross-references to equations will follow the same logic. For example, if eq. (1) appears in X.1(a)(1) but is referenced in X.1(b), it will be referenced as eq. (a)(1)(1). If eq. (1) appears in X.1(a)(1) but is referenced in a different subsection/subarticle/paragraph, it will be referenced as eq. X.1(a)(1)(1).

INTRODUCTION

(13) U-1 SCOPE

(a) See below.

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

(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.

(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.

(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 Part 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.

(c) See below.

(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.

(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) 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 water¹ 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);