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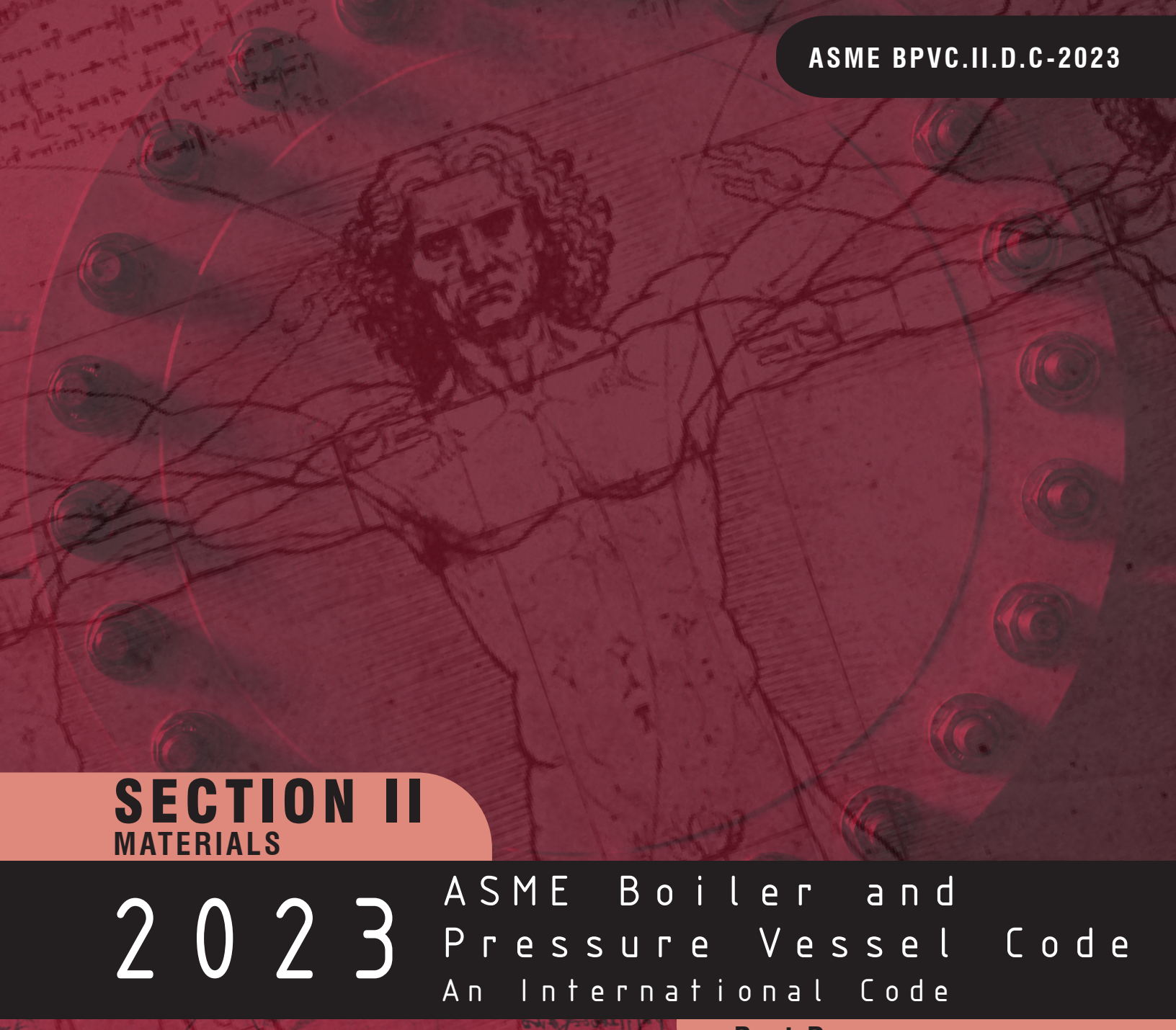

SECTION II
MATERIALS

2023 ASME Boiler and Pressure Vessel Code
An International Code

Part D
Properties (Customary)

ASME
SETTING THE STANDARD

AN INTERNATIONAL CODE

2023 ASME Boiler & Pressure Vessel Code

2023 Edition July 1, 2023

II

MATERIALS

Part D

Properties (Customary)

ASME Boiler and Pressure Vessel Committee
on Materials

The American Society of Mechanical Engineers

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: July 1, 2023

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ASME Collective Membership Mark

ASME Single Certification Mark

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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 In 2009, the Boiler and Pressure Vessel Committee was superseded by the following committees: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) 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.

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ASME codes and standards are developed and maintained by committees with the intent to represent the consensus of concerned interests. Users of ASME codes and standards may correspond with the committees to propose revisions or cases, report errata, or request interpretations. Correspondence for this Section of the ASME Boiler and Pressure Vessel Code (BPVC) should be sent to the staff secretary noted on the Section's committee web page, accessible at https://go.asme.org/CSCommittees.

NOTE: See ASME BPVC Section II, Part D for guidelines on requesting approval of new materials. See Section II, Part C for guidelines on requesting approval of new welding and brazing materials ("consumables").

Revisions and Errata

The committee processes revisions to this Code on a continuous basis to incorporate changes that appear necessary or desirable as demonstrated by the experience gained from the application of the Code. Approved revisions will be published in the next edition of the Code.

In addition, the committee may post errata and Special Notices at http://go.asme.org/BPVCerrata. Errata and Special Notices become effective on the date posted. Users can register on the committee web page to receive e-mail notifications of posted errata and Special Notices.

This Code is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

Cases

(a) The most common applications for cases are

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

(2) to provide alternative requirements

(3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Code

(4) to permit use of a new material or process

(b) Users are cautioned that not all jurisdictions or owners automatically accept cases. Cases 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.

(c) The committee will consider proposed cases concerning the following topics only:

(1) equipment to be marked with the ASME Single Certification Mark, or

(2) equipment to be constructed as a repair/replacement activity under the requirements of Section XI

(d) A proposed case shall be written as a question and reply in the same format as existing cases. The proposal shall also include the following information:

(1) a statement of need and background information

(2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)

(3) the Code Section and the paragraph, figure, or table number(s) to which the proposed case applies

(4) the edition(s) of the Code to which the proposed case applies

(e) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Cases that have been approved will appear in the next edition or supplement of the Code Cases books, "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 until the next edition of the 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. The status of any case is available at http://go.asme.org/BPVCCDatabase. An index of the complete list of Boiler and Pressure Vessel Code Cases and Nuclear Code Cases is available at http://go.asme.org/BPVCC.

Interpretations

(a) Interpretations clarify existing Code requirements and are written as a question and reply. Interpretations do not introduce new requirements. If a revision to resolve conflicting or incorrect wording is required to support the interpretation, the committee will issue an intent interpretation in parallel with a revision to the Code.

(b) Upon request, the committee will render an interpretation of any requirement of the Code. An interpretation can be rendered only in response to a request submitted through the online Interpretation Submittal Form at http://go.asme.org/InterpretationRequest. Upon submitting the form, the inquirer will receive an automatic e-mail confirming receipt.

(c) ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Code requirements. If, based on the information submitted, it is the opinion of the committee that the inquirer should seek assistance, the request will be returned with the recommendation that such assistance be obtained. Inquirers may track the status of their requests at http://go.asme.org/Interpretations.

(d) ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME committee or subcommittee. ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

(e) Interpretations are published in the ASME Interpretations Database at http://go.asme.org/Interpretations as they are issued.

Committee Meetings

The ASME BPVC committees regularly hold meetings that are open to the public. Persons wishing to attend any meeting should contact the secretary of the applicable committee. Information on future committee meetings can be found at http://go.asme.org/BCW.

SUMMARY OF CHANGES

Changes listed below are identified on the pages by a margin note, **(23)**, placed next to the affected area.

Page	*Location*	*Change*
xiii	List of Sections	*(1)* Under Section III, Division 4 added *(2)* Title of Section XI and subtitle of Section XI, Division 2 revised *(3)* Information on interpretations and Code cases moved to "Correspondence With the Committee"
xvii	Personnel	Updated
xxxix	Correspondence With the Committee	Added (replaces "Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees")
xlvi	Cross-Referencing in the ASME BPVC	Updated
8–11	Table 1A	Lines 5 and 30 deleted
12–15	Table 1A	Lines 24, 28, and 34 corrected by errata
16–19	Table 1A	Lines 29 and 37 revised
24–27	Table 1A	Line 43 revised
28–31	Table 1A	Line 14 corrected by errata
36–39	Table 1A	Line 25 revised
56–59	Table 1A	Line 4 added
72–75	Table 1A	Lines 26–35, 37–42, and 44 revised
76–79	Table 1A	Lines 1 and 2 revised
88–91	Table 1A	Lines 38 and 39 revised
92–95	Table 1A	Lines 36 and 37 revised
116–119	Table 1A	Lines 24–29 revised and relocated
124–127	Table 1A	Line 31 corrected by errata
128–131	Table 1A	Lines 19 and 20 added
148–151	Table 1A	Lines 19–22 added
156–159	Table 1A	Lines 10 and 11 added
172–175	Table 1B	Lines 42 and 43 revised
184–187	Table 1B	Lines 30–33 revised
188–191	Table 1B	*(1)* Lines 26, 38, and 39 revised *(2)* Lines 36 and 37 deleted
192–195	Table 1B	*(1)* Lines 4–7 revised *(2)* Lines 43 and 45 added
196–199	Table 1B	*(1)* Line 2 added *(2)* Lines 3 and 19–22 revised
200–203	Table 1B	*(1)* Lines 21, 22, 25, and 26 deleted *(2)* Lines 23, 27, 43, and 45 revised

Page	*Location*	*Change*
		(3) Lines 24, 28, 30, 32, 34, 36, 38, 41, and 44 added
204–207	Table 1B	*(1)* Lines 1 and 3 added *(2)* Lines 29, 30, and 41 revised
208–211	Table 1B	*(1)* Lines 26, 27, 40, and 44 revised *(2)* Line 45 added
212–215	Table 1B	*(1)* Lines 1, 3, 5, 31, and 32 revised *(2)* Lines 2, 4, and 6 added
216–219	Table 1B	*(1)* Lines 18, 19, 24, 26, 34, and 35 revised *(2)* Lines 24 and 26 corrected by errata
220–223	Table 1B	*(1)* Lines 5, 18, and 32 revised *(2)* Lines 12, 19, 21, and 22 corrected by errata *(3)* Line 23 added by errata
224–227	Table 1B	Lines 9 and 24–42 revised
236–239	Table 1B	Line 22 revised
240–243	Table 1B	*(1)* Lines 13 and 14 added *(2)* Line 19 corrected by errata *(3)* Line 25 revised
248–251	Table 1B	Lines 3–11 corrected by errata
256–259	Table 1B	Lines 8 and 26 revised
260–263	Table 1B	Lines 26 and 40 revised
264–267	Table 1B	Lines 1 and 43 revised
272–275	Table 1B	Line 2 revised
284–287	Table 1B	Lines 26–34 revised
288–291	Table 1B	*(1)* Lines 21–24, 26, and 29–31 revised *(2)* Lines 25 and 32 added *(3)* Lines 27 and 28 deleted by errata
292	Table 1B	Note G17 revised
296–298	Table 2A	Line 8 deleted
300–302	Table 2A	Lines 27–30 added
304–306	Table 2A	*(1)* Lines 22–29, 44, and 45 added *(2)* Line 30 revised
308–310	Table 2A	*(1)* Line 8 added *(2)* Line 11 revised
312–314	Table 2A	*(1)* Line 13 revised *(2)* Lines 24–33 added
316–318	Table 2A	Lines 6–8, 17, 26–32, and 41 added
324–326	Table 2A	*(1)* Lines 7 and 21 added *(2)* Lines 38–40 revised
328–330	Table 2A	*(1)* Line 6 revised *(2)* Lines 29 and 32–34 added
336–338	Table 2A	*(1)* Line 25 revised *(2)* Line 26 added

Page	*Location*	*Change*
344–346	Table 2A	Lines 3, 4, 41, and 42 added
348–350	Table 2A	*(1)* Line 35 revised *(2)* Line 39 added
352–354	Table 2A	*(1)* Line 9 revised *(2)* Line 43 added
356–358	Table 2A	Lines 41 and 42 added
368–370	Table 2A	*(1)* Line 3 added *(2)* Line 45 revised and relocated
372–374	Table 2A	*(1)* Lines 1–3 revised and relocated *(2)* Lines 31–36 added
376–378	Table 2A	Lines 43–45 added
380–382	Table 2A	Lines 1, 36, 44, and 45 added
384–386	Table 2A	Lines 1–5 added
390–416	Table 2B	"Type/Grade" column added
394–396	Table 2B	*(1)* Lines 18, 19, 31, and 32 deleted *(2)* Lines 20–23, 33–42, 44, and 45 added *(3)* Lines 24 and 43 revised
398–400	Table 2B	*(1)* Lines 1–5 added *(2)* Lines 26 and 35 revised *(3)* Line 33 corrected by errata
402–404	Table 2B	Lines 5, 11, and 13 corrected by errata
406–408	Table 2B	Lines 23 and 25 corrected by errata
410–412	Table 2B	Lines 42–45 revised
414–416	Table 2B	Lines 1–41 revised
417	Table 2B	Note E5 added
422–425	Table 3	*(1)* Lines 18, 19, 24, 25, 37, 40, and 43 revised *(2)* Lines 18 and 19 transposed *(3)* Lines 24 and 25 transposed
434–437	Table 3	*(1)* Lines 9, 10, and 34–39 revised *(2)* Lines 29 and 32 corrected by errata
438–441	Table 3	*(1)* Lines 9–14 corrected by errata *(2)* Line 43 revised
447	Table 3	Note T13 added
456–458	Table 4	Lines 1–8 corrected by errata
460–463	Table 5A	*(1)* Line 5 deleted *(2)* Line 38 revised
464–467	Table 5A	Lines 16, 20, 29, 35, 36, 41, and 42 revised
480–483	Table 5A	Lines 24 and 40 revised
496–499	Table 5A	Lines 14 and 26 revised
504–507	Table 5A	Lines 17, 39, and 40 revised
508–511	Table 5A	Line 1 revised and relocated

Page	*Location*	*Change*
522–545	Table 5B	"Type/Grade" column added
526–529	Table 5B	*(1)* Lines 36, 37, and 39–42 added *(2)* Line 38 revised
538–541	Table 5B	Lines 33–45 revised
542–545	Table 5B	Lines 1–27 revised
550, 551	Table 6A	*(1)* Line 31 added *(2)* Line 34 deleted
552, 553	Table 6A	*(1)* Lines 8, 10, and 11 added *(2)* Lines 9 and 30–39 revised
558, 559	Table 6B	*(1)* Lines 19–21 revised *(2)* Lines 22 and 37 added
560, 561	Table 6B	*(1)* Lines 4 and 25 added *(2)* Lines 24 and 43–45 revised
562, 563	Table 6B	*(1)* Lines 1–3 and 13 revised *(2)* Lines 4–9 and 17–20 added
578–580	Table U	Lines 5 and 23 deleted
582–584	Table U	Line 13 corrected by errata
618–620	Table U	Lines 33 and 34 corrected by errata
626–628	Table U	Lines 24 and 26 revised
630–632	Table U	Line 4 added
650–652	Table U	Lines 8, 11, and 16 revised
654–656	Table U	*(1)* Lines 13 and 15 added *(2)* Line 14 revised
658–660	Table U	Lines 5 and 35 revised
674–676	Table U	Lines 23–26 revised and relocated
678-680	Table U	Line 34 added
690–692	Table U	Line 45 added
694–696	Table U	Lines 1, 42, and 43 added
722–724	Table U	*(1)* Line 6 added *(2)* Lines 7, 8, and 42 revised
730–732	Table U	Lines 14 and 15 added
734–736	Table U	Lines 29–34 revised
738–740	Table U	*(1)* Lines 27–30 and 41 revised *(2)* Line 42 added
742–744	Table U	*(1)* Line 8 corrected by errata *(2)* Lines 11 and 12 revised *(3)* Line 13 added
754–756	Table U	*(1)* Lines 13, 15, and 17–22 revised *(2)* Lines 14, 16, and 45 added by errata *(3)* Lines 23–27 and 39–41 corrected by errata *(4)* Line 38 added

Page	*Location*	*Change*
766–768	Table U	Lines 24, 26, 28, 30, 32, and 34 deleted
770–772	Table U	Lines 2 and 4 revised
786–788	Table U	Lines 5–11 added
790–794	Table Y-1	Lines 5 and 23 deleted
796–800	Table Y-1	Lines 15, 19, and 25 corrected by errata
856–860	Table Y-1	Line 22 corrected by errata
868–872	Table Y-1	Line 40 added
880–884	Table Y-1	Lines 20–22 and 25 deleted
904–908	Table Y-1	Lines 10, 14, and 19 revised
910–914	Table Y-1	*(1)* Lines 17 and 19 added *(2)* Line 18 revised
916–920	Table Y-1	Lines 9 and 39 revised
946–950	Table Y-1	Lines 1–4 revised and relocated
952–956	Table Y-1	Line 14 added
970–974	Table Y-1	Lines 25 and 26 added
976–980	Table Y-1	Lines 22 and 23 added
1006–1010	Table Y-1	*(1)* Line 24 added *(2)* Lines 25 and 26 revised
1012–1016	Table Y-1	Line 15 revised
1018–1022	Table Y-1	Lines 27 and 28 added
1030–1034	Table Y-1	Lines 8–10 revised
1036–1040	Table Y-1	*(1)* Lines 3–6 revised *(2)* Lines 17, 18, and 32–34 added
1054–1058	Table Y-1	Line 39 added by errata
1060–1064	Table Y-1	*(1)* Lines 5, 19, 26, 28, and 31 corrected by errata *(2)* Line 18 added *(3)* Lines 20 and 27 added by errata *(4)* Lines 29–33 revised
1078–1082	Table Y-1	*(1)* Lines 9, 11, 13, 15, 17, and 19 deleted *(2)* Lines 29 and 34 revised
1108–1112	Table Y-1	Lines 1–7 added
1114	Table Y-2	Title revised
1115	Subpart 2, Introduction	Fifth paragraph added
1116	Table TE-1	Note (2) revised
1134	Table TCD	Notes (11) and (12) revised
1148	Table TM-1	Notes (6) and (8) revised
1152	Table TM-3	Revised
1302	Table 5-800	Corrected by errata
1332	A-702.1.6	Added

(**23**)

CROSS-REFERENCING IN THE ASME BPVC

Paragraphs within the ASME BPVC may include subparagraph breakdowns, i.e., nested lists. The following is a guide to the designation and cross-referencing of subparagraph breakdowns:

(a) Hierarchy of Subparagraph Breakdowns

(1) First-level breakdowns are designated as (a), (b), (c), etc.

(2) Second-level breakdowns are designated as (1), (2), (3), etc.

(3) Third-level breakdowns are designated as (-a), (-b), (-c), etc.

(4) Fourth-level breakdowns are designated as (-1), (-2), (-3), etc.

(5) Fifth-level breakdowns are designated as (+a), (+b), (+c), etc.

(6) Sixth-level breakdowns are designated as (+1), (+2), etc.

(b) Cross-References to Subparagraph Breakdowns. Cross-references within an alphanumerically designated paragraph (e.g., PG-1, UIG-56.1, NCD-3223) do not include the alphanumerical designator of that paragraph. The cross-references to subparagraph breakdowns follow the hierarchy of the designators under which the breakdown appears. The following examples show the format:

(1) If X.1(c)(1)(-a) is referenced in X.1(c)(1), it will be referenced as (-a).

(2) If X.1(c)(1)(-a) is referenced in X.1(c)(2), it will be referenced as (1)(-a).

(3) If X.1(c)(1)(-a) is referenced in X.1(e)(1), it will be referenced as (c)(1)(-a).

(4) If X.1(c)(1)(-a) is referenced in X.2(c)(2), it will be referenced as X.1(c)(1)(-a).

SUBPART 1
STRESS TABLES

STATEMENT OF POLICY ON INFORMATION PROVIDED IN THE STRESS TABLES

The purpose of this Statement of Policy is to clarify which information in the stress tables is mandatory and which is not. The information and restrictions provided in the Notes found throughout the various stress tables provided in Section II, Part D, Subpart 1, are mandatory. It is vital to recognize that lines of information in Tables 1A, 1B, 2A, 2B, 3, 4, 5A, 5B, 6A, 6B, 6C, and 6D frequently have essential information referenced in the Notes column. These Notes are organized as follows:

(a) EXX: defining onset of values based on successful experience in service

(b) GXX: general requirements

(c) HXX: heat treatment requirements

(d) SXX: size requirements

(e) TXX: defining onset of time-dependent behavior

(f) WXX: welding requirements

The specifications and grades or types, coupled with the assigned Notes for each line, provide the complete description of material in the context of the allowable stresses or design stress intensities. Additional requirements for particular types of construction must also be obtained from the rules governing the construction.

In Tables 1A, 2A, 5A, 6A, 6C, and 6D, the information in the Nominal Composition column is nonmandatory and is for information only. However, these nominal compositions are the primary sorting used in these six tables. See the Guideline on Locating Materials in Stress Tables, and in Tables of Mechanical and Physical Properties. The information in the Alloy Designation/UNS Number column is nonmandatory for specifications for which a grade or type is provided. This is primarily true for the non-stainless steel alloys in these tables. For specifications for which no type or grade is listed, the UNS number is mandatory. Particularly for the stainless steels, for which no type or grade is listed, the UNS number is the grade.

The only difference between Tables 1A, 2A, 5A, 6A, 6C, and 6D and Tables 1B, 2B, 5B, and 6B, with regard to the mandatory/nonmandatory nature of the information, is that in Tables 1B, 2B, 5B, and 6B, the UNS number information is used as the basis of the sorting scheme for materials and is almost always mandatory.

Where provided, the information in the columns for Product Form, Specification Number, Type/Grade, Class/Condition/Temper, and External Pressure Chart Number is mandatory. The information in the P-Number and Group Number columns is also mandatory; however, the primary source for this information is Table QW/QB-422 in Section IX. When there is a conflict between the P-number and Group number information in these stress tables and that in Section IX, the numbers in Section IX shall govern.

The information in the Minimum Tensile Strength, Minimum Yield Strength, and Size/Thickness dimension columns is also mandatory; however, the primary source for this information is the material specifications in Section II, Parts A and B. These values are a primary basis for establishing the allowable stresses and design stress intensities. When there is a conflict between the tensile and yield strength values in the stress tables and those in the material specifications in Section II, Parts A and B, the minimum tensile and yield strength values in Parts A and B shall govern. For dual-unit specifications and for product forms for which separate U.S. Customary and Metric specifications are provided, for the Size/Thickness dimensions for size breaks at which the Minimum Specified Yield or Tensile Strengths, or both, decrease with increasing size or thickness, the values in the material specifications in Parts A and B shall govern. When there is a conflict between the maximum size or thickness values in the stress tables and those in the material specifications, the values in the stress tables shall govern.

The information in the Applicability and Maximum Temperature Limits columns is mandatory. Where a material is permitted for use in more than one Construction Code, and in the SI units version of these tables, the maximum use temperature limit in these columns is critical. The temperature to which allowable stress or design stress intensity values are listed is not necessarily the

temperature to which use is permitted by a particular Construction Code. Different Construction Codes often have different use temperature limits for the same material and condition. Further, values may be listed in the stress tables at temperatures above the maximum use temperature limit. These stress values are provided to permit interpolation to be used to determine the allowable stress or design stress intensity at temperatures between the next lowest temperature for which stress values are listed and the maximum-use temperature limit listed in these columns.