

Summary of Significant Changes in the

2021 ASME Boiler and Pressure Vessel Code

Section IV
Section II
Section V
Section IX

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Summary of Significant Changes in the 2021 ASME Boiler and Pressure Vessel Code

Sections IV, II, V, and IX

The American Society of Mechanical Engineers
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FOREWORD

This book is a companion to the 2021 ASME Boiler and Pressure Vessel Code (BPVC). It explains only significant changes to Code requirements that have been approved since 2019 and that will be published in the 2021 Edition. It covers the following ASME BPVC Sections:

- Section IV
- Section II, Parts A, B, C, and D
- Section V
- Section IX

For each of the above Sections, an Introduction describes the historical background, scope of coverage, and commercial application of that Section by industry and government organizations. The list of changes follows the Introduction. The "Explanation" for each change provides the reason for the action and the value to the Code user. The sequence of the changes follows the order of the Code requirements.

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- Carlton R. Ramcharran, *S&C Project Engineering Advisor*, Sections IV and V
- Colleen E. Rodrigues, *S&C Project Engineering Manager*, Section II, Parts A, B, and D
- Erika Lawson, *S&C Project Engineer*, Section II, Part C; and Section IX

ASME Press's *Online Companion Guide to the ASME Boiler and Pressure Vessel Codes: Criteria and Commentary on Select Aspects of the Boiler & Pressure Vessel and Piping Codes* (January 2020) provided source material for the Introduction preceding each list of changes. The complete Guide is available in the ASME Digital Collection at https://asmedigitalcollection.asme.org/ebooks/pages/onlinecompanionguide.

ASME gratefully acknowledges the members of the following volunteer committees, who are responsible for development of the ASME Boiler and Pressure Vessel Code Sections noted in this book:
- BPV Committee on Heating Boilers (IV)
- BPV Committee on Materials (II)
- BPV Committee on Nondestructive Examination (V)
- BPV Committee on Welding, Brazing, and Fusing (IX)

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SECTION IV

Introduction

Section IV of the ASME Boiler and Pressure Vessel Code (BPVC) provides requirements for the design, fabrication, installation, and inspection of steam heating, hot water heating, and hot water supply boilers that are directly fired with oil, gas, electricity, coal, or other solid or liquid fuels, and for operation of these boilers at or below the pressure and temperature limits set forth in Section IV. Similar requirements for potable water heaters are also included. Section IV is divided into five Parts. Part HG covers general requirements for all materials and construction. Part HF covers requirements for boilers constructed of wrought materials. It is divided into two Subparts: Subpart HW contains requirements for boilers fabricated by welding, and Subpart HB contains requirements for boilers fabricated by brazing. Part HC contains requirements for boilers constructed of cast iron. Part HA contains requirements for boilers constructed of cast aluminum. Finally, Part HLW contains requirements for potable water heaters.

Section IV also includes Mandatory Appendices, which contain specific requirements that are not covered elsewhere in that Code, and Nonmandatory Appendices, which provide information and suggested good practices.

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Significant Changes

Location: HG-300 Through HG-800; HB-1510; Part HLW, Articles 1, 6, and 9; and Mandatory Appendices 5, 8, 9, and 10
Subject: Use of "Stamp" in Reference to the Nameplate or the Certification Mark
Explanation: Multiple paragraphs have been revised to replace the words "stamp," "stamped," and "stamping" with, respectively, "mark," "marked," and "marking" in reference to the marking of the nameplate or the application of the Certification Mark.

Location: HG-301.1
Subject: Definition of E
Explanation: The definition of E has been revised to clarify the joint efficiency for welded pipe and tubing.

Location: HG-312
Subject: Design Temperature of Plain Furnaces
Explanation: The requirement for design temperature of plain furnaces has been revised in HG-312.1(b) for consistency with Section I. The arbitrary design temperature for plain furnaces was removed in the 1997 Addenda of Section I and replaced with a design temperature not less than the mean expected wall temperature. In the 2011 Edition of Section I, the design temperature requirement was moved to PG-28.1.1. The revision to HG-312.1(b) makes the paragraph consistent not only with Section I but also with HLW-300(d), which covers cylindrical components under external pressure.

Location: Table HG-321
Subject: Axis Ratio
Explanation: In the equivalent spherical radius equation in Table HG-321, "$D/2h$" has been revised to "$D/2d$." The Table notes define the variable d, not the variable h.

Location: Part HG, Articles 4 and 4A; and HLW-800
Subject: Adoption of 2021 Edition of Section XIII, Rules for Overpressure Protection
Explanation: Section IV has adopted the new ASME BPVC Section XIII, Rules for Overpressure Protection. This new Section consolidates and standardizes pressure relief device requirements for all ASME BPVC Sections. To ensure a smooth transition, modifications to Section IV have been issued concurrently with the issuance of Section XIII. These changes include the transfer of pressure relief device requirements from Section IV to Section XIII and the restructuring of the remaining overpressure protection requirements within the new Article 4A.

Location: HG-530.1 and HLW-602.3
Subject: Marking of Boilers and Water Heaters
Explanation: Paragraphs HG-530.1(b) and HLW-602.3 have been revised to incorporate dot peening and engraving as methods for applying markings to nameplates on boilers and water heaters. This revision results from interpretations 18-437 and 18-438. Additionally, this revision adds to Part HLW the same precautions and prerequisites for applying these markings as are found in Part HG.

Location: HG-531 and HLW-602.4
Subject: Incorporation of Code Cases 2962 and 2972
Explanation: Paragraphs have been added to HG-531 and HLW-602.4 to allow alternative marking of small parts. These revisions are based on Section I, PG-106.8.2.

Location: HG-701.6

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Subject: Minimum Pressure and Temperature Requirements
Explanation: Paragraphs HG-701.6(c) and HG-701.6(d) have been added to require minimum pressure and temperature ratings of safety and safety relief valve discharge piping.

Location: Part HG, Article 8
Subject: Modular Boiler Requirements
Explanation: Modular boiler requirements have been consolidated into a single location, the new Article 8. The affected requirements have also been revised to resolve some jurisdictional questions and concerns. Previously, these requirements were scattered throughout Section IV, in HG-330.6, HG-530.3, HG-607, HG-615, HG-710.4, HG-716, and Nonmandatory Appendix E. The varied locations made it difficult for new users to understand the requirements for modular boilers.

Location: HF-207
Subject: Added Reference to Section II, Part D, Nonmandatory Appendix A, A-300
Explanation: During the incorporation of Code Case 2656 into Section IV, some limitations in the provisions of the Code Case were not included. Paragraph HF-207 has been revised to reference Section II, Part D, Nonmandatory Appendix A, A-300 for detailed guidance and recommendations for uniform corrosion.

Location: Tables HF-300.1 (HF-300.1M), HF-300.2 (HF-300.2M), HLW-300, and HLW-301
Subject: Removal of Allowable Stress Tables From Section IV
Explanation: The allowable stress tables have been removed from Section IV. Related cross-references in HG-301.2(f), HF-201(b)(1), and Table 4-1 have been revised to reference Section II, Part D. The allowable stress tables from Section IV were added to Section II in the 2019 Edition. A separate revision has made the Section IV allowable stress tables in Section II mandatory.

Location: HW-713 and Table HW-713
Subject: Smaller Tube Extensions for Firetubes Attached to Tubesheets by Laser Beam Welding
Explanation: Paragraph HW-713 and Table HW-713 have been revised to allow smaller tube extensions for firetubes attached to tubesheets by laser beam welding (LBW). Boiler Manufacturers use LBW to attach firetubes with tubesheets in their constructions. LBW is a highly accurate, automatic welding technique that produces high-quality welds more effectively and more reliably than manual welding. It is used to join pieces of metal through the use of a laser. The beam provides a concentrated heat source, allowing for narrow, deep welds and high welding rates. Due to the applied technology, LBW requires proper welding preparation, which includes very small gaps between the tube and the tubesheet, and almost no tube extension beyond the surface of the tubesheet. The previous requirements in Table HW-713 required that in the case of tubesheets where tube holes are not beveled or recessed, the firetubes extend at least the thickness of the tube. In most cases, that extension would be too much for LBW. This revision allows smaller tube extension for firetubes attached by LBW, thereby enabling Manufacturers to use LBW properly in their shops.

Location: HA-407
Subject: Hydrostatic Testing of Assembled Boilers
Explanation: In HA-407, the term “boiler sections” has been revised to “boilers” to correct inconsistent wording. The opening paragraph of HA-407 references HA-406.1(c), which uses the term “assembled boiler.” The revision clarifies the intent of HA-407, which addresses the hydrostatic test of the assembled boiler.

Location: HLW-201
Subject: Materials SA-414 and SA-513
Explanation: Paragraphs HLW-201(a)(1) and HLW-201(a)(2), which limited the use of SA-414, Grade G, and SA-513, Grades 1008, 1010, and 1015, to glass-lined parts, have been deleted. Neither of these limitations were ever intended by the Code; they originated from errata and inexact wording in previous Editions.

Location: Table HLW-301, Note (3), and HLW-602.5
Subject: Incorporation of Code Case 2656
Explanation: Table HLW-301, Note (3) has been revised to reference the precautionary instructions in HF-207. This cross-reference replaces the previously stated restriction that water heaters using austenitic stainless steel be operated only on deionized water. HLW-602.5, which restated the limitations on the use of austenitic stainless steel, has been

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deleted. Limiting the use of austenitic stainless steel to deionized water only is not necessary if appropriate precautions are taken as outlined in HF-207 and as allowed by Code Case 2656.

Location: HLW-801.3
Subject: Use of Y-Bases
Explanation: Paragraph HLW-801.3 has been revised to explicitly prohibit the use of Y-bases with temperature and pressure safety relief valves. HG-701.7 appears to indicate that Y-bases are not to be used with temperature and pressure safety relief valves; however, HG-100 indicates that Part HG does not apply to Part HLW. This revision clarifies that the prohibition on the use of Y-bases with temperature and pressure safety relief valves applies in Part HLW.

Location: HLW-810
Subject: Incorporation of Code Case 2852
Explanation: Paragraph HLW-810(c) has been added to incorporate the requirements of Code Case 2852. This revision allows the bottom drain valve of a water heater to be installed in the bottom of the storage tank when the heater is installed above and connected to the storage tank.

Location: Mandatory Appendix 2, Table 2-100
Subject: Update of References
Explanation: ASME B16.3, ASME B16.4, ASME B16.14, ASME B16.21, ASME B39.19M, and ASTM 126 have been added to Table 2-100.

Location: Mandatory Appendix 3, 3-100
Subject: Adhesive Nameplates
Explanation: Paragraph 3-100 has been revised to standardize the wording of the adhesive nameplate requirements and to clarify the intent of the requirements. This revision is part of a project to standardize the adhesive nameplate requirements throughout all applicable ASME BPVC Sections.

Location: Mandatory Appendix 4, Forms H-5 and HA-5
Subject: Certified Individual
Explanation: In Forms H-5 and HA-5, the term “Witness of test(s)” has been replaced with “Certified Individual” for consistency with HC-403, HC-502.12.2, HA-404, and HA-505.12.2.

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SECTION II

Introduction

Section II, Materials, is a "service section" of the ASME Boiler and Pressure Vessel Code (BPVC). This Section provides specifications for ferrous and nonferrous materials, and for welding rods, electrodes, and filler metals. It also provides material properties, including allowable, design, tensile, and yield stress values; physical properties; and external pressure charts and tables. Section II is divided into four parts, as follows:

- Part A — Ferrous Material Specifications
- Part B — Nonferrous Material Specifications
- Part C — Specifications for Welding Rods, Electrodes, and Filler Metals
- Part D — Properties

(a) Part A and Part B contain material specifications published by ASTM International, Inc., and other national and international developers. These specifications have been modified as necessary for use in ASME BPVC construction. These specifications are designated with an "S" added to the beginning of the other organization's specification designation (e.g., ASTM A105 becomes ASME SA-105). These specifications contain requirements for chemical and mechanical properties, heat treatment, manufacture, heat and product analyses, and methods of testing. Note that all materials contained within a specification adopted by ASME and included in Parts A and B are not necessarily permitted for use in ASME BPVC construction. This Summary of Significant Changes describes only significant specification changes affecting materials permitted by the ASME BPVC. It does not include specification changes affecting materials not permitted by ASME BPVC.

(b) Part C contains material specifications, most of which are identical to corresponding specifications published by AWS and other recognized national or international organizations. All adopted specifications are either reproduced in Part C, where permission to do so has been obtained from the originating organization, or so referenced and information about how to obtain them from the originating organization is provided. The ASME BPV Committee on Welding, Brazing, and Fusing (Section IX) reviews all material specifications submitted to it and, if the Committee feels a specification needs to be adapted for ASME BPVC purposes, they revise it accordingly. However, ASME, AWS, and other originating organizations communicate regularly in an effort to maintain identical specifications.

(c) Part D primarily comprises tables providing stress and property data for materials permitted for use in ASME BPVC construction. These tables contain allowable stresses; design stress intensities; mechanical properties, including tensile strength and yield strength; and physical properties, including thermal expansion, thermal conductivity and diffusivity, moduli of elasticity, and Poisson's ratio. In addition to these tables, Part D provides charts and tables for determining shell thickness of components under external pressure.

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