

SECTION XII

2017

ASME Boiler and
Pressure Vessel Code
An International Code

**Rules for Construction
and Continued Service
of Transport Tanks**

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AN INTERNATIONAL CODE

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XII

RULES FOR CONSTRUCTION AND CONTINUED SERVICE OF TRANSPORT TANKS

ASME Boiler and Pressure Vessel Committee
on Transport Tanks



The American Society of
Mechanical Engineers

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 In 2009, the Boiler and Pressure Vessel Committee was superseded by the following committees: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

PERSONNEL

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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.

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
xv	List of Sections	Updated
xx	Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees	Revised in its entirety (13-2222)
xxiii	Personnel	Updated
2	TG-110.2	Revised (16-558)
2	TG-130.1	Reference to ASME CA-1 added (14-341)
3	Table TG-130	Revised (10-1608)
7	TG-320	Subparagraph (a) revised (14-341)
9	TG-410	Definition of <i>Certified Individual (CI)</i> revised (14-341)
51	TM-250	Penultimate sentence added (14-903)
51	TM-250.1	New subpara. (b) added and subsequent subparagraphs redesignated (14-903)
53	TM-250.3	First paragraph revised (14-903)
53	TM-250.6	Subparagraphs (b), and (d)(1) through (d)(3) revised (14-903)
54	TM-250.8	Subparagraphs (b) and (b)(3) revised (14-903)
72	Table TD-430	Reformatted editorially for clarity
82	Table TD-610.1	Reformatted editorially for clarity
150	TE-110.2	(1) Subparagraph (a)(2) revised (11-871) (2) Subparagraph (c) added (11-871)
164	TR-110	(1) Definitions of <i>breaking pin; breaking pin device; breaking pin housing; gas; manufacturing design range; nonreclosing pressure relief device; pressure relief valve; rupture disk; rupture disk device; set pressure; and specified disk temperature</i> ; revised (03-1385) (2) Definitions of <i>competent authority (CA); coincident temperature; fusible plug device; and frangible disk device</i> added (03-1385)
182	TR-500	First paragraph and subpara. (a) revised (14-341)
184	TR-560	Subparagraphs (a)(1) and (a)(2) revised (14-341)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
188	Article TS-2	(1) In TS-200 , last line revised (14-341) (2) TS-200.1 through TS-200.6 revised in their entirety (14-341)
203	1-1.4(b)	Last paragraph revised (10-1429)
207	Table 1-1.4	Deleted (10-1429)
207	Table 1-1.4M	Deleted (10-1429)
225	1-4.3	Subparagraph (d) revised (13-262)
233	3-1.4	Subparagraphs (e) and (f) revised (13-262)
244	I-1	In first paragraph, first sentence revised (14-341)
291	Table XIX-1	Column heads added editorially
295	C-1	Subparagraph (a) revised (10-1754)
296	Table C-1	Items (56) and (58) deleted and former item (57) renumbered as (56) and revised (10-1754, 11-328)
300	Form T-1A	Last line of "Certificate of Shop Inspection" revised (10-1754)
301	Form T-1B	Last line of "Certificate of Shop Inspection" revised (10-1754)
302	Form T-1C	Last line of "Certificate of Shop Inspection" revised (10-1754)
303	Form T-2A	Last line of "Certificate of Shop Inspection" revised (10-1754)
304	Form T-2B	Last line of "Certificate of Shop Inspection" revised (10-1754)
305	Form T-2C	Last line of "Certificate of Shop Inspection" revised (10-1754)
306	Form T-3A	Last line revised (10-1754)
307	Form T-3B	Last line revised (10-1754)
308	Form T-3C	Last line revised (10-1754)
312	Nonmandatory Appendix D	Table editorially reformatted to reflect changes made to Figure D-1
313	Figure D-1	Updated by ASME Conformity Assessment
325	Nonmandatory Appendix H	Title revised (15-923)
325	H-1	Last sentence revised (15-923)
330	Nonmandatory Appendix J	Revised in its entirety (14-903)
338	Nonmandatory Appendix K	Added (05-630)

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
03-1385	Updated definition for <i>assembler, breaking pin, breaking pin device, breaking pin housing, gas, manufacturing design range, nonreclosing pressure relief device, pressure relief valve (PRV), rupture disk, rupture disk device, set pressure, and specified disk temperature (supplied to the rupture disk manufacturer)</i> . Added definitions for <i>coincident temperature, competent authority (CA), fusible plug device, and frangible disk device</i> .
05-630	Added Nonmandatory Appendix K.
10-1429	Revised 1-1.4(b) on minimum thickness requirements and deleted Figures 1-1.4 and 1-1.4M.
10-1608	Updated the following references listed in Table TG-130: ASME B16.1, ASME B16.5, ASME B16.11, ASME B16.15, ASME B16.24, ASME B16.42, and ASME B16.47. Added ASME PCC-2.
10-1754	Revised Forms T-1A, T-1B, T-1C, T-2A, T-2B, T-2C, T-3A, T-3B, and T-3C, and Table C-1 to reflect the simplified Authorized Inspector documentation requirements.
11-328	Revised Forms T-1A, T-2A, and T-2C, and Table C-1.
11-871	Added TE-110.2(c) and revised the reference to Section V in TE-110.2(a)(2).
13-262	Revised 1-4.3(d) to be consistent with 3-1.4(f). Revised temperature in 3-1.4(e). Added 1-4.3(e) to be consistent with the revised 3-1.4(e).
13-2222	Revised the front guidance on interpretations in its entirety.
14-341	Revised TG-130.1, TG-320, TG-410, TR-500, TR-560, Article TS-2, and I-1.
14-903	Added TM-250.1(b). Revised TM-250.1(c) and (d), TM-250.3, TM-250.6(b) and (d), TM-250.8(b), and Nonmandatory Appendix J.
15-923	Revised Nonmandatory Appendix H heading and H-1 text.
16-558	Revised TG-110.2(a) to read "Internal pressure shall be in the range from full vacuum to 207 bar (3,000 psig)."

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).

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PART TG

GENERAL REQUIREMENTS

ARTICLE TG-1

SCOPE AND JURISDICTION

TG-100 INTRODUCTION

TG-100.1 INTENT

The rules of this Section constitute requirements for construction and continued service of pressure vessels for the transportation of dangerous goods via highway, rail, air, or water. *Construction* is an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and over-pressure protection. *Continued service* is an all-inclusive term referring to inspection, testing, repair, alteration, and recertification of a transport tank that has been in service. The term *pressure vessel* refers to the pressure boundary defined by the geometric scope of this Section and includes, but is not limited to, the shell, heads, and openings. The term *tank* refers to the pressure vessel, appurtenances, and additional components that are covered by the Modal Appendices (see TG-220.1).

The general requirements given in Part TG shall be met for all vessels within the scope of this Section. In addition, all the applicable requirements of Modal Appendices, which address unique service conditions of the vessel, shall be met.

TG-100.2 APPLICABILITY

(a) The rules of this Section apply specifically to pressure vessels intended for transporting dangerous goods (see Mandatory Appendix III) with design pressures appropriate for the transportation mode and volumes greater than 450 L (120 gal).

(b) Pressures normally incident to transportation, including loading and unloading operations, are to be considered.

(c) This Section does not contain rules to cover all details of design and construction, and those aspects that are not addressed shall not be considered prohibited. Where complete details are not given, the Manufacturer, subject to the acceptance of the Inspector, shall provide details of design and construction that will be as safe as those provided by the rules of this Section. In the case

of Class 3 vessels, the Design Certifying Engineer shall perform this function. (For definition of *Inspector*, see TG-410.)

TG-100.3 LAWS OR REGULATIONS

The laws or regulations issued by the competent authority covering the construction and continued service of pressure vessels intended for transporting dangerous goods shall be reviewed to determine if the requirements are more restrictive than the rules of this Section. Applicable laws and regulations may contain additional requirements for pressure vessels used in the transportation of dangerous goods, which are not addressed in this Section, such as Code of Federal Regulation, Title 49, Parts 100 through 185, Transportation.

TG-110 SCOPE

TG-110.1 GEOMETRIC SCOPE OF THE PRESSURE VESSEL

(a) The geometric scope of this Section shall, as a minimum, include the pressure-containing parts of pressure vessels up to and including the following:

- (1) the first threaded joint for threaded connections.
- (2) the face of the first flange for flanged connections.
- (3) the first sealing surface for proprietary connections or fittings for which rules are not provided in this Section.
- (4) the welding end connection for the first circumferential joint for welded connections to attached piping, valves, and instruments, etc.
- (5) the welding pad for attachment of any external nonpressure attachments such as shipping frames, and handling points, etc. Parts welded to these pads need not comply with (b).

(6) pressure-retaining permanent covers and closures, including seals, bolting, and other mechanical retainers at openings.