

SECTION VIII

Rules for Construction of Pressure Vessels

2021

ASME Boiler and
Pressure Vessel Code
An International Code

Division 3

Alternative Rules for Construction
of High Pressure Vessels

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AN INTERNATIONAL CODE

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VIII

RULES FOR CONSTRUCTION OF PRESSURE VESSELS

Division 3

Alternative Rules for Construction of High Pressure Vessels

ASME Boiler and Pressure Vessel Committee
on Pressure Vessels



The American Society of
Mechanical Engineers

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* In the 2021 Edition, Subsections NC and ND have been incorporated into one publication, Subsection NCD (BPVC.III.1.NCD), Class 2 and Class 3 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 2021 Code Cases book: "Boilers and Pressure Vessels" or "Nuclear Components." Each Code Cases book is updated with seven Supplements. Supplements will be sent or made available automatically to the purchasers of the Code Cases books up to the publication of the 2023 Code. Annulments of Code Cases become effective six months after the first announcement of the annulment in a Code Case Supplement or Edition of the appropriate Code Case book. Code Case users can check the current status of any Code Case at <http://go.asme.org/BPVCCDatabase>. Code Case users can also view an index of the complete list of Boiler and Pressure Vessel Code Cases and Nuclear Code Cases at <http://go.asme.org/BPVCC>.

FOREWORD*

(21)

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 In 2009, the Boiler and Pressure Vessel Committee was superseded by the following committees: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) Committee on Overpressure Protection (XIII)
- (l) 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 overpressure protection.

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 the ASME Single 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.

The words "shall," "should," and "may" are used in this Standard as follows:

- *Shall* is used to denote a requirement.
- *Should* is used to denote a recommendation.
- *May* is used to denote permission, neither a requirement nor a recommendation.

STATEMENT OF POLICY ON THE USE OF THE ASME SINGLE 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 ASME Single 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 ASME Single Certification Mark for the benefit of the users, the enforcement jurisdictions, and the holders of the ASME Single 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 ASME Single 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 ASME Single 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 ASME Single 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 ASME Single Certification Mark who may also use the facsimile in advertising to show that clearly specified items will carry the ASME Single Certification Mark.

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 ASME Single Certification Mark described in the governing Section of the Code.

Markings such as “ASME,” “ASME Standard,” or any other marking including “ASME” or the ASME Single 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.

(21) 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) Interpretations will be issued only if existing Code text is ambiguous or conveys conflicting requirements. If a 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. This information should include a statement indicating why the included paragraphs, figures, or tables are ambiguous or convey conflicting requirements. 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 ASME Single 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 include a statement indicating why the included paragraphs, figures, or tables are ambiguous or convey conflicting requirements. 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>.

PERSONNEL

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

January 1, 2021

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Special Working Group on High Temperature Technology (TOMC)

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ISO TAG to ISO TC 185 Safety Devices for Protection Against Excessive Pressure (BPV XIII)

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SUMMARY OF CHANGES

Errata to the BPV Code may be posted on the ASME website 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, **(21)**, placed next to the affected area.

<i>Page</i>	<i>Location</i>	<i>Change</i>
xv	List of Sections	(1) Listing for Section III updated (2) Section XIII added (3) Code Case information updated
xvii	Foreword	(1) Subparagraph (k) added and subsequent subparagraph redesignated (2) Second footnote revised (3) Last paragraph added
xx	Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees	Paragraphs 1(a)(3)(-b), 2(b), and 5(a)(3) revised
xxiii	Personnel	Updated
1	KG-103	Revised
2	KG-116	Revised
2	KG-120	Revised
2	KG-121	Title and first paragraph revised
3	KG-141	In subpara. (a), last bulleted item added
4	Table KG-141	Revised
3	KG-150	In subpara. (e), last line revised
6	KG-210	Subparagraph (e) revised
8	KG-311.11	In last line, cross-reference updated
8	KG-311.12	Subparagraph (i) added
16	KG-510	Cross-references updated
16	KG-516	Last cross-reference updated
17	KG-522	Last cross-reference updated
18	KG-611	Third cross-reference updated
18	KG-613	Subparagraph (a) and first line of subpara. (c) revised
19	KM-100	Subparagraph (a) and first line of subpara. (c) revised
23	KM-211.1	In subpara. (b), last line revised
23	KM-211.2	Subparagraphs (a), (b), and (c) revised
24	KM-211.3	Subparagraph (b) revised

<i>Page</i>	<i>Location</i>	<i>Change</i>
27	KM-234.1	In subpara. (b), second cross-reference updated
29	KM-252	Revised
29	KM-253	Revised
30	KM-261	First paragraph revised
31	KM-304	Cross-reference updated
32	KM-400	Subparagraph (a)(4) added and subpara. (b) revised
33	Table KM-400-1	(1) For Carbon Steel, SA-738, UNS No. revised (2) For Carbon Steel, SA-841, Type/Grade A and B, thickness revised (3) For 1Cr- $\frac{1}{2}$ Mo-V, SA-193, UNS No. K14072, Specified Min. Tensile 100, thickness revised (4) Entries for $\frac{3}{4}$ Ni-1Cu- $\frac{3}{4}$ Cr, SA-736, Type/Grade A, entries for Specified Min. Tensile 90, 72, and 65 deleted (5) Note (16) revised
39	Table KM-400-1M	(1) For Carbon Steel, SA-738, UNS No. revised (2) For Carbon Steel, SA-841, Type/Grade A, thickness and specified min. tensile revised; for Type/Grade B, thickness revised (3) For C- $\frac{1}{4}$ Mo, SA-320, thickness revised (4) For 1Cr- $\frac{1}{5}$ Mo, SA-193 Type/Grade B7, SA-320 Type/Grade L7M, SA-320 Type/Grade L7, thickness revised (5) For 1Cr- $\frac{1}{4}$ Mo-V, SA-193, UNS No. K14072, Specified Min. Tensile 690, thickness revised (6) For 1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Ti, SA-517, UNS No. K21604, Specified Min. Tensile 725 and 795, thickness revised (7) For $\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V, SA-517, K11576, thickness revised (8) Entries for $\frac{3}{4}$ Ni-1Cu- $\frac{3}{4}$ Cr, SA-736, Type/Grade A, entries deleted for specified min. tensile 620, 495, and 450 (9) For 1 $\frac{1}{4}$ Ni-1Cr- $\frac{1}{2}$ Mo, SA-517, K21650, thickness revised (10) Note (16) revised
46	Table KM-400-2	(1) Notes (11) and (12) added and entries in Notes column updated (2) In Notes (6) and (8), cross-references updated
49	Table KM-400-2M	(1) Notes (11) and (12) added and entries in Notes column updated (2) In Notes (6) and (8), cross-references updated
56	KM-620	In first paragraph, first line revised
56	KM-630	Cross-references updated
57	Table KM-620	In second column, entries editorially revised
64	KD-131	Subparagraph (b) revised
65	KD-200	Subparagraphs (d) and (e) revised
65	KD-210	(1) Subparagraph (c) added and subsequent subparagraphs redesignated (2) Subparagraph (o) deleted
71	Table KD-230.2	Second entry added
69	KD-231.2	(1) Subparagraph (b) revised (2) Paragraph below subpara. (b)(4) revised
71	Table KD-230.3	In first column, last entry corrected by errata from "143" to "1.43"
69	KD-231.3	In Step 3, second sentence revised

<i>Page</i>	<i>Location</i>	<i>Change</i>
72	Table KD-230.4	Revised
71	KD-232.1	(1) Subparagraph (a) revised (2) In subpara. (e), definition of $\sigma_{e,k}$ revised in nomenclature
74	KD-234.1	In Step 3, second sentence revised
75	KD-240	(1) Subparagraph (d) revised in its entirety (2) In subpara. (e), second and third lines revised
78	KD-312.4	In subpara. (b), " $\sigma_{nm\ ij} < 0$ " revised to " $\sigma_{nm\ ij} \leq 0$ "
81	KD-330	Subparagraph (a) revised and subpara. (f) deleted in its entirety
82	KD-341	In Step 3, second sentence revised
86	KD-354.1	(1) In Step 5, last sentence revised (2) In Step 7, first line revised
87	KD-372	In subpara. (b), second sentence revised
90	Table KD-320.1	(1) Entry for Figure 320.3 revised (2) General Note (d)(5) deleted and subsequent notes redesignated (3) Note (1) added
93	Table KD-320.1M	(1) Entry for Figure 320.3M revised (2) General Note (d)(5) deleted and subsequent notes redesignated (3) Note (1) added
97	Figure KD-320.3	Revised
98	Figure KD-320.3M	Revised
100	Figure KD-320.4M	Editorially revised
102	Figure KD-320.5M	Editorially revised
110	KD-401	Subparagraphs (a) and (c) revised
110	KD-412	Revised
110	KD-412.1	Subparagraph (b) revised
111	KD-412.2	Subparagraph (c) revised
111	KD-430	(1) In subpara. (b)(2), third paragraph, definition of ΔK_{th} corrected by errata (2) In subpara. (d), definitions of C_o and m revised in nomenclature
112	KD-440	(1) In first paragraph, first sentence revised (2) In second paragraph, second sentence revised
112	Table KD-430	Title and second column head revised
112	Table KD-430M	Title and second column head revised
117	KD-601	Subparagraph (d) revised
117	KD-623	Subparagraphs (b), (d), (f), and (g) revised
118	KD-631	Revised
121	KD-700	In subpara. (d)(1), fourth line revised
123	KD-723	Revised
125	KD-811.1	In second equation, first denominator E_i revised to E_j
131	Figure KD-830.4	Revised

<i>Page</i>	<i>Location</i>	<i>Change</i>
132	Figure KD-830.5	Illustrations (c) and (d) revised
137	KD-922	Revised
145	KD-1110	Fourth cross-reference updated
157	KD-1270	Subparagraph (a)(2) revised
158	KD-1310	(1) In subpara. (c), last cross-reference updated (2) In subpara. (h), first and second sentences, last cross-reference updated
159	KD-1311	Last cross-reference updated
163	KF-201	In subpara. (a), first line revised
181	KF-821	(1) Subparagraph (f) revised (2) Subparagraph (g) deleted and last two paragraphs added
184	Figure KF-822(b)	Editorially revised
184	KF-825.4	Subparagraph (b) revised
185	Figure KF-825.4	Former Figure KF-826.4(a) redesignated and revised
185	Figure KF-825.4(b)	Deleted
186	KF-826	(1) New designator KF-826.1 added and subparas. (c)(1), (c)(2), and (c)(3) revised (2) KF-826.2 added
193	KF-1211	In third sentence, cross-reference updated
193	KF-1212	(1) In subpara. (a), cross-references updated (2) In subpara. (b)(2), first sentence, last cross-reference updated
195	Part KR	Revised in its entirety
196	Part KOP	Added
204	KE-112.1	Revised in its entirety
230	KE-503	(1) Subparagraph (b) revised (2) In subpara. (b)(2), cross-references to Section X updated
232	KT-230	Revised
237	KT-510	Subparagraph (a) revised
238	KS-100	Subparagraph (b) revised
239	KS-120	(1) Subparagraph (b) revised (2) Subparagraph (c) merged with subpara. (b)
241	KS-200	Revised
241	KS-230	Revised
241	KS-240	Revised
241	KS-250	Subparagraph (c) deleted and subpara. (d) redesignated as (c)
244	1-100	(1) Definitions of A , C , C_o , CTOD, CVN, d_s , F_i , M , $mn\Delta S_{range}$, n , P , P_T , S , S_{alt} , S_y , W , Z , α , σ_e revised (2) Definitions of C_M , C_T , E_B , E_C , J_{crit} , $K_{c\delta}$, K_{Jc} , k_{c1} , P_O , S_i , S_M , S_T , δ_{crit} , added (3) Definitions of J_{Ic} , K_D , K_{uteq} , L_d , P_B , W_a , W_T , ρ deleted

<i>Page</i>	<i>Location</i>	<i>Change</i>
252	Mandatory Appendix 2	2-100, 2-110(c), 2-112, 2-113, 2-114, 2-118, 2-120, 2-121, and 2-124 revised
255	5-100	Revised
266	Mandatory Appendix 9	(1) 9-100, 9-200, 9-210, 9-220, 9-250, 9-260, 9-270, 9-300 revised (2) Former Figure 9-200-1 redesignated as Figure 9-200.1 and revised (3) 9-110 and Table 9-100.1 added
278	Form K-4	Deleted
278	Table A-100.2	Deleted
279	Form K-5	Deleted
279	Table A-100.3	Deleted
296	D-600	Deleted
298	E-210	Revised
299	E-222	Subparagraph (a) revised
315	Figure H-101	Note (1) revised
325	K-110	Definition of T_o revised
325	K-200	(1) Subparagraphs (f) and (g) merged and revised (2) Subparagraphs (h) and (i) redesignated as (g) and (h), respectively, and revised
326	Figure K-200-2	Revised
327	Nonmandatory Appendix L	Deleted. Refer to ASME Section VIII, Division 2, Annex 5-A.
328	Nonmandatory Appendix M	Added

LIST OF CHANGES IN RECORD NUMBER ORDER

DELETED

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).

PART KG

GENERAL REQUIREMENTS

ARTICLE KG-1

SCOPE AND JURISDICTION

KG-100 SCOPE

KG-101 INTENT

The rules of this Division constitute requirements for the design, construction, inspection, and overpressure protection of metallic pressure vessels with design pressures generally above 10 ksi (70 MPa). However, it is not the intent of this Division to establish maximum pressure limits for either Section VIII, Division 1 or 2, nor minimum pressure limits for this Division. Specific pressure limitations for vessels constructed to the rules of this Division may be imposed elsewhere in this Division for various types of fabrication. Whenever *Construction* appears in this document, it may be considered an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and pressure relief.

KG-102 DESCRIPTION

Pressure vessels within the scope of this Division are pressure containers for the retainment of fluids, gaseous or liquid, under pressure, either internal or external.

This pressure may be generated by

- (a) an external source
- (b) the application of heat from
 - (1) direct source
 - (2) indirect source
- (c) a process reaction
- (d) any combination thereof

(21) KG-103 LAWS OR REGULATIONS

The scope of this Division has been established to identify components and parameters considered in formulating the rules given in this Division. Laws or regulations issued by municipal, 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 the jurisdiction. Those laws or regulations may require the

use of this Division 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 of this Division.

KG-104 LOCATION

KG-104.1 Fixed Location. Except as provided in [KG-104.2](#), these rules cover vessels to be installed at a fixed (stationary) location for a specific service where operation and maintenance control are maintained in conformance with the User's Design Specification and records retained during the life of the vessel by the User.

KG-104.2 Mobile Vessels. These rules also apply to pressure vessels that are relocated from work site to work site between pressurizations, and where operation and maintenance control are maintained in conformance with the User's Design Specification and records retained during the life of the vessel by the User.

KG-105 DIRECT FIRED

Pressure vessels which are subject to direct firing and are not within the scope of Section I may be constructed to the rules of this Division, except as excluded by [KG-120](#).

KG-110 GEOMETRIC SCOPE OF THIS DIVISION

The scope of this Division includes only the vessel and integral communicating chambers and shall include the following ([KG-111](#) through [KG-117](#)).

KG-111 EXTERNAL PIPING AND JACKETS

Where external piping is to be connected to the vessel (see [Article KD-6](#)):

- (a) the first threaded joint for screwed connections
- (b) the face of the first flange for flanged connections