

SECTION XIII

2021

ASME Boiler and
Pressure Vessel Code
An International Code

**Rules for Overpressure
Protection**

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AN INTERNATIONAL CODE

2021 ASME Boiler & Pressure Vessel Code

2021 Edition

July 1, 2021

XIII **RULES FOR OVERPRESSURE PROTECTION**

**ASME Boiler and Pressure Vessel Committee
on Overpressure Protection**



**The American Society of
Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

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TABLE OF CONTENTS

List of Sections		vii
Foreword		x
Statement of Policy on the Use of the ASME Single Certification Mark and Code Authorization in Advertising		xi
Statement of Policy on the Use of ASME Marking to Identify Manufactured Items		xii
Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees		xiii
Personnel		xvi
Cross-Referencing and Stylistic Changes in the Boiler and Pressure Vessel Code		xxxvii
Part 1	General Requirements	1
1.1	Scope	1
1.2	Organization	1
1.3	Definitions	2
1.4	Standards Referenced by This Section	2
1.5	Units of Measure	2
1.6	Tolerances	3
Part 2	Protection Against Overpressure	4
2.1	General	4
2.2	Responsibilities	4
2.3	Set Pressure	4
2.4	Overpressure	4
Part 3	Requirements for Pressure Relief Valves	7
3.1	General	7
3.2	Design and Mechanical Requirements	7
3.3	Material Requirements	9
3.4	Inspection of Manufacturing and/or Assembly	9
3.5	Assembler Requirements	11
3.6	Production Testing	11
3.7	Welding, Brazing, Heat Treatment, and Nondestructive Examination . .	14
3.8	Set Pressure Change	14
3.9	Marking	14
Part 4	Requirements for Rupture Disk Devices	16
4.1	General	16
4.2	Design and Mechanical Requirements	17
4.3	Material Requirements	17
4.4	Inspection of Manufacturing	17
4.5	Production Testing	18
4.6	Welding, Brazing, Heat Treatment, and Nondestructive Examination . .	19
4.7	Marking	19

Part 5	Requirements for Pin Devices	20
5.1	General	20
5.2	Design and Mechanical Requirements	20
5.3	Material Requirements	21
5.4	Inspection of Manufacturing	21
5.5	Production Testing	22
5.6	Welding, Brazing, Heat Treatment, and Nondestructive Examination	24
5.7	Marking	24
Part 6	Requirements for Spring-Actuated Non-Reclosing Devices	25
6.1	General	25
6.2	Design and Mechanical Requirements	25
6.3	Material Requirements	25
6.4	Inspection of Manufacturing and/or Assembly	25
6.5	Production Testing	25
6.6	Welding, Brazing, Heat Treatment, and Nondestructive Examination	25
6.7	Marking	25
Part 7	Requirements for Temperature and Pressure Relief Valves	26
7.1	General	26
7.2	Design and Mechanical Requirements	26
7.3	Material Requirements	26
7.4	Inspection of Manufacturing and/or Assembly	26
7.5	Production Testing	26
7.6	Welding	26
7.7	Marking	26
7.8	Certification of Capacity	26
Part 8	Requirements for Devices in Combination	27
8.1	General	27
8.2	Rupture Disk Device Installed Between a Pressure Relief Valve and the Pressurized Equipment	27
8.3	Rupture Disk Device Installed on the Outlet Side of a Pressure Relief Valve	27
8.4	Pin Device Installed Between a Pressure Relief Valve and the Pressurized Equipment	28
8.5	Marking	28
Part 9	Capacity and Flow Resistance Certification	30
9.1	General	30
9.2	Requirements for Pressure Relief Valves	30
9.3	Requirements for Non-Reclosing Pressure Relief Devices	31
9.4	Requirements for Spring-Actuated Non-Reclosing Pressure Relief Devices	31
9.5	Requirements for Pressure Relief Valves in Combination With Non-Reclosing Pressure Relief Devices	31
9.6	Optional Testing of Non-Reclosing Pressure Relief Devices and Pressure Relief Valves	32
9.7	Certification Methods	32
9.8	Alternative Methods for Valves and Pin Devices Exceeding the Laboratory Capabilities	38
9.9	Capacity Certification of NV-Designated Pressure Relief Valves	38

Part 10	Authorization to Use the ASME Certification Mark	43
10.1	Certification Mark	43
10.2	Certificates of Authorization	43
10.3	Designated Oversight	43
10.4	Quality Management System	43
10.5	Evaluation of the Quality Management System	43
10.6	Certified Individual (CI)	44
10.7	Certificate of Conformance	44
Part 11	Requirements for Open Flow Paths or Vents	45
11.1	Applicability	45
Part 12	Installation	46
12.1	Applicability	46
12.2	General	46
12.3	Location	46
12.4	Rupture Disk Installation	46
12.5	Inlet Piping	46
12.6	Mounting of Two or More Required Devices	46
12.7	Orientation of Pressure Relief Valves	47
12.8	Discharge Piping	47
12.9	Stop Valves	47
Part 13	Rules for Overpressure Protection by System Design	48
13.1	General	48
13.2	Pressurized Equipment for Which the Pressure Is Self-Limiting	48
13.3	Pressurized Equipment for Which the Pressure Is Not Self-Limiting	48
Mandatory Appendix I	Definitions	50
I-1	Introduction	50
I-2	Definitions of Terms	50
Mandatory Appendix II	Adhesive Attachment of Nameplates	56
II-1	Scope	56
II-2	Nameplate Application Procedure Qualification	48
II-3	References	56
Mandatory Appendix III	Quality Control System	57
III-1	General	57
III-2	Outline of Features Included in the Quality Control System	57
Mandatory Appendix IV	Capacity Conversion	59
IV-1	Introduction	59
IV-2	Equations for Determining Capacity	60
IV-3	Capacity Conversion Examples	61
IV-4	Equations for Conversion (Incompressible Fluids)	63
Nonmandatory Appendix A	Guidance for the Use of U.S. Customary and SI Units in the ASME Boiler and Pressure Vessel Code	65
A-1	Use of Units in Equations	65
A-2	Guidelines Used to Develop SI Equivalents	65
A-3	Soft Conversion Factors	67
Nonmandatory Appendix B	Stop Valves Used in Pressure Relief Systems	68

B-1	Introduction	68
B-2	Stop Valves Located in the Relief Path	68
B-3	Definitions	68
B-4	Responsibilities	69
B-5	Procedures and Management Systems	69
B-6	Stop Valves in Systems With Pressure From an Outside Source	69
B-7	Stop Valves Upstream or Downstream of the Pressure Relief Device	69
B-8	Stop Valves in the Pressure Relief Paths Handling Process Flow	69
B-9	Stop Valves in the Relief Paths Where Fire Is Source of Overpressure	70
Nonmandatory Appendix C	Guide to Manufacturer's and Assembler's Certificates of Conformance for Pressure Relief Devices	71
C-1	Introduction	71
C-2	Certificate of Conformance Forms	71
Figures		
9.9.1.2-1	Values of F for Nonchoking Flow	40
10.1-1	ASME Certification Mark With Designator	44
I-2-1	Typical Curtain Areas of Pressure Relief Devices	51
IV-1-1M	Constant, C , for Gas or Vapor Related to Ratio of Specific Heats ($k = c_p/c_v$)	59
IV-1-1	Constant, C , for Gas or Vapor Related to Ratio of Specific Heats ($k = c_p/c_v$)	60
IV-2-1M	Flow Capacity Curve for Rating Nozzle-Type Pressure Relief Devices on Saturated Water (Based on 10% Overpressure)	62
IV-2-1	Flow Capacity Curve for Rating Nozzle-Type Pressure Relief Devices on Saturated Water (Based on 10% Overpressure)	62
Tables		
1.4-1	Year of Acceptable Edition of Referenced Standards in This Section	2
2.1-1	Permitted Pressure Relief Devices or Methods by ASME BPVC Section	5
3.4.2.3-1	Maximum Blowdown for Sample Valves During Testing	10
3.6.3.1-1	Test Fluid for Set Pressure Tests	13
3.6.3.1-2	Set Pressure Tolerances for Pressure Relief Valves	13
9.7.2-1	Test Pressure for Certification Tests	33
IV-3-1	Molecular Weights of Gases and Vapors	62
C-1-1	Summary of Certificate of Conformance Forms	71
C-2-1	Guide for the Preparation of Manufacturer's Certificate of Conformance Form HV-1	73
C-2-2	Supplementary Instructions for the Preparation of Manufacturer's or Assembler's Certificate of Conformance Forms UV-1 and UD-1	76
C-2-3	Supplementary Instructions for the Preparation of Manufacturer's or Assembler's Certificate of Conformance Form K-4	78
C-2-4	Supplementary Instructions for the Preparation of Manufacturer's Certificate of Conformance Form K-5	80
C-2-5	Supplementary Instructions for the Preparation of Manufacturer's or Assembler's Certificate of Conformance Forms TV-1 and TD-1	83
Forms		
HV-1	Manufacturer's Certificate of Conformance for Pressure Relief Valves	72

UV-1	Manufacturer's or Assembler's Certificate of Conformance for Pressure Relief Valves	74
UD-1	Manufacturer's Certificate of Conformance for Nonreclosing Pressure Relief Devices	75
K-4	Manufacturer's or Assembler's Certificate of Conformance for Pressure Relief Valves	77
K-5	Manufacturer's Certificate of Conformance for Rupture Disk Devices . .	79
TV-1	Manufacturer's or Assembler's Certificate of Conformance for Pressure Relief Valves	81
TD-1	Manufacturer's Certificate of Conformance for Nonreclosing Pressure Relief Devices	82

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LIST OF SECTIONS

SECTIONS

- I Rules for Construction of Power Boilers
- II Materials
 - Part A — Ferrous Material Specifications
 - Part B — Nonferrous Material Specifications
 - Part C — Specifications for Welding Rods, Electrodes, and Filler Metals
 - Part D — Properties (Customary)
 - Part D — Properties (Metric)
- III Rules for Construction of Nuclear Facility Components
 - Subsection NCA — General Requirements for Division 1 and Division 2
 - Appendices
 - Division 1
 - Subsection NB — Class 1 Components
 - Subsection NCD — Class 2 and Class 3 Components*
 - Subsection NE — Class MC Components
 - Subsection NF — Supports
 - Subsection NG — Core Support Structures
 - Division 2 — Code for Concrete Containments
 - Division 3 — Containment Systems for Transportation and Storage of Spent Nuclear Fuel and High-Level Radioactive Material
 - Division 5 — High Temperature Reactors
- IV Rules for Construction of Heating Boilers
- V Nondestructive Examination
- VI Recommended Rules for the Care and Operation of Heating Boilers
- VII Recommended Guidelines for the Care of Power Boilers
- VIII Rules for Construction of Pressure Vessels
 - Division 1
 - Division 2 — Alternative Rules
 - Division 3 — Alternative Rules for Construction of High Pressure Vessels
- IX Welding, Brazing, and Fitting Qualifications
- X Fiber-Reinforced Plastic Pressure Vessels
- XI Rules for In-service Inspection of Nuclear Power Plant Components
 - Division 1 — Rules for Inspection and Testing of Components of Light-Water-Cooled Plants
 - Division 2 — Requirements for Reliability and Integrity Management (RIM) Programs for Nuclear Power Plants
- XII Rules for Construction and Continued Service of Transport Tanks
- XIII Rules for Overpressure Protection

* 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*

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 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 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 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.

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.

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>.

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January 1, 2021

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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 1

GENERAL REQUIREMENTS

1.1 SCOPE

(a) The rules of this Section provide the requirements for the overpressure protection of pressurized equipment such as boilers, pressure vessels, and piping systems. Overpressure protection methods include

(1) releasing excess pressure by use of pressure relief devices

(2) applying controls to prevent an increase in pressure (overpressure protection by system design)

(3) using a combination of (1) and (2)

(b) The referencing Code or Standard specifies the objectives of the overpressure protection and acceptable methods to achieve it. Where a pressure-releasing overpressure protection method is specified, the referencing Code or Standard identifies the permissible devices based on this Section's rules for devices to be marked with the Certification Mark and appropriate Designator (e.g., HV, UV, UD).

(c) This Section includes

(1) requirements relating to pressure integrity and performance governing the construction and installation of pressure relief devices. Construction requirements include materials, design, manufacture, examination, inspection, production testing, and certification. Installation requirements address only the variables that affect the performance and pressure-relieving function of the devices, including the inlet and outlet piping.

(2) requirements for conducting tests and analyses to determine the performance of pressure relief devices. These include rules for device-type certification of relieving capacity and/or flow resistance and production testing for new pressure relief devices.

(3) requirements for the use of overpressure protection by system design.

(4) Mandatory Appendices that address specific subjects not covered elsewhere in this Section.

(5) Nonmandatory Appendices that provide information and suggested best practices.

(d) This Section contains requirements, specific prohibitions, and nonmandatory guidance for the design, materials, manufacture, examination, inspection, testing, assembly, installation, and certification of pressure relief devices. The Code does not address all aspects of overpressure protection, and those aspects that are not specifically addressed should not be considered prohibited. In these situations, engineering judgment shall be

applied in a manner consistent with the philosophy of this Section, and such judgments shall never be used to overrule mandatory requirements or specific prohibitions of this Section or the referencing Code or Standard.

(e) The scope of this Section has been established to identify the devices and methods considered in formulating the rules given in this Section. 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 their jurisdiction.

(f) In relation to the geometry of pressure-containing and pressure-retaining parts of a device, the scope of this Section shall begin at the inlet connection of the device and end at the outlet connection of the device. The inlet and outlet connections are defined as

(1) the first circumferential joint for welded connections, excluding the connecting weld

(2) the first threaded joint for screwed connections

(3) the face of the flange for bolted, flanged connections, excluding the bolting

(4) the first sealing surface for proprietary connections or fittings

1.2 ORGANIZATION

(a) This Section is divided into 13 Parts.

(1) **Part 1** contains the scope and general requirements of this Section.

(2) **Part 2** contains the responsibilities for providing overpressure protection.

(3) **Part 3** contains requirements for the design, materials, inspection, testing, welding, and marking of pressure relief valves.

(4) **Part 4** contains requirements for the design, materials, inspection, testing, welding, and marking of rupture disk devices.

(5) **Part 5** contains requirements for the design, materials, inspection, testing, welding, and marking of pin devices.

(6) **Part 6** contains requirements for the design, materials, inspection, testing, welding, and marking of spring-actuated non-reclosing devices.

(7) **Part 7** contains requirements for the design, materials, inspection, testing, welding, and marking of temperature and pressure relief valves.