ASME BPVC.VIII.1-2017

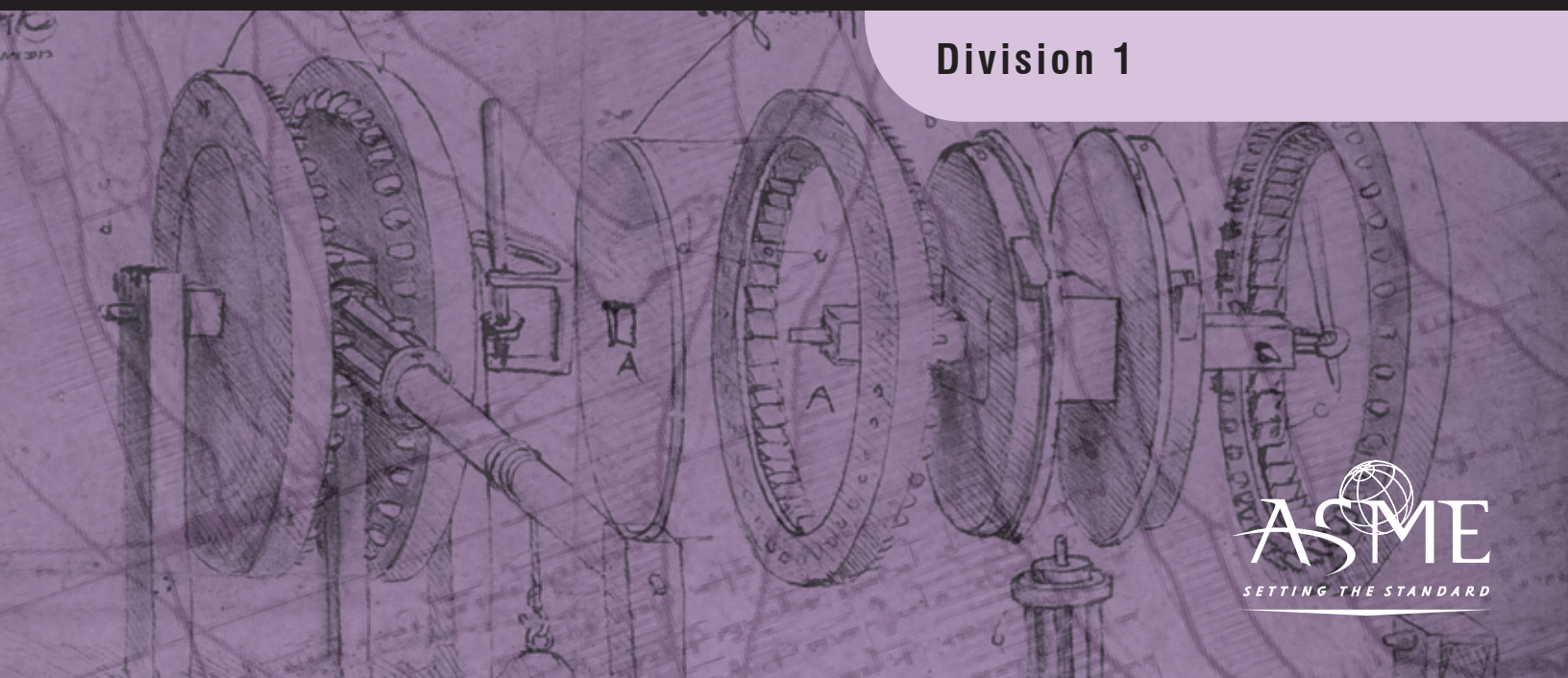
SECTION VIII

Rules for Construction of Pressure Vessels

2017 ASME Boiler and Pressure Vessel Code

An International Code

Division 1



ASME

SETTING THE STANDARD

AN INTERNATIONAL CODE

2017 ASME Boiler & Pressure Vessel Code

2017 Edition July 1, 2017

VIII

RULES FOR CONSTRUCTION OF PRESSURE VESSELS

Division 1

ASME Boiler and Pressure Vessel Committee
on Pressure Vessels

The American Society of Mechanical Engineers

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: July 1, 2017

This international code or standard was developed under procedures accredited as meeting the criteria for American National Standards and it is an American National Standard. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

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[*] The 2015 Edition of Section III was the last edition in which Section III, Division 1, Subsection NH, *Class 1 Components in Elevated Temperature Service*, was published. The requirements located within Subsection NH were moved to Section III, Division 5, Subsection HB, Subpart B for the elevated temperature construction of Class A components.

INTERPRETATIONS

Interpretations are issued in real time in ASME's Interpretations Database at http://go.asme.org/Interpretations. Historical BPVC interpretations may also be found in the Database.

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 2017 Code Cases book: "Boilers and Pressure Vessels" or "Nuclear Components." Supplements will be sent or made available automatically to the purchasers of the Code Cases books up to the publication of the 2019 Code.

FOREWORD[*]

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)

(k) Technical Oversight Management Committee (TOMC)

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. The technical consistency of the Sections of the Code and coordination of standards development activities of the Committees is supported and guided by the Technical Oversight Management Committee. 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 judgment* 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

[*] The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. Therefore, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Code.

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

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.

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://go.asme.org/BPVCPublicReview 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.

(17) # 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 applicable Boiler and Pressure Vessel (BPV) Standards Committee (hereinafter referred to as the Committee). See the guidelines on approval of new materials under the ASME Boiler and Pressure Vessel Code in Section II, Part D for requirements for requests that involve adding new materials to the Code. See the guidelines on approval of new welding and brazing materials in Section II, Part C for requirements for requests that involve adding new welding and brazing materials ("consumables") to the Code.

Technical inquiries can include requests for revisions or additions to the Code requirements, requests for Code Cases, or requests for Code Interpretations, as described below:

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

(2) Code Cases. Code Cases represent alternatives or additions to existing Code requirements. 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 regulators, jurisdictions, or Owners automatically accept Code Cases. The most common applications for Code Cases are as follows:

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

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

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

(3) Code Interpretations

(-a) Code Interpretations provide clarification of the meaning of existing requirements in the Code and are presented in Inquiry and Reply format. Interpretations do not introduce new requirements.

(-b) If existing Code text does not fully convey the meaning that was intended, or conveys conflicting requirements, and revision of the requirements is required to support the Interpretation, an Intent Interpretation will be issued in parallel with a revision to the Code.

(b) Code requirements, 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 requirements.

(c) Inquiries that do not comply with the following guidance 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 should include the following information:

(a) Purpose. Specify one of the following:

(1) request for revision of present Code requirements

(2) request for new or additional Code requirements

(3) request for Code Case

(4) request for Code Interpretation

(b) Background. The Inquirer should 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, the Inquirer should provide a copy of, or relevant extracts from, the specific referenced portions of the Code.

(c) Presentations. The Inquirer may desire to attend 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 BPV Standards Committee meeting shall be at the expense of the Inquirer. The Inquirer's attendance or lack of attendance at a meeting will not be used by the Committee as a basis for acceptance or rejection of the Inquiry by the Committee. However, if the Inquirer's request is unclear, attendance by the Inquirer or a representative may be necessary for the Committee to understand the request sufficiently to be able to provide an Interpretation. If the Inquirer desires to make a presentation at a Committee meeting, the Inquirer should provide advance notice to the Committee Secretary, to ensure time will be allotted for the presentation in the meeting agenda. The Inquirer should consider the need for additional audiovisual equipment that might not otherwise be provided by the Committee. With sufficient advance notice to the Committee Secretary, such equipment may be made available.

3 CODE REVISIONS OR ADDITIONS

Requests for Code revisions or additions should include the following information:

(a) Requested Revisions or Additions. For requested revisions, the Inquirer should identify those requirements of the Code that they believe should be revised, and should submit a copy of, or relevant extracts from, the appropriate requirements as they appear in the Code, marked up with the requested revision. For requested additions to the Code, the Inquirer should provide the recommended wording and should clearly indicate where they believe the additions should be located in the Code requirements.

(b) Statement of Need. The Inquirer should provide a brief explanation of the need for the revision or addition.

(c) Background Information. The Inquirer should 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 requested revision or addition. Sketches, tables, figures, and graphs should be submitted, as appropriate. The Inquirer should identify any pertinent portions of the Code that would be affected by the revision or addition and any portions of the Code that reference the requested revised or added paragraphs.

4 CODE CASES

Requests for Code Cases should be accompanied by a statement of need and background information similar to that described 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) should be described. In addition, it is important 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 should 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 requested Code Case applies.

5 CODE INTERPRETATIONS

(a) Requests for Code Interpretations should be accompanied by the following information:

(1) Inquiry. The Inquirer should propose a condensed and precise Inquiry, omitting superfluous background information and, when possible, composing the Inquiry in such a way that a "yes" or a "no" Reply, with brief limitations or conditions, if needed, can be provided by the Committee. The proposed question should be technically and editorially correct.

(2) Reply. The Inquirer should propose a Reply that clearly and concisely answers the proposed Inquiry question. Preferably, the Reply should be "yes" or "no," with brief limitations or conditions, if needed.

(3) Background Information. The Inquirer should provide any need or background information, such as described in 3(b) and 3(c), respectively, for Code revisions or additions, that will assist the Committee in understanding the proposed Inquiry and Reply.

If the Inquirer believes a revision of the Code requirements would be helpful to support the Interpretation, the Inquirer may propose such a revision for consideration by the Committee. In most cases, such a proposal is not necessary.

(b) Requests for Code Interpretations should be limited to an Interpretation of a particular requirement in the Code or in a Code Case. Except with regard to interpreting a specific Code requirement, the Committee is not permitted to 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

(a) Submittal. Requests for Code Interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at http://go.asme.org/InterpretationRequest. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt. If the Inquirer is unable to use the online form, the Inquirer may mail the request to the following address:

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

All other Inquiries should be mailed to the Secretary of the BPV Committee at the address above. Inquiries are unlikely to receive a response if they are not written in clear, legible English. They must also include the name of the Inquirer and the company they represent or are employed by, if applicable, and the Inquirer's address, telephone number, fax number, and e-mail address, if available.

(b) Response. The Secretary of the appropriate Committee will provide a written response, via letter or e-mail, as appropriate, to the Inquirer, upon completion of the requested action by the Committee. Inquirers may track the status of their Interpretation Request at http://go.asme.org/Interpretations.

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(17)

January 1, 2017

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SUMMARY OF CHANGES

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 by ASME at http://go.asme.org/BPVCerrata.

Changes given below are identified on the pages by a margin note, **(17)**, 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.

Page	*Location*	*Change (Record Number)*
xxxiii	List of Sections	Updated
xxxviii	Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees	Revised in its entirety *(13-2222)*
xli	Personnel	Updated
2	U-1(e)(1)(-a)	Cross-reference revised *(15-934)*
2	U-1(f)	Revised *(11-2106)*
2	U-1(j)	Revised *(11-1901)*
3	U-2	Subparagraphs (h)(1) through (h)(3) revised *(16-598)*
5	Table U-3	References updated *(13-177, 15-1843, 15-2605, 16-532, 16-2185)*
4	U-4	In subpara. (b), fourth paragraph revised *(09-619)*
7	UG-4	Subparagraph (h) and Note added *(12-2123)*
9	UG-9	Revised *(11-737)*
9	UG-10	Revised in its entirety *(06-1384)*
10	UG-11	Subparagraphs (a) and (c)(5) revised *(11-1901, 14-2389)*
13	UG-16	*(1)* Subparagraph (c) revised *(13-959)* *(2)* In subpara. (d), last sentence deleted *(15-1725)*
22	UG-28(f)	First sentence revised *(15-2324)*
30	Table UG-33.1	Editorially reformatted
32	UG-34	*(1)* In subpara. (b), in definition of W, cross-references revised *(15-1586)* *(2)* In second equation of subpara. (d)(9), "SLd^3" corrected by errata to "SLd^2" *(16-2176)*
36	UG-35.2	Revised *(11-1901)*
37	UG-35.3	Added *(11-1901)*
37	UG-36	*(1)* Subparagraph (b)(1) revised *(11-907, 14-1745)* *(2)* Subparagraphs (c)(2)(-c) and (c)(2)(-d) deleted *(11-907)*
43	Table UG-37	Editorially reformatted
43	UG-37(g)	Revised *(16-1250)*

Page	*Location*	*Change (Record Number)*
43	UG-37(h)	Revised *(16-1250)*
54	UG-46	Subparagraphs (a) and (a)(2) revised *(15-2173)*
57	UG-53(h)	*(1)* In subpara. (1), SI units revised *(14-1745)* *(2)* In subpara. (2), SI units added *(14-1745)*
59	UG-79	Subparagraph (d)(2) revised *(13-959)*
65	Figure UG-84	Revised *(14-2153)*
68	Table UG-84.2	In spanned column heading, "of" revised to "or" *(16-54)*
70	UG-84(h)	Subparagraph (3) revised, and subpara. (5) added *(15-2021)*
71	UG-90	Subparagraph (b)(6) revised *(13-959)*
73	UG-93	Subparagraphs (a)(1)(-b), (a)(2), (d)(4)(-a), and (d)(4)(-c), and last sentence of subpara. (d)(3) revised *(12-603, 14-1271, 15-2591)*
74	UG-96	In subpara. (a), first sentence revised *(13-959)*
75	UG-99	*(1)* Subparagraphs (a)(1) and (b) revised *(10-1307, 13-959)* *(2)* Subparagraph (k)(4) added *(14-1850)*
76	UG-100	Subparagraph (b) revised *(10-1307)*
82	UG-116	*(1)* Subparagraphs (a)(1)(-c) and (h)(4) added *(12-1755, 13-1562)* *(2)* Subparagraph (h)(1)(-a) revised *(12-1755)*
82	Figure UG-116	Revised *(12-1755)*
84	UG-117	Revised in its entirety *(12-1755, 13-177, 16-598)*
86	Figure UG-118	Revised *(12-1755, 13-855, 16-2185)*
87	UG-120	Revised *(12-1734, 13-1858, 14-645, 16-598)*
90	UG-126	Former subpara. (c) deleted, and former subpara. (d) redesignated as (c) *(12-1472)*
97	UG-131(f)	Revised *(13-177)*
100	UG-135	In last sentence of subpara. (a), cross-reference to UG-125(a)(2) revised to UG-125(a)(3) *(14-2499)*
103	UG-136(c)(3)(-d)	Revised *(14-654)*
104	UG-136(d)(4)(-a)(-6)	Revised *(14-305)*
104	UG-136(g)	Added *(12-1472)*
105	UG-137	Subparagraph (c)(3)(-d) revised *(14-654)*
107	UG-138(c)(3)(-d)	Revised *(14-654)*
108	UG-138(d)(5)(-e)(-2)	In subparas. (+b) and (+c), equations editorially revised
108	UG-138(d)(6)	Added *(13-1751)*
110	UW-2	First sentence of subpara. (a) and last sentence of subpara. (a)(1)(-c)(-1) revised *(13-1029, 15-934, 15-1551)*
111	UW-3	In first paragraph, penultimate sentence revised *(16-100)*
112	UW-5	Subparagraphs (b)(3) and (c) revised *(15-2779)*
113	UW-9	Subparagraphs (a) and (c) revised *(10-1689, 14-1493)*
114	Figure UW-9-1	Former Figure UW-9 editorially redesignated as Figure UW-9-1

Page	*Location*	*Change (Record Number)*
114	Figure UW-9-2	Added *(10-1689)*
115	UW-11(a)(8)	Former subpara. (a)(8) deleted, and former subpara. (a)(9) redesignated as (a)(8) *(14-1826)*
115	UW-11(d)	First sentence revised *(14-1826)*
116	UW-11(e)(3)	Revised *(15-2591)*
116	UW-12	First paragraph revised *(14-1826)*
116	UW-13	*(1)* Subparagraphs (b)(4)(-c) and (e)(3) revised *(15-934, 15-2591)* *(2)* Former Mandatory Appendix 28 revised and redesignated as new subpara. (f), and existing subparas. (f) through (h) redesignated as (g) through (i), respectively *(15-934)*
121	Figure UW-13.2	Illustrations (r) and (s) added, and layout of illustrations (a) through (q) revised editorially *(15-934)*
126	Figure UW-13.3	In General Note (b), cross-reference to UW-13(f) revised to UW-13(g) *(15-934)*
126	Figure UW-13.4	Note (1) revised *(14-2052)*
134	Table UW-16.1	Title revised *(16-1270)*
134	UW-16(f)(3)(-a)(-6)	Revised *(16-1270)*
143	UW-34	Second sentence and endnote 71 revised *(15-1523, 15-2591)*
144	UW-35	Subparagraph (b)(1) revised *(13-959)*
147	UW-40(d)	Revised *(15-2473)*
147	UW-40(f)	Revised *(06-5)*
148	UW-51	Subparagraphs (a)(1) through (a)(4) revised *(14-1826, 16-1520)*
150	UW-53	Revised in its entirety *(14-1826)*
150	UW-54	Revised in its entirety *(15-2605, 16-661)*
150	UW-65	Deleted *(11-2106)*
151	UF-12	Second paragraph revised *(07-706)*
152	UF-27	In subpara. (b), definition of E revised *(12-2123)*
153	UF-31(b)(1)(-a)	Second sentence revised *(15-2591)*
154	UF-32(b)(4)	Revised *(15-2591)*
156	UF-125	Deleted *(11-2106)*
163	UB-60	Deleted *(11-2106)*
166	Table UCS-23	Entries for SA-307, SA-372, and SA/EN 10028-2 revised, and entry for SA/EN 10216-2 added *(07-706, 11-1276, 14-2383, 15-587)*
167	UCS-56	Subparagraphs (d)(2) and (d)(5) revised *(15-1229, 15-1579)*
170	Table UCS-56-2	General Note (d)(5) added *(15-2352)*
171	Table UCS-56-3	General Note (b)(5) added *(15-2352)*
172	Table UCS-56-4	General Note (b)(5) added *(15-2352)*
176	Table UCS-56-10	Deleted *(15-2608, 16-322)*

Page	Location	Change (Record Number)
177	Table UCS-56-11	In second column of Table and in Note (1), minimum holding temperature revised *(15-2553)*
178	Table UCS-57	Entry for 10F Gr. 1 deleted *(15-2608, 16-322)*
190	UCS-66(f)	First sentence revised *(16-134)*
179	Figure UCS-66	In Notes (2)(a) and (4), SA-299 added *(13-1110)*
182	Figure UCS-66M	In Notes (2)(a) and (4), SA-299 added *(13-1110)*
191	Figure UCS-66.3	Illustrations (d) and (e) revised *(13-597)*
194	UCS-68	Subparagraph (b)(2) revised *(14-2074)*
196	UCS-125	Deleted *(11-2106)*
197	Nonmandatory Appendix UCS-A	Former Nonmandatory Appendix CS editorially redesignated as Nonmandatory Appendix UCS-A
201	Table UNF-23.3	"UNS No." entries for SB-163, SB-166, SB-167, SB-168, SB-366, SB-462, SB-463, SB-464, SB-468, SB-516, SB-517, SB-564, SB-574, SB-575, SB-619, SB-622, and SB-626 revised *(05-434, 14-43, 14-1065)*
204	UNF-91	Endnote 80 (formerly endnote 81) revised *(15-1266)*
204	UNF-125	Deleted *(11-2106)*
206	Nonmandatory Appendix UNF-A	Former Nonmandatory Appendix NF editorially redesignated as Nonmandatory Appendix UNF-A
210	Table UHA-23	*(1)* Revised *(07-713, 07-792, 16-1087)* *(2)* Entry for SA-240 corrected by errata to include UNS No. N08904, and in Note (1), "Type 309" corrected by errata to "Type 304" *(15-1112, 15-2793)*
213	Table UHA-32-3	In General Note, cross-reference revised *(16-538)*
217	UHA-51(a)(3)(-a)(-1)	Revised *(10-1703)*
217	UHA-51(b)	Revised *(13-567)*
218	UHA-51(e)(3)(-c)	Spelling of "chromium" corrected by errata *(15-2793)*
219	UHA-51(f)(4)(-c)	Second sentence revised *(11-737)*
220	UHA-65	Deleted *(11-2106)*
221	Nonmandatory Appendix UHA-A	*(1)* Former Nonmandatory Appendix HA editorially redesignated as Nonmandatory Appendix UHA-A *(2)* UHA-A-10 added *(16-538)*
226	UCI-125	Deleted *(11-2106)*
227	UCL-11	In subpara. (c), second paragraph, last sentence revised *(11-737)*
231	UCL-60	Deleted *(11-2106)*
235	UCD-125	Deleted *(11-2106)*
241	UHT-28	*(1)* In subpara. (a), first sentence revised *(14-1176)* *(2)* Subparagraph (c) added *(14-1176)*
242	UHT-57	In subpara. (e), first sentence revised *(15-2591)*
243	UHT-79	Subparagraphs editorially redesignated

Page	*Location*	*Change (Record Number)*
246	UHT-115	First and last sentences revised *(12-1755)*
246	UHT-125	Deleted *(11-2106)*
269	ULW-90	Revised *(12-1755)*
269	ULW-125	Deleted *(11-2106)*
271	ULT-16	Subparagraphs editorially redesignated
277	ULT-125	Revised *(11-2106)*
278	UHX-4	In subpara. (b), first sentence revised *(15-1605)*
280	UHX-9.3	*(1)* Definition of S deleted, and definition of S_{fe} added *(16-991)* *(2)* In definitions of W and W_{m1}, cross-reference to UHX-4(c) revised to UHX-4(b) *(15-1586)*
281	UHX-9.5	In subparas. (a) and (c), equations revised *(16-991)*
282	UHX-11.3	In definition of E^*, Note deleted *(12-2123)*
288	UHX-12.3	In definition of E_s, Note deleted *(12-2123)*
294	UHX-13.3	*(1)* In definition of E_t, Note deleted *(12-2123)* *(2)* Definitions of Δ_J and Δ_s added *(11-1693)*
310	UHX-13.10	Added *(07-218)*
312	Figure UHX-13.10.3-1	Added *(07-218)*
313	UHX-14.3	In definition of E_t, Note deleted *(12-2123)*
324	UHX-16	Revised *(11-1693)*
324	UHX-17	*(1)* Title and subpara. (a) revised *(16-100)* *(2)* Subparagraph (c) added *(11-1693)*
325	Table UHX-17	Title revised *(16-100)*
325	UHX-18	Revised *(16-154)*
330	UIG-22	Last sentence added *(11-2106)*
345	UIG-96	Subparagraphs editorially redesignated
346	UIG-116	Subparagraphs (b) and (d) revised *(12-1755)*
346	UIG-120	Subparagraph (a) revised *(12-1755)*
346	UIG-125	Deleted *(11-2106)*
356	Form CPQ	Revised editorially
359	1-1	Subparagraphs editorially redesignated
359	1-2	Subparagraphs editorially redesignated
363	1-5	In subpara. (a), in definition of E_r, Note deleted *(12-2123)*
369	1-8	*(1)* In subpara. (a), in definition of E_x, Note deleted *(12-2123)* *(2)* In subpara. (b)(3), second paragraph revised *(13-2125)*
374	1-9	Deleted *(11-907)*
374	1-10	Deleted *(11-907)*
375	2-1	In first paragraph of subpara. (a), penultimate sentence revised *(15-1228)*

Page	Location	Change (Record Number)
375	2-2	Subparagraphs (d), (d)(1), (d)(2), and (d)(2)(-a) revised *(05-768)*
376	2-3	In nomenclature, order of definitions of R corrected by errata *(16-894)*
377	2-4	Subparagraphs editorially redesignated
397	3-2	*(1)* Definitions of *ASME Designated Organization*, *ASME designee, full vacuum (FV)*, and *Material Test Report* revised *(12-603, 13-177, 15-2324)* *(2)* Definitions of *completed pressure vessel* and *pressure vessel part* added *(12-1734)*
408	Mandatory Appendix 5	Title; 5-1(a), 5-1(d), 5-1(f), 5-3(f), 5-4, and 5-5(b) through 5-5(e); and Figures 5-1 and 5-2 revised *(16-100)*
428	10-5	Revised *(12-1755)*
429	10-13	*(1)* Subparagraph (b)(15) added *(12-1734)* *(2)* Subparagraph (c) revised *(13-1522)*
431	11-1	Nomenclature for "For air" equation revised editorially
443	13-5	In definition of E_3, Note deleted *(12-2123)*
457	13-12	In subpara. (b)(1), eq. (2) revised *(15-2812)*
468	17-1	*(1)* Subparagraphs (a), (d), and (e)(1) revised *(15-1847)* *(2)* Subparagraph (b)(8) and last sentence of subpara. (f) added *(15-1847)*
468	17-2	Subparagraph (c) revised *(15-1847)*
469	17-4	Last sentence revised *(15-1847)*
469	17-5	In subpara. (b)(1), cross-references revised *(15-1847)*
469	17-7	Subparagraphs (a), (a)(2)(-a), (b)(1)(-b), and (c)(1) revised *(15-1847)*
471	17-8	In first sentence of subpara. (b)(1), cross-references revised *(15-1847)*
471	17-9	In last sentence, cross-references revised *(15-1847)*
484	22-2	Revised *(07-706)*
488	24-1	*(1)* In subpara. (a), second sentence revised *(15-1228)* *(2)* In subpara. (f), last sentence deleted *(11-1901)*
494	Mandatory Appendix 25	Deleted *(13-177)*
496	Figure 26-1-1	Illustration (a) revised *(14-1629)*
497	Figure 26-1-2	Illustration (a) revised *(14-1629)*
495	26-3	*(1)* Definitions of E_s, t_{eq}, and subscript s added *(14-1629)* *(2)* Definition of S_1''' revised *(14-1629)* *(3)* In definition of Y_{sm}, "$K_{f\varepsilon f}$" corrected by errata to "$K_f\varepsilon_f$" *(15-2793)*
499	26-4.1	In subpara. (d)(1), last sentence added *(16-154)*
501	26-6.1	In first paragraph, last sentence added *(14-1629)*
501	26-6.2	Subparagraphs (e) and (f) added *(14-1629)*

Page	Location	Change (Record Number)
501	26-6.3	Paragraphs 26-6.3.1, 26-6.3.2, and 26-6.3.3(a)(1) revised *(14-1629, 16-102)*
504	26-6.5.2	In subparas. (a) and (b), "e_{eq}" revised to "t_{eq}" *(14-1629)*
505	26-7.1	In first paragraph, last sentence added *(14-1629)*
507	26-7.4.1	In equation, "N_q" corrected by errata to "Nq" *(15-2793)*
510	26-8.5.1	Revised *(13-360)*
519	Form 26-1	Revised *(16-154)*
520	Form 26-1M	Revised *(16-154)*
521	27-2	In subpara. (b), definition of *E* revised *(12-2123)*
521	27-4	Revised *(14-1850)*
523	Mandatory Appendix 28	Information relocated to UW-13(f) *(15-934)*
528	31-4	Title and subparas. (a) and (b) revised *(14-2496)*
529	Mandatory Appendix 32	Revised in its entirety *(16-751)*
534	Table 34-1	Entry for 14Cr–16Ni–6Si–Cu–Mo added *(07-792)*
534	34-2	*(1)* Paragraphs editorially redesignated *(2)* Subparagraph (b) added *(07-792)*
535	Table 34-2	Entry for 14Cr–16Ni–6Si–Cu–Mo added *(07-792)*
534	34-3	Subparagraph (b) revised *(07-792)*
537	35-5	Cross-references to Forms revised *(16-598)*
543	38-2	Revised editorially
544	38-10	Subparagraphs editorially redesignated
546	39-7	Subparagraphs editorially redesignated
550	Mandatory Appendix 41	*(1)* In 41-1, 41-2, 41-6, and 41-10.1, paragraphs editorially redesignated *(2)* In 41-5, definition of *E* revised *(12-2123)*
557	43-2	Revised *(14-1743)*
558	44-5	Subparagraphs (a) and (c) revised *(15-107)*
561	Mandatory Appendix 45	Added *(11-923)*
570	Nonmandatory Appendix C	Paragraph titles added *(16-2177)*
571	Nonmandatory Appendix D	Paragraph titles added *(16-2177)*
572	Nonmandatory Appendix E	Paragraph titles added *(16-2177)*
573	Nonmandatory Appendix F	Paragraph titles added *(16-2177)*
574	Nonmandatory Appendix G	Paragraph titles added *(16-2177)*
580	L-1	Title revised editorially

Page	*Location*	*Change (Record Number)*
580	L-1.4	Paragraphs redesignated editorially
580	L-11	Deleted *(13-855)*
585	Figure L-11-1	Deleted *(13-855)*
585	Figure L-11-2	Deleted *(13-855)*
585	Figure L-11-3	Deleted *(13-855)*
594	R-9	P-No. 10F deleted *(15-2608, 16-322)*
599	W-1	Subparagraph (g) added *(13-1858)*
599	W-2	First paragraph revised *(16-598)*
600	Form U-1	Revised *(13-1858, 16-1094)*
603	Form U-1A	Revised *(13-1858, 16-1094)*
605	Form U-1B	Revised *(13-1858, 16-1094)*
606	Form U-1P	*(1)* Revised *(13-1858, 16-1094)* *(2)* In line 5, "VII" corrected by errata to "VIII" *(15-2793, 15-2923)*
608	Form U-2	Revised *(12-1755, 13-1858, 16-1094)*
611	Form U-2A	Revised *(12-1755, 13-1858, 16-1094)*
613	Form U-3	Revised *(13-1858, 16-509)*
615	Form U-3A	Revised *(13-1858, 16-509)*
617	Form U-3P	Added *(16-509)*
619	Form U-4	Revised *(13-1858, 16-1094)*
620	Form U-5	Revised *(13-1858, 16-1094)*
621	Table W-3	Revised *(13-1858, 14-1595, 14-2388, 16-509, 16-1094)*
627	Figure W-3.1	Revised *(13-1858, 16-1094)*
633	Y-3	In subpara. (a), definition of *E* revised *(12-2123)*
646	Nonmandatory Appendix DD	Revised *(12-1755, 16-962)*
648	Figure DD-1	Updated by ASME Conformity Assessment
654	Nonmandatory Appendix FF	Revised *(11-1901)*
676	KK-1	Designator and title revised editorially
681	Table KK-1	Under "Instruction," entry for reference no. (7) revised *(13-1153)*
677	Form U-DR-1	Revised *(13-1153)*
686	NN-2	Subparagraph (b)(1) revised *(11-1901)*
689	Table NN-6-1	Revised to include quick-actuating closures *(11-1901)*

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
05-434	Added Alloy UNS N06025 to Table UNF-23.3. Annulled Code Case 2359-2.
05-768	Revised Mandatory Appendix 2, 2-2(d) per proposal file to use the wording from Section VIII, Division 2 as a common rule.
06-5	Revised UW-40(f) to clarify nominal thickness definitions for purposes of PWHT, to address double-groove welds and tube-to-tubesheet welds. Relocated unnumbered paragraph following UW-40(f)(5)(-h) to new UW-40(f)(7).
06-1384	Revised UG-10 to address the proper and complete recertification process. Deleted recertification by non-Certificate Holders from UG-10(a).
07-218	Added new equations for the calculation of kettle shell stiffness to use in Part UHX.
07-706	Revised Table UCS-23, and UF-12 and 22-2.
07-713	Added SA 995, Grade 4A to Table UHA-23.
07-792	Added UNS S38815 to Table UHA-23 and Mandatory Appendix 34.
09-619	Added a sentence to last paragraph of U-4.
10-1307	Revised UG-99(b) and UG-100(b) to use the term “pressure-boundary materials.”
10-1689	Redesignated current UW-9(c) as UW-9(c)(1). Added UW-9(c)(2). Added new Figure UW-9.1.
10-1703	Revised UHA-51(a)(3) to increase the FN limit of 316L.
11-737	In various paragraphs, deleted the word “certified” with regard to Material Test Reports.
11-907	Deleted references to 1-9 and 1-10 in UG-36. Deleted 1-9 in its entirety. Deleted 1-10 in its entirety.
11-923	Added new Mandatory Appendix 45 on plate heat exchangers.
11-1276	Added SA/EN 10028-2, Grade 13CrMo4–5 to Table UCS-23.
11-1693	Added new paragraphs to UHX-16 and UHX-17.
11-1901	Revised UG-35.2 to redefine and update rules for quick-actuating closures. Added a new UG-35.3 to define and create rules for quick-opening closures. Revised Nonmandatory Appendix FF to address both quick-actuating and quick-opening closures.
11-2106	Revised paragraph references in U-1(f). Deleted UW-65, UF-125, UB-60, UCS-125, UNF-125, UHA-65, UCI-125, UCL-60, UCD-125, UHT-125, ULW-125, and UIG-125. Retitled, revised paragraph reference, and incorporated common language in ULT-125. Revised UIG-22.
12-603	Revised UG-93(a)(1)(-b). Revised Mandatory Appendix 3 definition of “Material Test Report.”
12-1472	Deleted current set pressure adjustment requirements in UG-126(c) and replaced it with a new UG-136(g) that provides more detailed requirements, including guidance for completing Form UV-1. Redesignated UG-126(d) as UG-126(c) due to deletion of UG-126(c).
12-1734	Revised UG-120(c) by adding requirements for transfer of parts between Certificate Holders within the same organization. Added a new endnote describing the term “organization” as used in UG-120(c). Revised Mandatory Appendix 3 to add new definitions of “completed pressure vessel” and “pressure vessel part.” Added 10-13(b)(15).
12-1755	Established a new Certificate of Authorization for organizations fabricating parts without design responsibility. Revised UG-116, UG-117, UG-120, UHT-115, ULW-90, UIG-116, UIG-120, 10-5, Figures UG-116 and UG-118, and Nonmandatory Appendices W and DD.
12-2123	Added new UG-4(h) that specifies the use of physical properties in Section VIII, Division 1. Revised notes in UF-27(b), 27-2, 41-5, and Y-3. Deleted notes in UHX-11.3, UHX-12.3, UHX-13.3, UHX-14.3, 1-5(a), 1-8(a), and 13-5.
13-177	Added reference to ASME CA-1 (latest edition) to Table U-3. Replaced conformity assessment requirements in UG-117 and UG-131 with references to ASME CA-1. Replaced definitions in Mandatory Appendix 3 with references to ASME CA-1. Deleted Mandatory Appendix 25 (rules for acceptance of testing labs, which are now published in ASME CA-1).
13-360	Revised 26-8.5 to state the following: “Toroidal bellows designed per the rules of this Division are suitable for external design pressures up to 15 psi (103 kPa) or full vacuum. For external design pressures greater than 15 psi (103 kPa), see U-2(g).”
13-567	Revised the text of UHA-51(b) to eliminate conflicts with the requirements of UG-82(h) and UHA-51(d).

Record Number	Change
13-597	Revised Figure UCS-66.3, illustrations (d) and (e) to clarify the governing thickness with flat components.
13-855	Added reference to ASME PTB-4 in Figure UG-118. Deleted nameplate examples from Nonmandatory Appendix L.
13-959	Revised UG-16(c) on plate tolerance. Revised UG-79(d)(2), UG-90(b)(6), UG-96(a), UG-99(a)(1), and UW-35(b)(1) to use design thickness as appropriate.
13-1029	Revised UW-2(a) to exempt lethal service butt welds in stiffening rings designed per UG-29 from radiographic examination.
13-1110	Added "SA-299" to Note (2) and "SA-299 if normalized" to Note (4) of the Impact Exemption Curve notes in Figures UCS-66 and UCS-66M.
13-1153	Editorially revised Nonmandatory Appendix KK, Form U-DR-1.
13-1522	Revised 10-13(c) concerning the UM Designator.
13-1562	Added removal and destruction of interfering Certification Marked nameplates to UG-116(h)(4). Created Code Case for immediate application.
13-1751	Added UG-138(d)(6) to provide seat tightness requirements for pin devices.
13-1858	Revised UG-120(a)(2) and Nonmandatory Appendix W.
13-2125	Revised the cylinder length factor in 1-8(b)(3) from 1.4 to 2.0.
13-2222	Revised the front guidance on interpretations in its entirety.
14-43	Added UNS N10362 to Table UNF-23.3.
14-305	Revised wording of UG-136(d)(4)(-a)(-6) from "hydraulic or pneumatic lift assist device" to "auxiliary lift-assist device."
14-645	Revised UG-120(c) to clarify who signs the Form U-1 if there are both shop and field components to assembly of a pressure vessel.
14-654	Revised UG-136(c)(3)(-d), UG-137(c)(3)(-d), and UG-138(c)(3)(-d) to clarify actions that need to be taken within the 60-day period following a failure of replacement valves.
14-1065	Deleted UNS Nos. N08024 and N08026 from Table UNF-23.3.
14-1176	Added "and (c)" after "Except as permitted in (b)" in first sentence of UHT-28. Added UHT-28(c) for minor attachments.
14-1271	Revised UG-93(d)(4)(-a) and UG-93(d)(4)(-c) to update sketches referenced in Figure UW-13.2.
14-1493	Revised UW-9(a) to clarify the weld joint types covered in Part UW. Corrected the UW-27(b) reference in UW-9(a) to UW-27(a)(2).
14-1595	Revised Table W-3, reference no. (73) to be consistent with Section VIII, Division 2, Table 2-D.1, note no. (54).
14-1629	In Mandatory Appendix 26, added new rules for bellows internally attached to the shell.
14-1743	Revised 43-2.
14-1745	Revised UG-36(b)(1), UG-53(h)(1), UG-53(h)(2), and 1-10(d) to update metric conversions.
14-1826	Revised UW-11(a)(8), UW-11(d), UW-12, UW-51(a)(4), and UW-53 to clarify when manual and automated UT examination methods are acceptable.
14-1850	Added UG-99(k)(4) and 27-4(b).
14-2052	Revised Figure UW-13.4, Note (1) to indicate that t_n shall not be less than that required by UG-45.
14-2074	Reformatted UCS-68(b)(2) into UCS-68(b)(2)(-a) and UCS-68(b)(2)(-b). Retained existing requirements of UCS-68(b)(2), and in the new UCS-68(b)(2)(-b), clarified that PWHT is not mandatory for tube-to-tubesheet seal welds defined per UW-20.2(c).
14-2153	Revised dimension lines in Figure UG-84.
14-2383	Added SA-307, Grade A to Table UCS-23.
14-2388	Revised Table W-3, reference no. (53).
14-2389	Revised UG-11(c)(5) to provide an exemption to the requirement for a Material Test Report for ASME product standard parts.
14-2496	Revised the title of 31-4 and the first sentence of 31-4(a). Added a sentence after the first sentence of 31-4(b).
14-2499	Corrected the reference in UG-135(a) to UG-125(a)(3).
15-107	Revised 44-5(a) to specify that static head is to be included in the design pressure, P, and revised 44-5(c) to specify that cold stretch pressure, P_c, shall be measured at the top of the vessel during cold stretching.

Record Number	Change
15-587	Added SA/EN 10216-2 P235GH, P265GH, 16Mo3, 13CrMo4–5, and 10CrMo9–10 to Table UCS-23.
15-934	Incorporated the provisions of Mandatory Appendix 28 into new UW-13(f). Redesignated remaining UW-13 paragraphs. Corrected references to UW-13 subparagraphs. Deleted Mandatory Appendix 28.
15-1112	Errata correction. See Summary of Changes for details.
15-1228	Revised 2-1 and 24-1.
15-1229	Revised UCS-56(d)(2).
15-1266	Corrected reference in endnote 81.
15-1523	Revised UW-34 to permit spin-holes not exceeding the size limitations of UG-36(c)(3)(-a).
15-1551	Revised UW-2(a) to clarify that RT is to be performed in accordance with UW-51.
15-1579	Revised UCS-56(d)(5) to implement thermal gradient limitations during the cooling phase of the PWHT process.
15-1586	Revised references in UG-34 and UHX-9.3.
15-1605	Revised UHX-4(b) to indicate that standard flanges (see UG-44) are no longer standard and need supporting calculations when pass partitions are present.
15-1725	Revised UG-16(d) regarding methods for including provision for the allowed manufacturing undertolerance in determining the selected pipe thickness used in design.
15-1843	Deleted reference to ACCP CP-1 in Table U-3.
15-1847	In Mandatory Appendix 17, moved all figures to the end of the Appendix. Added 17-1(b)(8) to incorporate Code Case 2829 and added reference to 17-1(b)(8) anywhere 17-1(b)(6) was cited. In 17-1(f), added a new sentence to incorporate Code Case 2424. In 17-2(c), changed “impact test” to “qualification with toughness testing.” In 17-4, changed “0.045 in.” to “0.030 in.” to incorporate Code Case 2507. Updated 17-7 to incorporate changes desired in Item 10-111. Changed “inspection” to “examination” in three places.
15-2021	Revised UG-84(h)(3) and added new UG-84(h)(5) to address testing requirements for impact test qualifications of multiple-process welding procedures.
15-2173	Revised UG-46(a) to indicate exemptions to the requirement for inspection openings on the shell side of some shell-and-tube heat exchangers.
15-2324	Revised UG-28(f), and in 3-2, revised metric definition of full vacuum (FV) to 103 kPa.
15-2352	Revised Tables UCS-56-2, UCS-56-3, and UCS-56-4 to add PWHT exemptions for tube-to-tubesheet seal welds.
15-2473	Revised UW-40(d) to provide informative guidance on PWHT of dissimilar metal weld joints.
15-2553	In Table UCS-56-11, revised the minimum PWHT temperature from 1,350°F (730°C) to 1,300°F (705°C) and the minimum holding temperature in Note (1) from 1,325°F (720°C) to 1,250°F (675°C).
15-2591	Changed “nonmagnetic” to “nonferromagnetic” in UG-93(d)(3), UW-13(b)(4)(-c), UF-31(b)(1)(-a), UF-32(b)(4), UHT-57(e), and endnote 71. Deleted hyphen from “nonferromagnetic” in UW-11(e)(3).
15-2605	Revised Table U-3 and UW-54 to reference Section V, Article 1, T-120(e), T-120(f), T-120(g), T-120(h), or T-120(i), as applicable, for NDE personnel qualification and certification requirements.
15-2608	In Table UCS-57 and R-9, deleted references to P-No. 10F. Deleted Table UCS-56-10, which addressed PWHT for P-No. 10F.
15-2779	Revised wording of UW-5(b)(3) and UW-5(c) to clarify meaning.
15-2793	Errata correction. See Summary of Changes for details.
15-2812	Modified 13-12, eq. (2).
15-2923	Errata correction. See Summary of Changes for details.
16-54	Revised wording in the column heading of Table UG-84.2, for consistency with Section VIII, Division 2, Table 3.11.
16-100	Updated Mandatory Appendix 5, specifically Figures 5-1 and 5-2, to include corner-corner and flued-only flexible shell element expansion joints and to allow thin liners. Generalized the terminology from “flanged-and-flued or flanged-only” to “flexible shell element” expansion joints in UHX-17 and Mandatory Appendix 5. Added references to “outer shell elements,” the cylinder between flexible elements, to 5-3(f), 5-4(b), 5-4(c), 5-4(d), 5-5(c), and Figures 5-1 and 5-2.

Record Number	Change
	Separated fabrication requirements for welds within the flexible element from welds attaching the flexible element to the shell in 5-4(a) and 5-4(b). Clarified flexible shell element corner weld categorization, design, and fillet sizing in UW-3 and 5-4(b)(2). Added permission to use a thin liner in 5-4(c). Added requirement for welds to Type 1 butts in the shell adjacent to the flexible element in 5-4(d). Separated inspection requirements for welds within the flexible element from welds attaching the flexible element to the shell in 5-5(b) and 5-5(c).
16-102	Revised 26-6.3.3(a)(1) to restrict circumferential membrane stress in end convolution of externally attached bellows to short tangents.
16-134	Inserted the words “other than bolting materials” between the words “Materials” and “having” in UCS-66(f).
16-154	Revised UHX-18, 26-4.1(d)(1), and Forms 26-1 and 26.1M to ensure that bellows expansion joints are properly hydrotested.
16-322	Deleted references to P-No.10F where they appear in Section VIII, Division 1. Deleted Table UCS-56-10, the last line of Table UCS-57, and the preheat line under the heading of R-9.
16-509	Added new Form U-3P to Nonmandatory Appendix W.
16-532	Revised Table U-3 to update year of acceptable edition for those standards that were reviewed.
16-538	Revised “UHA-108” to “UHA-110” in Table UHA-32-3 and added UHA-110.
16-598	Added references to Form U-1P in U-2, UG-120, Mandatory Appendix 35, and Nonmandatory Appendix W. Added references to Form U-3P in UG-117 and UG-120.
16-661	Deleted endnote 75.
16-751	Revised 32-3 through 32-8. Added new 32-4 and 32-5, and revised all figures showing head-to-shell details.
16-894	Errata correction. See Summary of Changes for details.
16-962	Revised Nonmandatory Appendix DD.
16-991	Revised UHX-9.3 and UHX-9.5 by replacing S with S_{fe} in the nomenclature and in both equations of UHX-9.5.
16-1087	Revised Table UHA-23 to correct an error.
16-1094	Changed “National Board (inc. endorsements)” to “National Board Authorized Inspector Commission number” on all Manufacturer’s Data Reports. Changed “Commissions and endorsements” to “Commissions” and added “National Board Authorized Inspector Commission number” on Form U-1B.
16-1250	Revised UG-37 to change the term “telltale hole” to “vent hole.”
16-1270	Revised UW-16(f)(3)(-a)(-6) and title of Table UW-16.1.
16-1520	Revised UW-51(a)(1) through UW-51(a)(3) to clarify the acceptability of radiographic examination techniques other than film-based radiography.
16-2176	Errata correction. See Summary of Changes for details.
16-2177	Added titles to the paragraphs in Nonmandatory Appendices C, D, E, F, and G.
16-2185	Revised Table U-3 to include ASME PTB-4, and in Figure UG-118, deleted the title of ASME PTB-4.

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

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 Section II, Part D, Nonmandatory Appendix A.

(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, and 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: