



KEY CHANGES TO 2021 ASME BOILER CODE EDITIONS (BY SECTION)

SECTION I – RULES FOR CONSTRUCTION OF POWER BOILERS

- Revised Figure PG-33.2 sketch (c) to depict d as the OD of the nozzle, in addition to reinstating Figure PW-16.1(Z) sketches as a new sketch (j).
- Revised Figures PG-58.2-1 and PG-58.2-6 by deleting the flow arrow for miscellaneous piping connections, in addition to replacing “Chemical Feed” and “Drum Sampling” references with “Water Treatment”.
- Revised PG-58.3.1 to further clarify the limits of BEP for a single installation.
- Revised PW-39.1 to add reference to Table PW-39.2, addressing temperature ranges for dissimilar and similar weld joints.

SECTION II - MATERIALS

- The range of acceptable ASTM editions has been updated for several specifications.
- The Guideline on the Approval of New Materials Under the ASME Boiler and Pressure Vessel Code has been updated.

Section II – Materials, Part A, Ferrous Material Specifications

- Updates to the latest adopted edition have been made to over 15 specifications.
- Two new specifications have been added:
 - SA-988/SA-988M
 - SA-989/SA-989M
- One specification has been removed, SA/NFA 36-215.

Section II – Materials, Part B, Nonferrous Material Specifications

- Updates to the latest adopted edition have been made to over 45 specifications.
- Two new specifications have been added:
 - SB-752/SB-752M
 - SB-834
- One specification has been removed, SB-858.

Section II – Materials, Part C, Specifications for Welding Rods, Electrodes, and Filler Metals

- Six AWS specifications for arc welding electrodes, gas welding rods and other filler metals adopted or updated into the 2021 edition and one removed:
 - AWS A5.01M/A5.01:2019 “Welding and Brazing Consumables - Procurement of Filler Materials and Fluxes” as SFA-5.01M/SFA-5.01

- AWS A5.17/A5.17M:2019 “Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding” as SFA-5.17/SFA-5.17M
- AWS A5.26/A5.26M:2020 “Specification for Carbon and Low-Alloy Steel Electrodes for Electrode Gas Welding” as SFA-5.26/SFA-5.26M
- AWS A5.28/A5.28M:2020 “Specification for Low-Alloy Steel Electrodes and Rods for Gas Shielded Arc Welding” as SFA-5.28/SFA-5.28M
- AWS A5.34/A5.34M:2018 “Specification for Nickel-Alloy Flux Cored and Metal Cored Welding Electrodes” as SFA-5.34/SFA-5.34M
- AWS A5.39/A5.39M:2020 “Specification for Flux and Electrode Combinations for Submerged Arc and Electroslag Joining and Surfacing of Stainless Steel and Nickel Alloys” as SFA-5.39/SFA-5.39M
- Removed SFA-5.36/SFA-5.36M, since AWS and ANSI have withdrawn A5.36/A5.36M

Section II – Materials, Part D, Properties (Customary, Metric)

- Existing stress lines for Grade 91 have been designated as “Type 1” and new lines have been added for Grade 91 “Type 2” with higher allowable stresses.
- Tables 6A through 6D containing allowable stresses for ASME BPVC Section IV have been made mandatory.
- Incorporated Code Cases 2445-2, 2543, and 2603-1.
- Additions and revisions to stress tables and mechanical property tables have been made to support updated specifications.

SECTION III – RULES FOR CONSTRUCTION OF NUCLEAR FACILITY COMPONENTS

Section III, Subsection NCA, General Requirements for Division 1 and 2

- NCA-1111 revised to include the scope of Division 5 and to provide a reference to Subsection HA to direct the user to general requirements for high temperature reactors.
- NCA-3461, NCA-3561, NCA-3661, NCA-3684 and NCA-3785 revised to provide consistency and clarification regarding N type Certificate Holders responsibilities.
- NCA-3862.2 revised to add requirements for N-type certification of materials.

Section III, Division 1, Subsection NB, Class 1 Components

- NB-3324 revised to add an additional thickness formula for nonspherical heads in Class 1 construction.
- NB-3500 revised to define requirements for safety relief devices.

Section III, Division 1, Subsection NCD, Class 2 and 3 Components

- Subsections NC and ND consolidated into one Subsection NCD. The new Subsection NCD contains the requirements for both Class 1 and Class 2 components.
- NCD-3531.1 and NCD-3593.1 revised to add design and test requirements to address Pilot Operated Relief Valves (PORVs) and Pressure Actuated Relief Valves (PARVs).
- Table NCD-4622.7(b)-1 revised to add rows for socket welds for P-No. 3, P-No. 9A Gr. 1, and P-No. 9B Gr. 1.

- General note: The rest of Section III was editorially revised to now refer to NCD rather than the individual subsections.

Section III, Division 1, Subsection NE, Class MC Components

- Figure NE-2575.2-1 revised to add General Note C to clarify that the sketch shown is typical but is to be used as guide for minimum required coverage of other configurations.
- Deleted NE-3228.1(a).
- NE-4211 revised to align NB/NC/ND/WB/WC/WD-4211.
- NE-6111 revised to clarify that “non-welded access opening covers” are exempted from pressure testing.

Section III, Division 1, Subsection NF, Supports

- Various revisions made to Subsection NF and Appendix F to reflect appropriate stress limit conditions identified in the NRC Regulatory Guide 1.130.
- NF-3322 revised to be consistent with AISC 360-16 and to align with current industry guidance for pin-connected members.
- Two new figures added to provide clarity in application of the dimensional limitations described in the text.
- NF-3223.5 added to provide additional specificity as to how to determine the critical buckling stress of NF Plate and Shell designs.

Section III, Division 1, Subsection NG, Core Support Structures

- NG-3211 revised to provide requirements to address buckling of beams and columns.
- The terms related to stress analysis in NG-3213 update to be consistent with those in Mandatory Appendix XIII, Design Based on Stress Analysis.
- Deleted NE-3228.1(a) since the limitation on analytical methods for “the remaining stress limits” is no longer needed.
- NG-3225, NG-3228, NG-3235 revised to consolidate and clarify the rules for limit analysis within Subsection NG.

Section III, Appendices

- XIII-3430 revised to add a new criterion to explicitly address the ratchet limit due to thermal membrane stress in addition to combined thermal membrane plus bending stress range.
- Appendix XXVI updated to add new Nonmandatory Supplement E to provide guidance for the pressure design of PE and metallic-to-PE flanged joints.
- Nonmandatory Appendix B revised to add guidance for additional ultrasonic examination for high alloy metals.
- New Nonmandatory Appendix MM added to provide guidance on the stress linearization process, based on the stress linearization guidelines in Section VIII, Division 2.

Section III, Division 2, Code for Concrete Containments

- Revised to harmonize the material sizing system. All metric bar and coupler sizes referenced within the Code have been revised to maintain the US material sizing system.

- Revised CC-2438.4.1 and CC-2438.4.2 to clarify that qualification test data and test data for permanent corrosion protection material as defined in CC-2438 shall be certified.
- Table CC-2623.2-1 revised to update strength requirements for studs.
- CC-2710 and CC-3121 revised to provide clarification on existing requirements.

Section III, Division 3, Containment Systems for Transportation and Storage of Spent Nuclear Fuel and High-Level Radioactive Material

- Subsections WB, WC and WD revised to clarify the prohibition of certain welding processes.
- Section WC-2129 added to include requirements for fabricated hubbed flanges.
- Section WC-3263 added to include requirements for Category C Weld Joints for Flat Heads with Hubs.
- Various Figures and paragraphs revised in WB-3000 to clarify the requirements for the hypothetical fire event.

Section III, Division 5, High Temperature Reactors

- HHA-3217 revised to update the failure probability calculation to increase the accuracy for fine grained graphite materials.
- Figure HBB-T-1420-1E revised to update the series of fatigue curves for Grade 91 at elevated temperatures from 700F to 1200F.
- Appendix HBB-T revised to provide equations for the isochronous stress-strain curves.

SECTION IV - RULES FOR CONSTRUCTION OF HEATING BOILERS

- Revised the design temperature of plain furnaces in HG-312.1(b).
- Added requirements to allow for alternative marking of small parts based on BPV Section I, para. PG-106.8.2.
- Removed the allowable stress tables from Section IV and updated the references to these tables to Section II, Part D.

SECTION V - NONDESTRUCTIVE EXAMINATION

- Added Nonmandatory Appendices in Articles 4 and 5 for General Techniques for Straight Beam and Angle Beam Transfer Correction.
- Added new Article 21 for Pulsed Eddy Current (PEC) Examination.
- Added a cautionary note to the cover page of each document in Subsection B.
- Added new Article 20, Requirements for Computed Tomography Examination.

SECTION VI - RECOMMENDED RULES FOR THE CARE AND OPERATION OF HEATING BOILERS

- There were no significant changes to Section VI in the 2021 Edition.

SECTION VII - RECOMMENDED GUIDELINES FOR THE CARE OF POWER BOILERS

- Figures were added for a watertube boiler and a package boiler.

SECTION VIII - RULES FOR CONSTRUCTION OF PRESSURE VESSELS

Division 1

- Added new Mandatory Appendix 47 to prescribe minimum competence requirements for performing design activities, as well as qualification and certification requirements for design personnel.
- Revisions have been made to provide requirements for a Division 1 pressure vessel to be constructed using a cast acrylic shell.
- Added New Nonmandatory Appendix UIG-A to serve as a quick reference guide for Manufacturers to use in conjunction with Part UIG.

Division 2

- Revised Annex 2-B and 2-J to allow engineers to provide Code services, in addition to Certifying Engineers and Designers. Educational requirements for engineers and Designers, have also been added. These changes align the requirements of Appendix 47 of Section VIII, Division 1.
- Revised Part 2, para. 2-F.7.1 to include the character size of 4 mm (5/32 in.) for stamping on the nameplate.
- Para. 3.11.4 revised to permit the use of flux-cored arc welding (FCAW) for Division 2 high alloy construction.
- ASME STP-PT-074 added as an acceptable method to be followed for evaluating local stresses in shells, formed heads and nozzles.

Division 3

- KM-400.2 and KM-400.2M revised to add new cautionary notes (11) and (12) that involve the chloride stress corrosion cracking of austenitic stainless steels and the corrosion of free-machining stainless steels, respectively.
- Tables KD-320.1, KD-320.1M, and Figures KD-320.3 and KD-320.3M revised to update the austenitic stainless-steel fatigue curves.
- KF-826 revised to update the rules for calculating maximum permissible gaps for welded layered vessel.
- KE-503 and KT-510 revised to remove requirement that Volumetric Expansion Test be performed separately after Hydrostatic and Acoustic Testing.
- Deleted Appendix L and added reference to Section VIII, Division 2, Annex 5-A.

SECTION IX - WELDING, BRAZING, AND FUSING QUALIFICATIONS

- Revised QW-200.4, Table QW-255, QW-403.10 and QW-404.32 concerning GMAW in short-circuit transfer mode.
- Revised QW-403.6, QW-406.3, QW-407.2, QW-409.1, QW-409.4 and QW-410.9 regarding exemptions for materials not affected by cooling rate when toughness qualification is required.
- Revised QG-106(a) regarding supervising qualification activities.
- Revised QG-108 regarding qualifications made to previous editions.

SECTION X - FIBER-REINFORCED PLASTIC PRESSURE VESSELS

- Laminate tapers for nozzle attachments revised from 6:1 to 4:1 to align with 4:1 tapers on head/shell and shell/shell joints.
- Permit the use of a KD factor of 1.0 for all chopped strand mat laminates and laminates consisting of chopped strand mat and woven roving.
- Adopted the new ASME BPVC Section XIII, Rules for Overpressure Protection.
- Increased the maximum operating pressure to 2,000 psi.
- Added reference to Section VIII, Division 3, KD-10 and to make it clear that load sharing pressure parts include not only the metallic liner but the end nozzles as well.

SECTION XI - RULES FOR INSERVICE INSPECTION OF NUCLEAR POWER PLANT COMPONENTS

Division 1

- Added Supplement 15, Qualification Requirements for PWR Reactor Vessel Upper Head Penetrations, to Mandatory Appendix VIII.
- Added a new Nonmandatory Appendix Y, Crack Growth Rate Curves, to consolidate all existing and future crack growth rate curves used in Section XI.
- Added a new Nonmandatory Appendix Z, Guide for Buried Piping and Component Inspection Program, to provide guidance for critical attributes which will be addressed in the Owner's inspection program.
- IWA-5244 revised to allow one of three pressure test options (i.e. ground surface examination, pressure drop test, or inventory reduction test) for Buried Class 2 and Class 3 components to provide more flexibility to Owners.

Division 2

- First published in 2019.
- Figures I-1.1-1 through I-1.1-6 replaced the original Figures I-1.1-1 through I-1.1-7 to fully integrate the flowcharts to convey the RIM process more effectively.

SECTION XII - RULES FOR CONSTRUCTION AND CONTINUED SERVICE OF TRANSPORT TANKS

- TM-120 revised to parallel the new wording used in Section VIII, Division 1, UG-10.
- TP-200 revised to require that all repairs and alterations to the pressure vessel of a transport tank be performed by organizations holding a National Board "R" Certificate of Authorization.
- Added new Mandatory Appendix on Bolted Flange Connections with Ring Gaskets.

SECTION XIII - RULES FOR OVERPRESSURE PROTECTION

- New in 2021, ASME BPVC Section XIII, Rules for Overpressure Protection.
- This new Section consolidates and standardizes pressure relief device requirements for all ASME BPVC Sections.

The 2021 ASME BPVC is available on the CSA Store:

<https://www.csagroup.org/store/asme-boiler-and-pressure/>

