

2021  
ASME BOILER &  
PRESSURE VESSEL CODE

# Today's Speaker and Moderator

---



**Chris Mahler**

*ASME*

Director, Derivative Programs

Conformity Assessment

mahlerc@asme.org

ASME's codes and standards are used and developed throughout the world by enterprises of all sizes, ranging from small- and medium-size businesses, in developed and developing nations, to large, multi-national corporations.

- Manufacturers
- Facility owners
- Plant operators
- Designers
- Constructors
- Inspection bodies
- Insurers
- Research institutes
- Local and national government



## ASME's Worldwide Locations

- |                     |                  |
|---------------------|------------------|
| 1. New York, NY     | 4. Houston, TX   |
| 2. Little Falls, NJ | 5. Delhi, India  |
| 3. Washington D.C.  | 6. Beijing China |

### European Liaisons:

- **ASME:** Louis Fredericks | [fredericksl@asme.org](mailto:fredericksl@asme.org)
- **ASME Conformity Assessment:** Giancarlo Gobbi | [gobbig@asme.org](mailto:gobbig@asme.org)

# ASME Codes & Standards

---

- ASME's Standards are produced by 4 internal development boards
- Below are just a few of the many standards that run across these areas:

## **Nuclear**

- Nuclear Codes and Standards, Sections III & XI
- Standards Committee on Cranes for Nuclear Facilities

## **Pressure Technology**

- BPVC Sections I, II, IV, V, VIII, IX, X, XII
- B31 Code
- Bioprocessing Equipment (BPE)

## **Safety**

- A17 Elevators and Escalators
- B20 Safety Standards for Conveyors and Related Equipment
- Rail Transit Vehicle Standard Committee

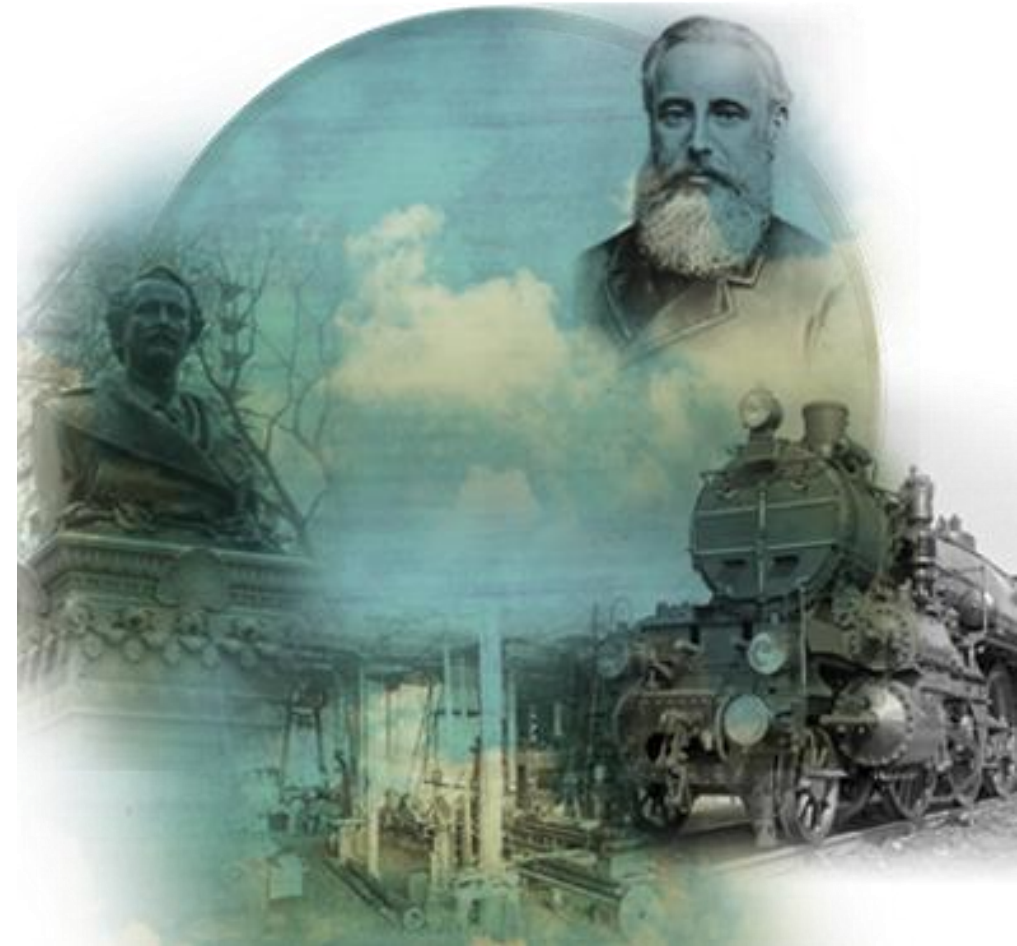
## **Standardization & Testing**

- Y14 Engineering Drawings and Related Documents
- EA Industrial Energy Assessment Standards Committee
- Performance Test Codes

# 2021 ASME Boiler & Pressure Vessel Code

---

- Anticipated release, July 2021
- ASME issued its first standard, Code for the Conduct of Trials of Steam Boilers, in 1884
- BPVC includes 29 books, plus several additional Code Case books, containing over 19,500 pages in total
- The standards cover industrial and residential boilers as well as nuclear facility components, transport tanks and other forms of pressure vessels
- They are kept current by nearly 1,000 volunteer technical experts from around the world – drawn from a balance of interests among industry, government and R&D – operating in a fully open & transparent manner via a consensus-driven process

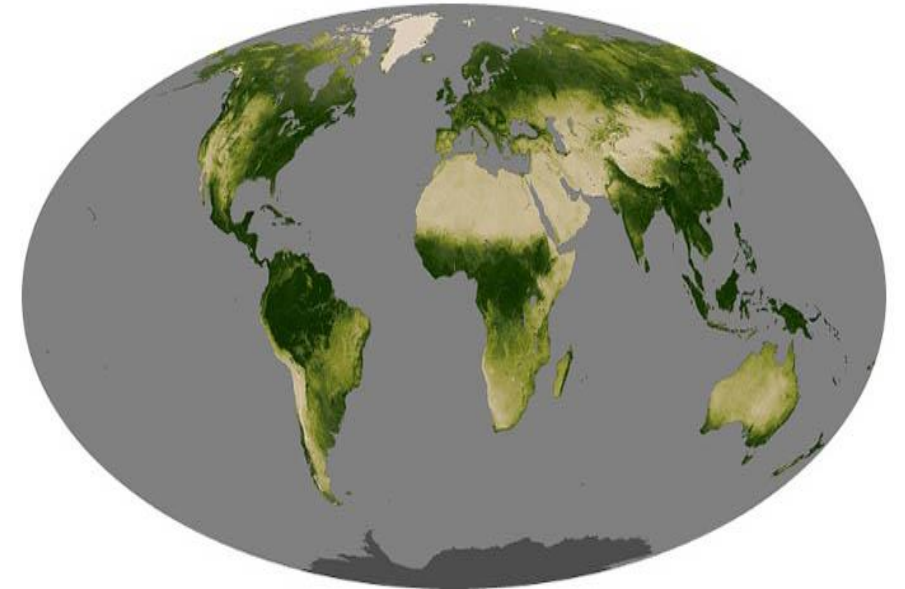


# 2021 ASME Boiler & Pressure Vessel Code

---

## **ASME's BPVC is a truly international set of standards:**

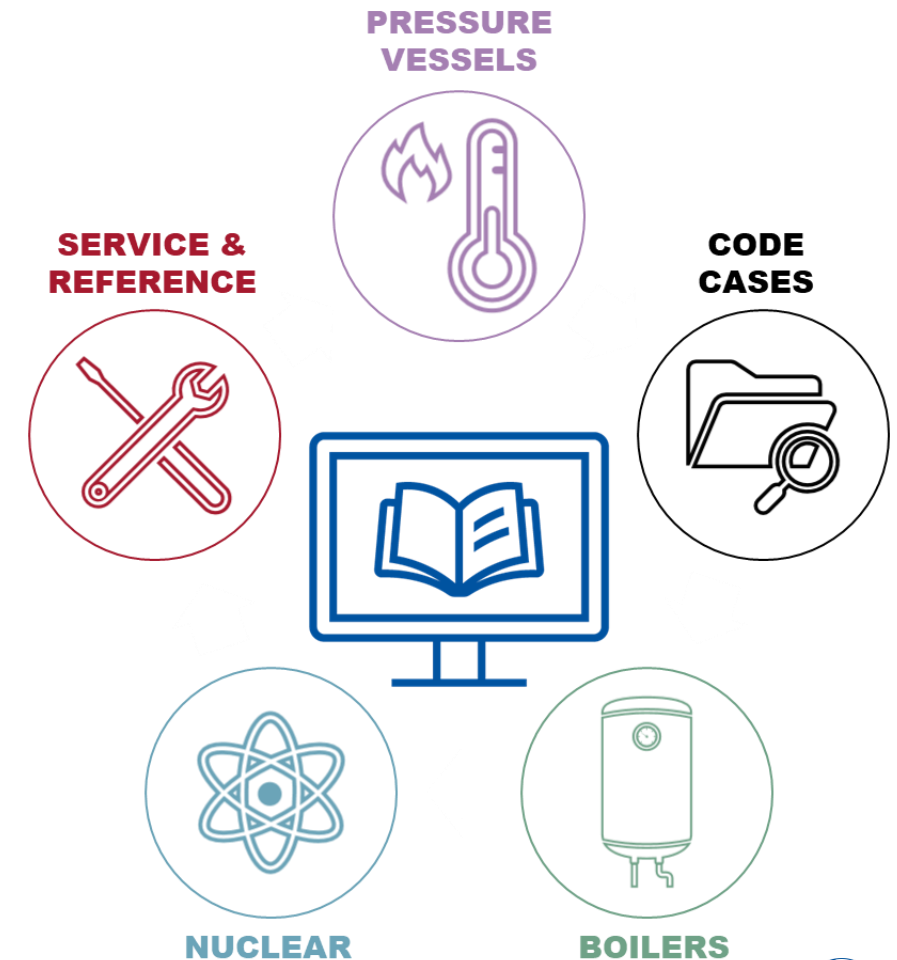
- Recognized by 116 countries
- Helps foster international sales while mitigating trade barriers
- Supports manufacturers, whose products house its stamp, in their product's use across these many regions
- Allows companies, who build to the Code and use the ASME stamp, to demonstrate their commitment to both safety & quality



# 2021 ASME Boiler and Pressure Vessel Code

BPVC is continuously evolving, providing essential rules & requirements across new materials, applications and technologies, including:

- Safety rules & guidelines for new construction of Nuclear and Non-Nuclear pressure devices
- Material properties and specifications for construction, including ferrous & nonferrous materials
- Customary and metric measurements
- Proper care and maintenance requirements for Nuclear and Non-Nuclear pressure devices
- Design and construction criteria across devices & components



# Non-Nuclear BPVC Sections

---

- Section I Rules for Construction of Power Boilers
- Section IV Rules for Construction of Heating Boilers
- Section VI Recommended Rules for the Care and Operation of Heating Boilers
- Section VII Recommended Guidelines for the Care of Power Boilers
- Section VIII Rules for Construction of Pressure Vessels
- Section X Fiber-Reinforced Plastic Pressure Vessels
- Section XII Rules for Construction and Continued Service of Transport Tanks





# Non-Nuclear BPVC Certification

---

## Section I

- S - Power Boilers
- A - Assembly of Power Boilers
- E - Electric Boilers
- M - Miniature Boiler
- PP - Pressure Piping
- V - Boiler Pressure Relief Valves
- PRT - Parts Fabrication Heating Boilers

## Section IV

- H - Heating Boilers/Cast Iron  
Sectional Heating Boiler
- HLW - Lined Potable Water Heaters
- HV - Heating Boiler Safety Valves
- PRT - Parts Fabrication Pressure Vessels

## Section VIII – Division 1

- U - Pressure Vessels
- UM - Miniature Pressure Vessels
- UV - Pressure Vessel Pressure Relief Valves
- UD - Pressure Vessel Pressure Relief Devices
- PRT - Parts Fabrication Pressure Vessels

## Section VIII – Division 2

- U2 - Pressure Vessels (Alternative Rules for Pressure Vessels)

## Section VIII – Division 3

- U3 - High Pressure Vessels
- UV3 - HP Vessel Pressure Relief Valves
- UD3 - HP Vessel Pressure Relief Devices
- RTP - Reinforced Plastic Vessels

# Non-Nuclear BPVC Certification

---

## **Section X**

- RP - Fiber-Reinforced Plastic Vessels Transports Tank

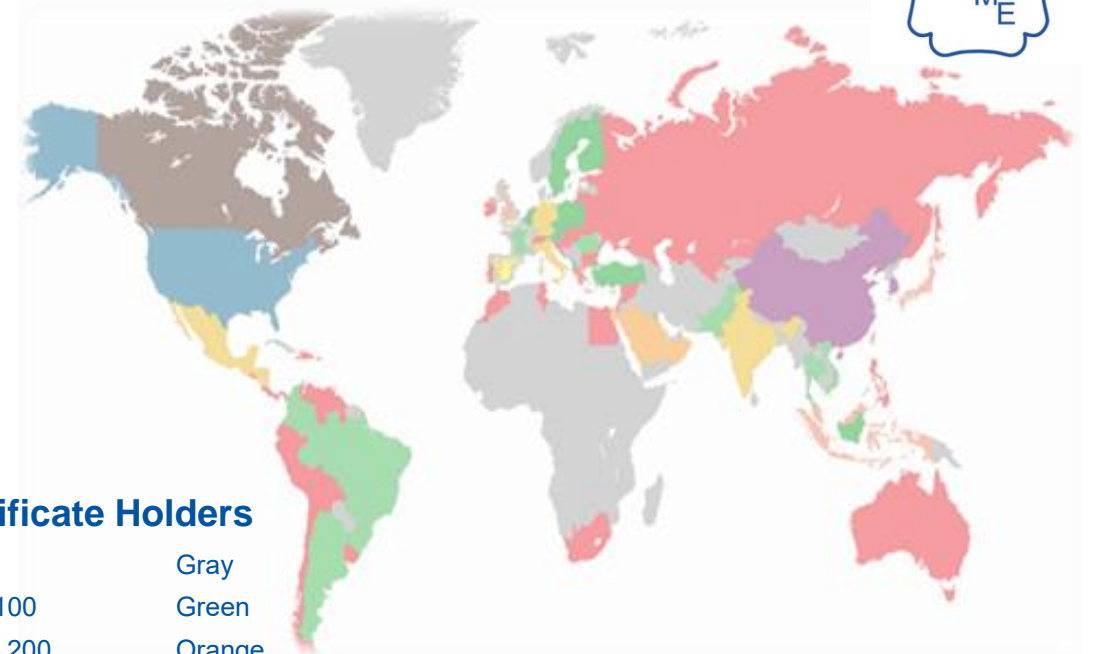
## **Section XII**

- T - Transport Tanks
- TV - Transport Tanks Pressure Relief Valves
- TD - Transport Tanks Pressure Relief Devices
- PRT - Parts Fabrication

# Certification

- Businesses and regulators around the world rely on the ASME Certification Mark (The Mark).
- ASME certification helps demonstrate to customers, supply chain, industry and regulators that your company is committed to public safety & quality.
- The ASME Single Certification Mark (The MARK) is the international mark of safety and quality.
- Companies that use parts and products with The MARK communicate their commitment to the highest levels of public safety and quality.
- That's why businesses and regulators around the world “Demand The Mark.”

Demand The Mark™



## Certificate Holders

0	Gray
26 – 100	Green
101 – 200	Orange
201 – 500	Yellow
501 – 1,000	Brown
1,001 – 5,000	Purple
5,001+	Blue

# Certification

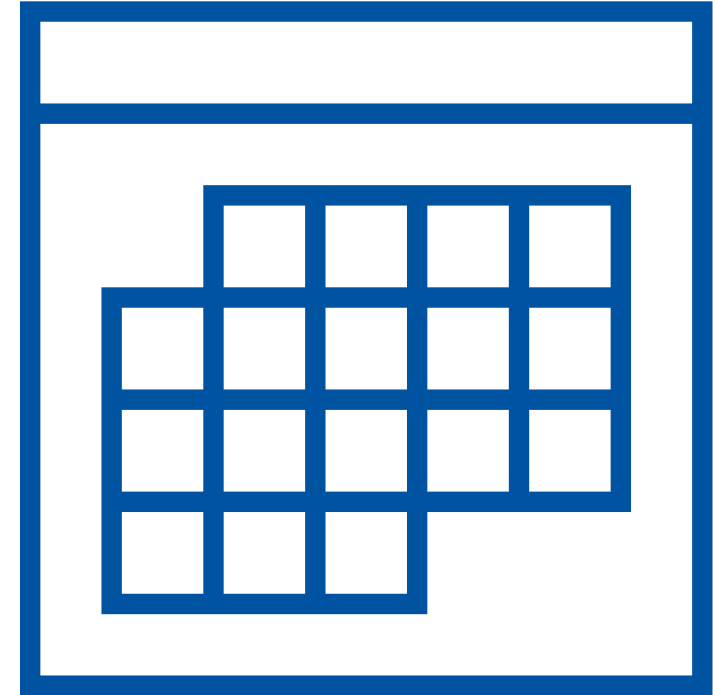
---

To be in compliance with Certification, the applicant must be on the latest release of the standard 6 months after its release.

All Code book purchases will be verified.

ASME Information Certification BPV-GUI-03 Issue 1, Rev. 1 12-05-2018.....Subscription to the indicated sections of the ASME Boiler and Pressure Vessel Code is required for certification to assure that Code users have the latest applicable Code rules.

ASME CA-1, 2020 Chapter 2.....2.1.3 The organization shall obtain and retain a copy of the governing standard(s) from an authorized seller of ASME codes and standards. Reproductions and translations from other sources are not acceptable for ASME accreditation and certification.



# Certification

## U & UM Certifications

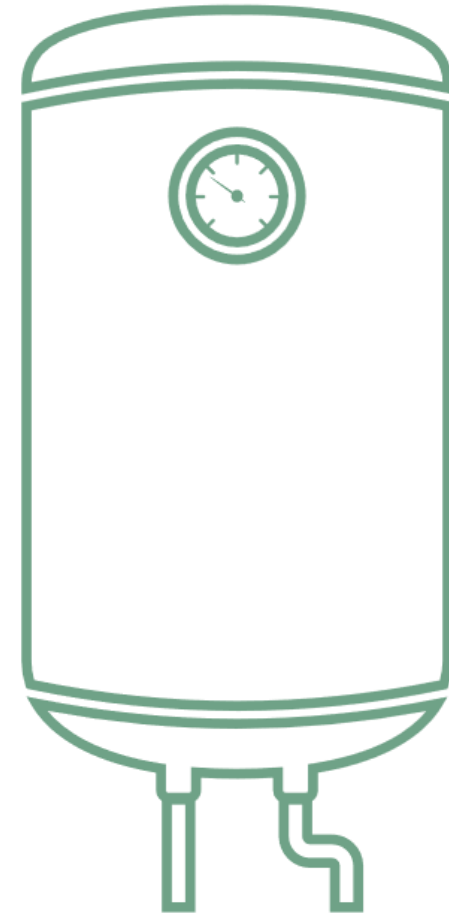
- BPVC Section II – Materials Part A-Ferrous Materials Specifications (2 Volumes)
- BPVC Section II – Materials Part B-Nonferrous Material Specifications
- BPVC Section II – Materials Part C-Specifications for Welding Rods Electrodes and Filler Metals
- BPVC Section II – Materials Part D-Properties- (Customary or Metric)
- BPVC Section V – Nondestructive Examination
- BPVC Section VIII – Rules for Construction of Pressure Vessels Division 1
- BPVC Section IX – Welding, Brazing, and Fusing Qualifications
- CA-1 Conformity Assessment Requirements



# Boiler Sections

---

- Section I – Rules for Construction of Power Boilers
- Section IV – Rules for Construction of Heating Boilers
- Section VI – Recommended Rules for the Care and Operation of Heating Boilers
- Section VII – Recommended Guidelines for the Care of Power Boilers



# Section I – Rules for Construction of Power Boilers

Section I provides requirements for all methods of construction of power, electric and miniature boilers; high temperature water boilers used in stationary service; and power boilers used in:

- Locomotive
- Portable
- Traction service

The rules are applicable to boilers in which steam or other vapor is generated at pressures exceeding 15 psig, and high temperature water boilers intended for operation at pressures exceeding 160 psig and/or temperatures exceeding 250° Fahrenheit.



# Section IV – Rules for Construction of Heating Boilers

Section IV provides requirements for the design, fabrication, installation and inspection of steam heating, hot water heating, hot water supply boilers and potable water heaters, intended for low-pressure service and that are directly fired by oil, gas, electricity, coal or other solid or liquid fuels.

Section IV contains appendices that cover:

- Submission of new materials for approval
- Definitions relating to boiler design and welding
- Quality control systems
- Methods along with examples of
  - Checking safety-valve and safety-relief-valve capacity
  - Calculation and computation





# Section VI – Recommended Rules for the Care and Operation of Heating Boilers

This Section covers general descriptions, terminology and operation guidelines applicable to steel and cast-iron boilers that are limited to the operating ranges of Section IV Heating Boilers.

Section VI includes:

- Guidelines for associated controls and automatic fuel burning equipment
- Illustrations showing typical examples of available equipment.
- A glossary of terms commonly associated with boilers, controls and fuel burning equipment

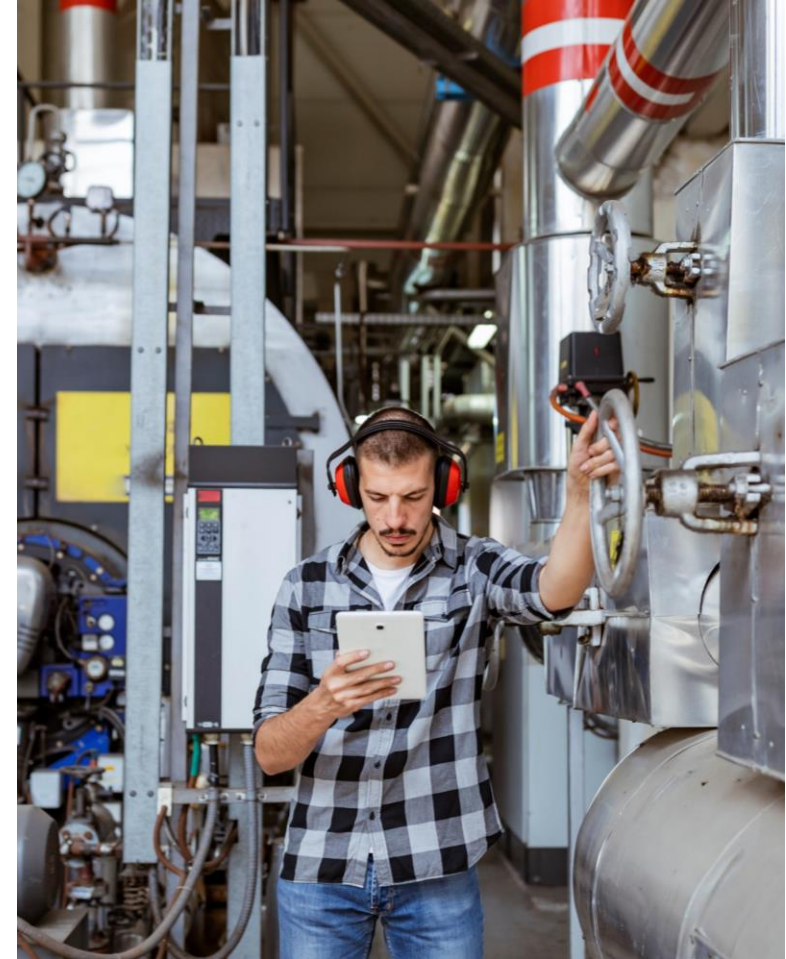


# Section VII – Recommended Guidelines for the Care of Power Boilers

This Section provides recommended guidelines to promote safety in the use of power boilers. The term “power boiler”, in this Section, includes stationary, portable and traction-type boilers, but does not include locomotive and high-temperature-water boilers, nuclear power-plant boilers, heating boilers, pressure vessels or marine boilers. Emphasis has been placed on industrial type boilers because of their extensive use.

Section VII includes:

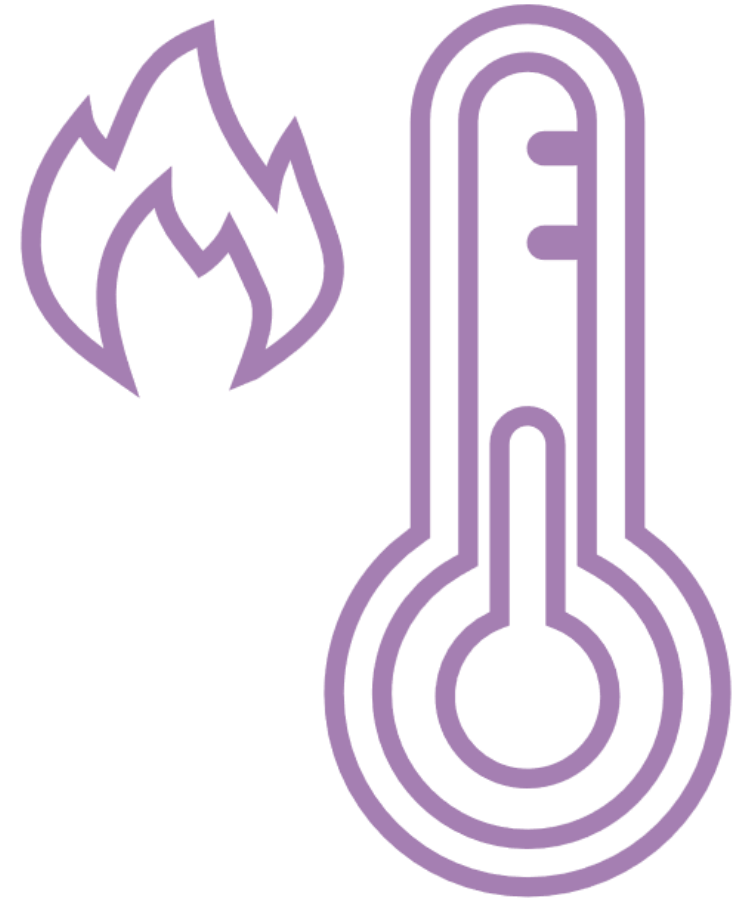
- Guidelines to assist those directly responsible for operating, maintaining and inspecting power boilers.
- Operation of auxiliary equipment and appliance guidelines that affect the safe and reliable operation of power boilers.



# Pressure Vessel Sections

---

- Section VIII – Rules for Construction of Pressure Vessels
- Section X – Fiber-Reinforced Plastic Pressure Vessels
- Section XII – Rules for Construction and Continued Service of Transport Tanks



# Section VIII – Rules for Construction of Pressure Vessels, Division 1

Division 1 is very important from a design perspective because of the compulsory requirements, specific prohibitions, and impulsive, guidelines for materials, design, fabrication, inspection, and testing, markings and reports, overpressure protection, and certification of pressure vessels having an indoor or external pressure more than 15 psi (100 kPa)

The Division isn't numbered within the traditional method (Part 1, Part 2, etc.) but is structured with Subsections and Parts, which contains letters followed by variety.

“Design-by-Rule” philosophy



# Section VIII – Rules for Construction of Pressure Vessels, Division 2, Alternative Rules

- Division 2 provides requirements applicable to the design, fabrication, inspection, testing, and certification of pressure vessels operating at either internal or external pressures exceeding 15 psig.
- This pressure may be obtained from an external source or by the application of heat from a direct or indirect source, or any combination thereof.
- These rules provide an alternative to the minimum requirements for pressure vessels under Division 1 rules. These rules may also apply to human occupancy pressure vessels typically in the diving industry.
- Both “Design-by-Rule” and “Design-by-Analysis” (a methodical approach for demonstrating the adequacy of a pressure vessel component design. It provides detailed rules for performing analyses.) philosophy

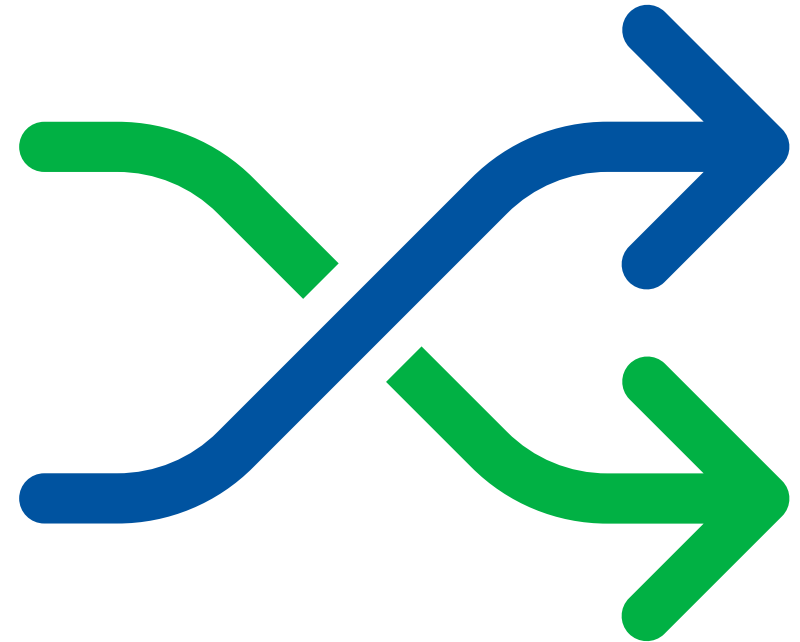


# Section VIII – Rules for Construction of Pressure Vessels, Differences Between Divisions 1 & 2

---

ASME Section VIII, Division 2 is intended for purpose-specific vessels with a defined fixed location. Another major difference between the Division 1 and Division 2 lies in failure theory. While Division 1 is based on normal stress theory, Division 2 is based on maximum distortion energy.

*von Mises Distortion Energy Theory (1913). In this theory failure by yielding occurs when at any point in the body, the distortion energy per unit volume in a state of combined stress becomes equal to that associated with yielding in a simple tension test.*



# Section VIII – Rules for Construction of Pressure Vessels, Division 3, Alternative Rules for Construction of High Pressure Vessels

- Provides requirements applicable to the design, fabrication, inspection, testing, and certification of pressure vessels operating at either internal or external pressures generally above 10,000 psi.
- Division 3 rules cover vessels intended for a specific service and installed in a fixed location or relocated from work site to work site between pressurizations.
- Division 3 does not establish maximum pressure limits for either Section VIII, Divisions 1 or 2.



# Section X – Fiber-Reinforced Plastic Pressure Vessels

This Section provides requirements for construction of an FRP pressure vessel in conformance with a manufacturer's design report.

It includes production, processing, fabrication, inspection and testing methods required for the vessel. Section X includes three Classes of vessel design; Class I and Class III - qualification through the destructive test of a prototype and Class II - mandatory design rules and acceptance testing by nondestructive methods.

These vessels are not permitted to store, handle or process lethal fluids. Vessel fabrication is limited to the following processes: bag-molding, centrifugal casting and filament-winding and contact molding.





# Section XII – Rules for Construction and Continued Service of Transport Tanks

---

This Section covers requirements for construction and continued service of pressure vessels for the transportation of dangerous goods via highway, rail, air or water at pressures from full vacuum to 3,000 psig and volumes greater than 120 gallons.

"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.

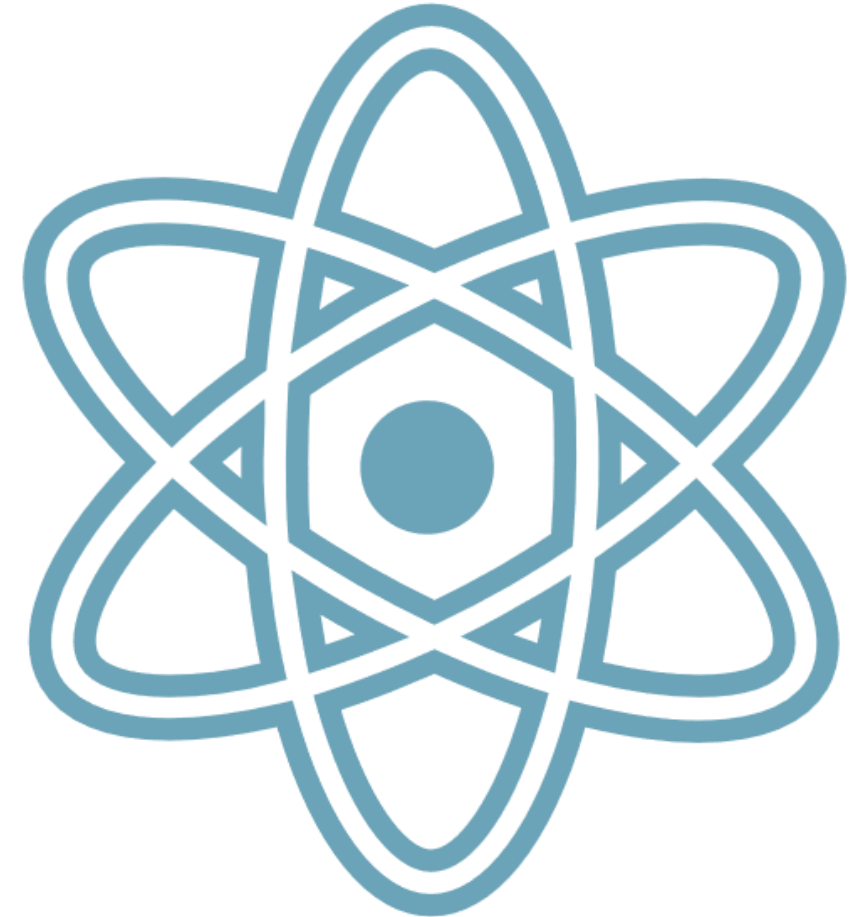
This Section contains modal appendices containing requirements for vessels used in specific transport modes and service applications.



# Nuclear Sections

---

- Section III – Rules for Construction of Nuclear Facility Components
- Section XI – Rules for In-Service Inspection of Nuclear Power Plant Components



# Nuclear BPVC Certification

## Sections III and XI

- **N:** Vessels, pumps, valves, piping systems, storage tanks, core support structures, concrete containments, and transport packaging
- **NA:** Field installation and shop assembly of all items
- **NPT:** Parts, appurtenances, welded tubular products, and piping subassemblies
- **NS:** Supports
- **NV:** Pressure relief valves
- **N3:** Transportation containments and storage containments
- **OWN:** Nuclear power plant owner
- **QSC-** Nuclear Material Organization



# Section III – Rules for Construction of Nuclear Facility Components

- Subsection NCA – General requirements for Divisions 1 & 2
- Appendices – Mandatory and non-mandatory appendices referenced by all Divisions of Section III
- Division 1 – Requirements for Class 1, 2, 3 and MC Components, Supports and Core Support Structures
  - Subsection NB – Class 1 Components
  - Subsection NCD – Class 2 & 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 & Transport Packagings
- Division 5 – High Temperature Reactors



# Section XI – Rules for In-Service Inspection of Nuclear Power Plant Components

Provides requirements to maintain the nuclear power plant while in operation and to return the plant to service following outages.

- **Division 1 Rules for Inspection and Testing of Components of Light-Water-Cooled Plants:**

Rules for the examination, inspection, and testing; NDE methods, qualifications, and requirements; evaluation and acceptance standards for flaws, defects, and relevant conditions; repair/replacement processes and correction actions/measures in light water-cooled nuclear power plants.

- **Division 2 Requirements for Reliability and Integrity Management Programs for Nuclear Power Plants:**

Provides requirements for the creation of the Reliability and Integrity Management (RIM) Program, which addresses the entire lifecycle of a plant for all types of nuclear power plants, including advanced nuclear reactor designs.



# Service & Reference Sections

---

- Section II – Materials
- Section V – Nondestructive Examination
- Section IX – Welding, Brazing and Fusing Qualifications
- **NEW!!** Section XIII – Rules for Overpressure Protection

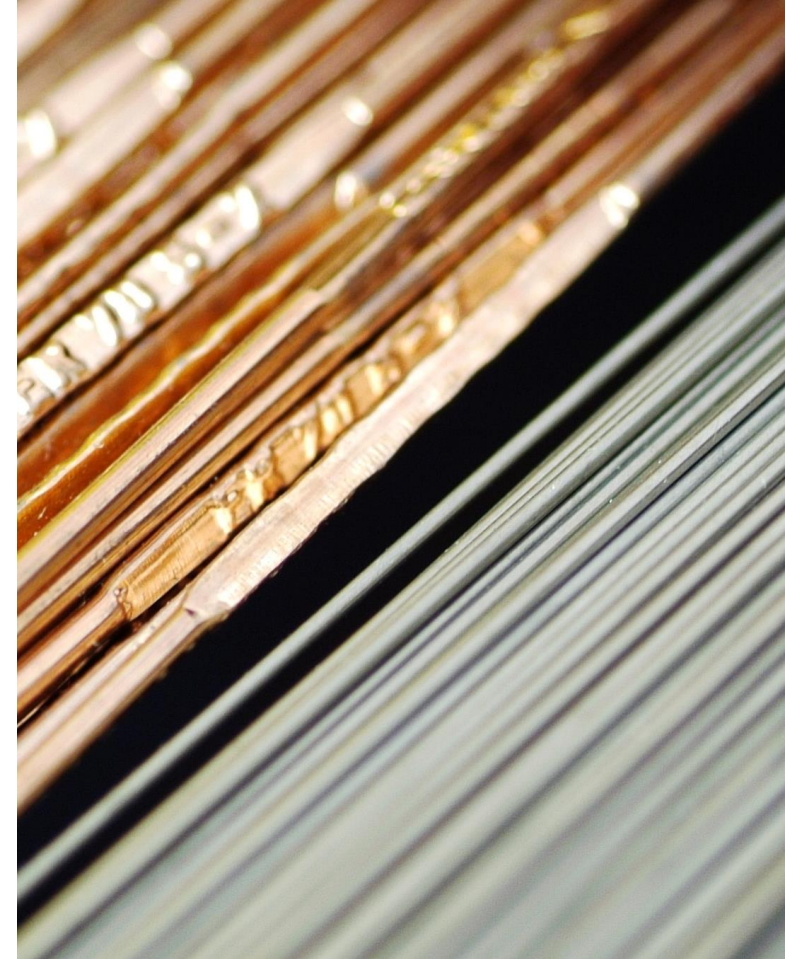


# Section II – Materials

---

Contains four parts that efficiently organize the important materials data used in ASME code design and construction of boilers and pressure vessels.

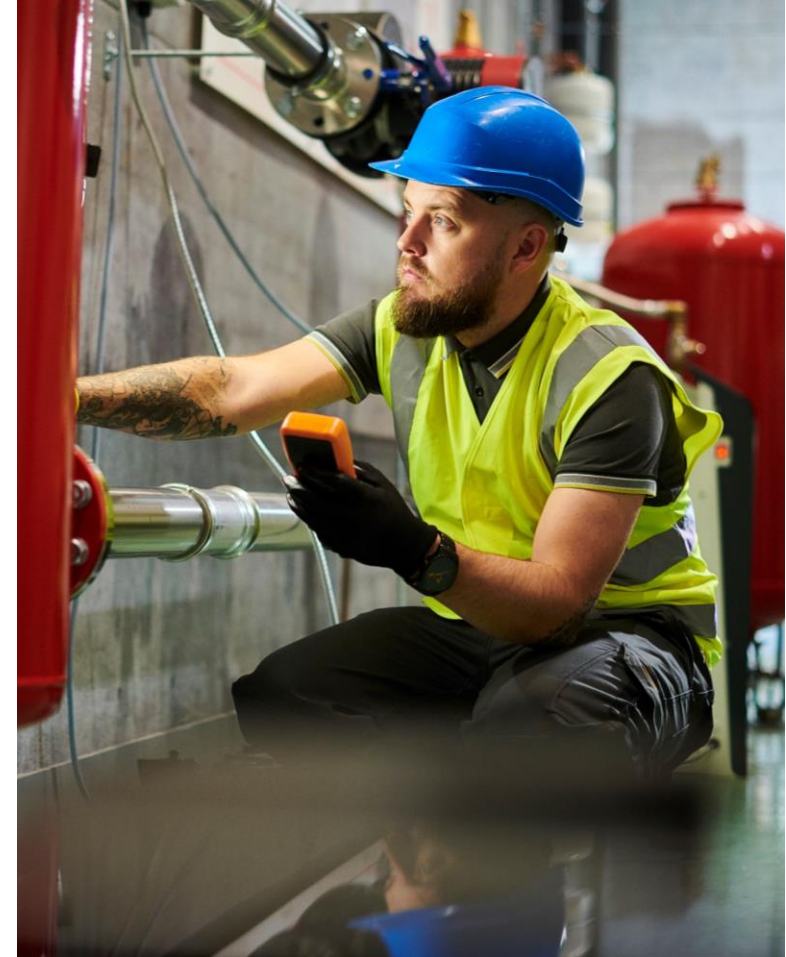
- Part A, Ferrous Material
- Part B, Nonferrous Material
- Part C, Welding Rods, Electrodes, and Filler Metals
- Part D, Material Properties (Customary and Metric units)



# Section V – Nondestructive Examination

Contains requirements and methods for nondestructive examination that are referenced & required by other Sections, including:

- Manufacturer's examination responsibilities
- Duties of authorized inspectors
- Personnel qualification requirements
- Inspection requirements
- Examination requirements





# Section IX – Welding, Brazing, and Fusing Qualifications

Relates to the qualification of welders, welding operators, brazers, and brazing operators, along with the procedures they employ.

Following Codes all refer to Section IX for welding and brazing:

- I – Rules for Construction of Power Boilers
- II – Materials
- III – Rules for Construction of Nuclear Facility Components
- IV – Rules for Construction of Heating Boilers
- VIII – Rules for Construction of Pressure Vessels
- XI – Rules for Inservice Inspection of Nuclear Power Plants
- XII – Rules for Construction and Continued Service of Transport Tanks
- B31.1 – Power Piping
- B31.3 – Process Piping
- B31.4 – Liquid Transportation Systems
- B31.5 – Refrigeration Piping
- B31.8 – Gas Transmission & Distribution Piping Systems
- B31.9 – Building Services Piping
- B31.11 – Slurry Transportation Piping Systems
- B31.12 – Hydrogen Piping



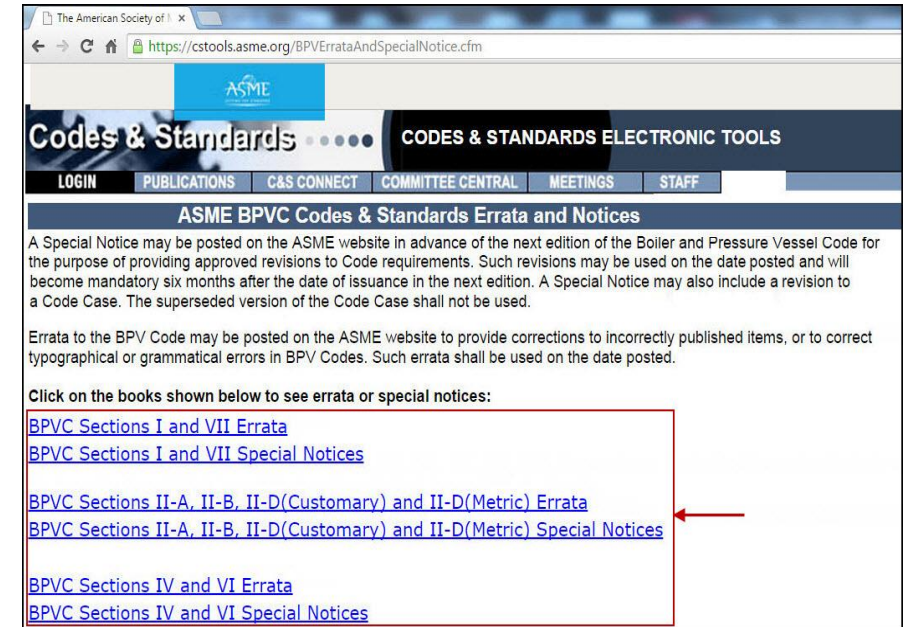
# Section XIII – Rules for Overpressure Protection

- Provides rules for the overpressure protection of pressurized equipment such as boilers, pressure vessels and piping systems.
- Provides clear pressure integrity and performance requirements, enabling users to identify a pressure relief device's performance along with anything needed to support overpressure protection.
- Organizes all requirements by pressure relief device type, including any exceptions or unique ones identified in a specific BPVC section, enabling users to easily identify all requirements across a device.
- Places capacity certification requirements across BPVC's many sections into one centralized location for easy reference, allowing users to easily compare the test results of different equipment across similar applications.



# Errata

- Errata to codes and standards may be posted on the ASME Web site under the Committee Pages to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in code and standard. Such errata shall be used on the date posted.
- On the Committee Page, there is an option available to automatically receive an e-mail notification when errata are posted to a particular code or standard.



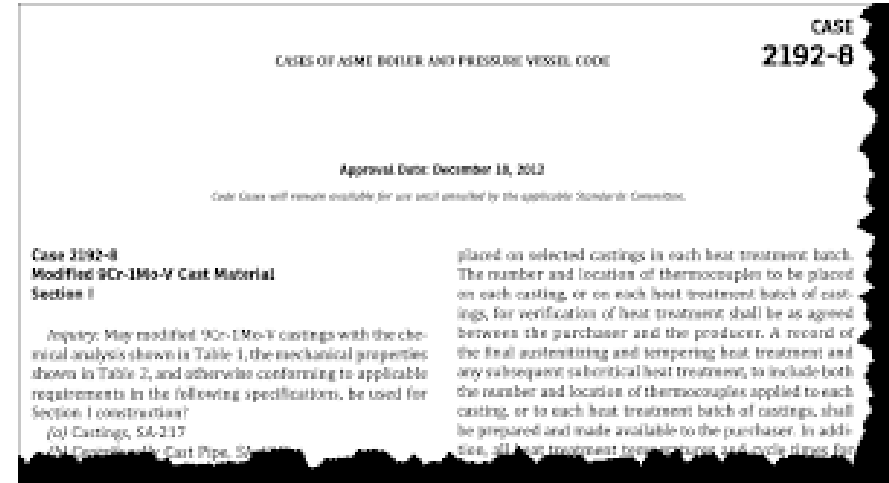
# Boiler & Pressure Vessel Code

## Code Cases

- Created when an urgent need arises for alternative rules concerning materials, construction, or an in-service inspection activity not covered by existing BPVC rules.
- Released 7 times over the 2-year BPVC edition cycle
- Provided as part of a subscription service for purchasers of BPV or Nuclear Code Case books
- Available for download until a supplement is issued, after which, the PDF is removed

## Interpretations

- Written replies to inquiries concerning interpretation of technical aspects of the Code
- Issued throughout the year, as they are approved
- Posted for free to the interpretations database
- No longer included as a part of the BPVC publication



ASME Interpretations Database [Submit Interpretation](#)

Search Results: 9 Record(s) Found

Standard	Record #	Interpretation #	Edition	Para Fig Table	Subject	Date of Issuance	Select Interpretation to be Displayed
B31.3	22-19				ASME B31.3 2006 Paragraph 331.1.3 Postweld Heat Treatment (PWHT)	10/13/08	<input type="checkbox"/>
B31.3	21-19				ASME B31.3 2004 Edition PWHT of Repaired Weld under Table 331.1.1	09/20/06	<input type="checkbox"/>
B31.3	21-12				ASME B31.3 2004 Edition PWHT Requirement for Carbon Steel Pipe	09/20/06	<input type="checkbox"/>
B31.3	20-44				ASME B31.3 2004 Edition PWHT Requirements	10/18/05	<input type="checkbox"/>
B31.3	5-06				B31.3 1984 Edition with the B31.3a 1984 Addenda Table 331.3.1 and Paragraph 331.3.6 PWHT Branch Connection Welds	12/02/86	<input type="checkbox"/>
B31.3	2-2				P.No. 1 Materials PWHT	01/27/83	<input type="checkbox"/>
B31.3	14-690		2012	K 331.1.1(b)	Interpretation on minimum required difference between tempering & PWHT temperature	09/25/14	<input type="checkbox"/>
B31.3	15-616		B31.3-2014	Para. 331.1.3(a)(2), 331.3(c)	B31.3-2014 Interpretation of Paras. 331.1.3(a)(2), 331.3(c) Preheat and PWHT Governing Thickness (Armstrong)	04/28/15	<input type="checkbox"/>
B31.3	16-2140	B31.3-16-19	2014	Paragraph 331.1.1, 331.1.3, and Table 331.1.1	B31.3-2014 Interpretation of Para. 331.1.1, 331.1.3, and Table 331.1.1 PWHT (Marine)	10/13/16	<input type="checkbox"/>

[Reset Selection](#) [Select All](#)  
[Display Selected Interpretations](#)

# Resources BPVC/Certification

## BPVC Resources

STANDARDS AND CERTIFICATION

### Publications Information

#### BPVC Resources

Code Cases of the ASME Boiler and Pressure Vessel Code

ASME Data Report Forms

#### Standards & Certification Update

#### Energy Standards, Certification & Training Programs

#### Safety Codes and Standards

#### Performance Test Codes

#### Standards & Certification FAQ

#### ISO Committees and U.S. Technical Advisory Groups

#### History of ASME Standards

#### Engineering Student Resources

#### ASME Standards & Certification Member Training Resources and Guidance Documents

#### ASME BPVC Stress Tables >

This database is the online version of the tables found in the ASME Boiler & Pressure Vessel Code, Section II, Part D — Properties, and is available in U.S. customary units and metric units.

#### Approval of New Materials >

This is a guideline on how you may obtain approval of new material used for the construction of boilers, pressure vessels, & nuclear components in accordance with the ASME Boiler & Pressure Vessel Code.

#### ASME Certificate Holder Search >

Find an ASME Certificate Holder, such as AIA-Authorized Inspection Agency, S-Power Boilers and more.

#### ASME BPVC Interpretations On-Line >

Interpretations to the Code that were previously distributed by hard copy in January are now available on-line.

#### ASME Data Report Forms >

Complete list of Data Report Forms from the Boiler & Pressure Vessel Code Sections.

#### BPVC Code Cases >

Code Cases are issued by the Committee when there is an urgent need to provide alternatives to existing Code requirements or acceptable Code materials.

#### ASME BPVC Codes & Standards Errata and Notices >

Access posting of Errata or Notices to a BPV Code

#### ASME Boiler and Pressure Vessel Code Week >

Information regarding Boiler Code Week meetings including dates and locations.



The American Society of Mechanical Engineers



Certification Accreditation > Resources and Events > Downloadable Resources

Frequently Asked Questions

Downloadable Resources

Contact Us

Locate ASME Certified Companies

## Downloadable Resources

#### General Downloads

[Boiler and Pressure Vessel Certification \(BPV\)](#)

[Bioprocessing Equipment Certification \(BPE\)](#)

[Nuclear Quality Assurance Certification \(NQA\)](#)

[Nuclear Component Certification \(N-Type\)](#)

[Nuclear Material Organization Certification \(QSC\)](#)

[Reinforced Thermoset Plastic Corrosion-Resistant Equipment Certification \(RTP\)](#)

[Authorized Inspection Agency \(AIA\)](#)

[Pressure Relief Device Testing Lab \(PRD\)](#)

Trouble accessing PDF files? Simply download the PDF to your local computer and open with [Adobe Acrobat Reader](#)

## General Downloads Notices

#### Conduct

Procedures Conduct of ASME Surveys, Reviews, Audits, Investigations, and Interviews  
[Download >>](#)

#### Notice on Requests for Certificate Extensions

Provides information for Certificate Holders who want to request an extension of the expiration date of their certification.  
[Download >>](#)

#### Policy on the Use of the Certification Mark in Advertising

#### Due Process

A notice about the rights an organization has during the survey/review process.  
[Download >>](#)

#### Notice on Use of Electronic Version of the Boiler Pressure Vessel Code by Certificate Holders

Provides information for companies who wish to use an electronic version of the ASME BPVC Books.  
[Download >>](#)

#### How to Change Primary Contact Information

# Now Presenting

---

**Steven J. Rossi**

*ASME*

*Project Engineering Manager*

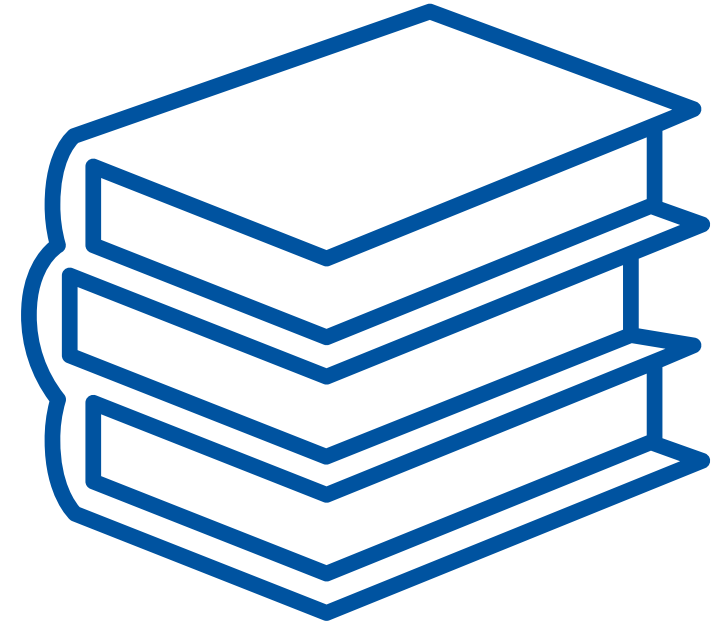
Standards & Certification

rossisj@asme.org

# 2021 BPV Code Major Changes

---

- This presentation is a general summary of some of the major changes that will appear in the 2021 Edition of the ASME Boiler & Pressure Vessel Code.
- All changes to the Code will be available when the 2021 Edition is issued in July, 2021.
- The specific detailed changes should be carefully reviewed and verified as published in the 2021 Edition to ensure compliance with Code requirements.



# General Change to Sections I, IV, VIII (Divisions 1, 2, and 3), X, and XII

- Adopted the new ASME BPVC Section XIII, Rules for Overpressure Protection
- Revisions to Sections I, IV, VIII (Divisions 1, 2 and 3), X and XII have been issued concurrent with the publication of Section XIII. These include the transfer of pressure relief device requirements, from each of the aforementioned Sections to Section XIII.
- The remaining overpressure protection requirements have been restructured; cross-references updated; and new Appendices added to list the new locations for all those requirements, formerly located in each of the Sections.





# Section I – Rules for Construction of Power Boilers

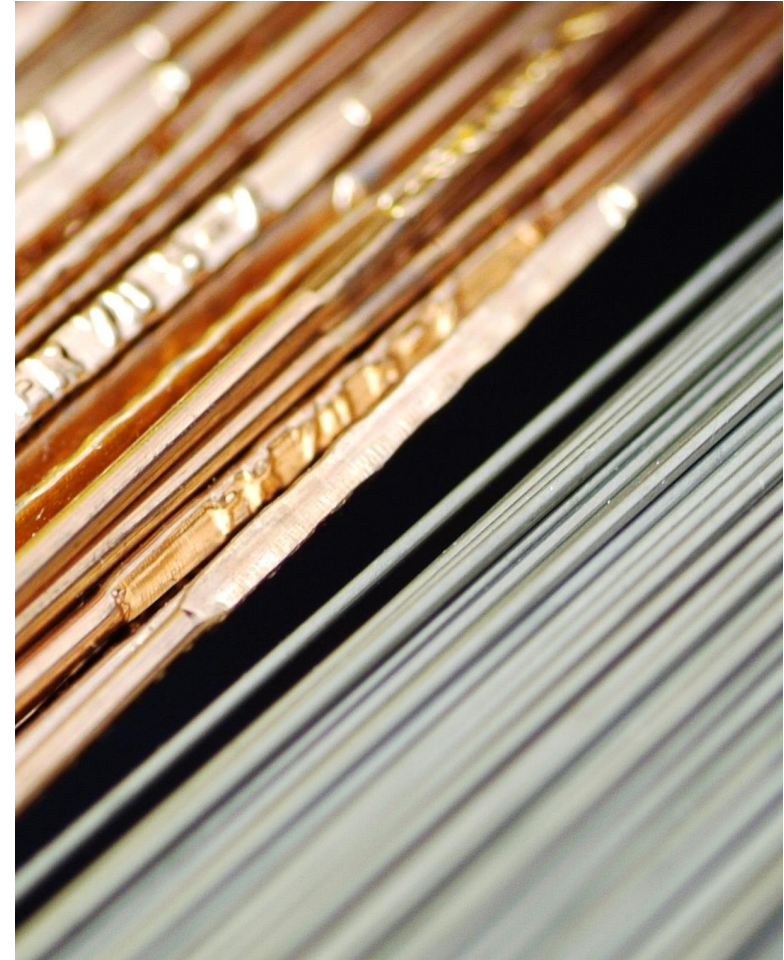
- Revised Figure PG-33.2 sketch (c) to depict  $d$  as the OD of the nozzle, in addition to reinstating Figure PW-16.1(Z) sketches as a new sketch (j).
- Revised Figures PG-58.2-1 and PG-58.2-6 by deleting the flow arrow for miscellaneous piping connections, in addition to replacing “Chemical Feed” and “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

---

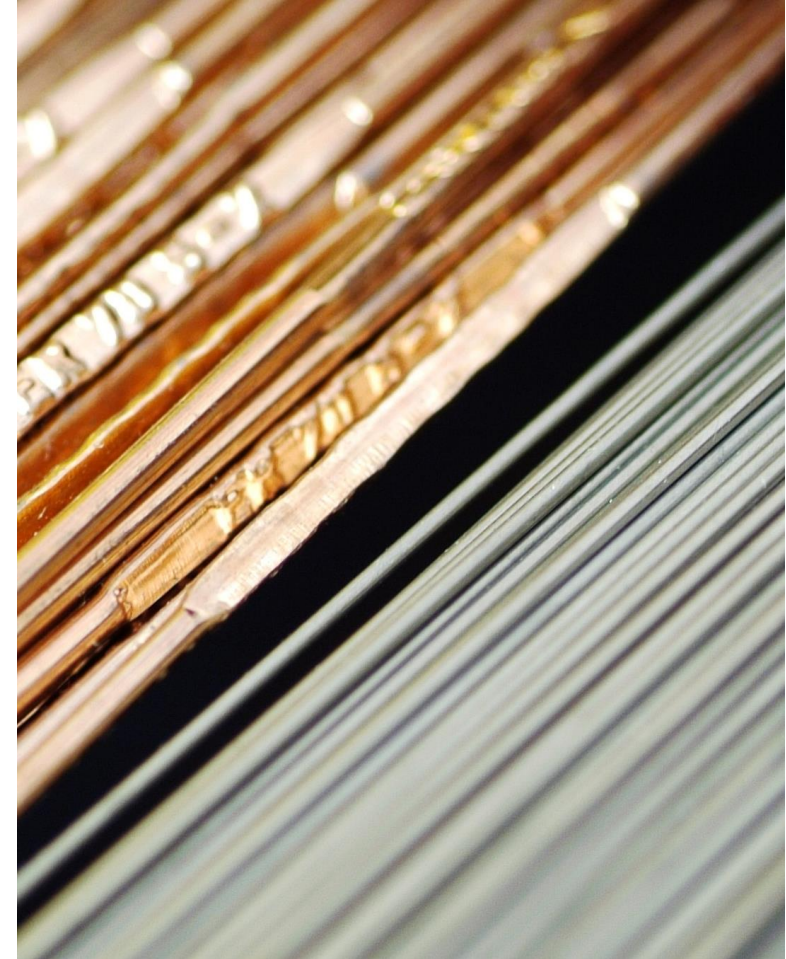
- The range of acceptable ASTM editions has been updated for a number of specifications.
- The Guideline on the Approval of New Materials Under the ASME Boiler and Pressure Vessel Code has been updated.



# Section II – Materials, Part A, Ferrous Material Specifications

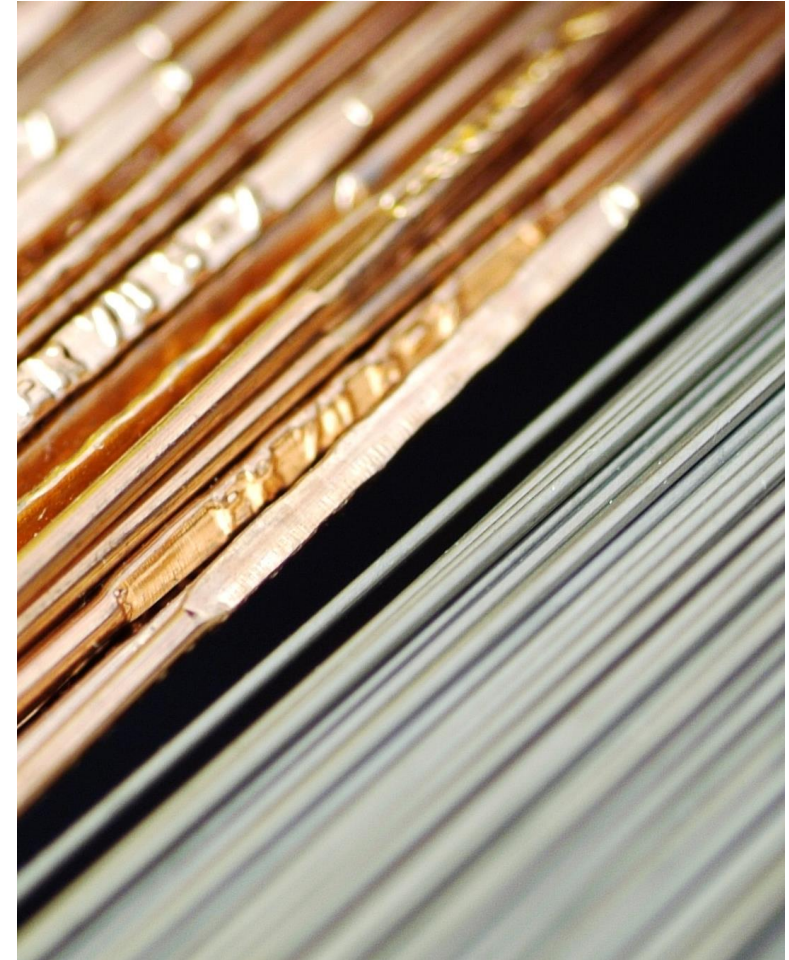
---

- 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.



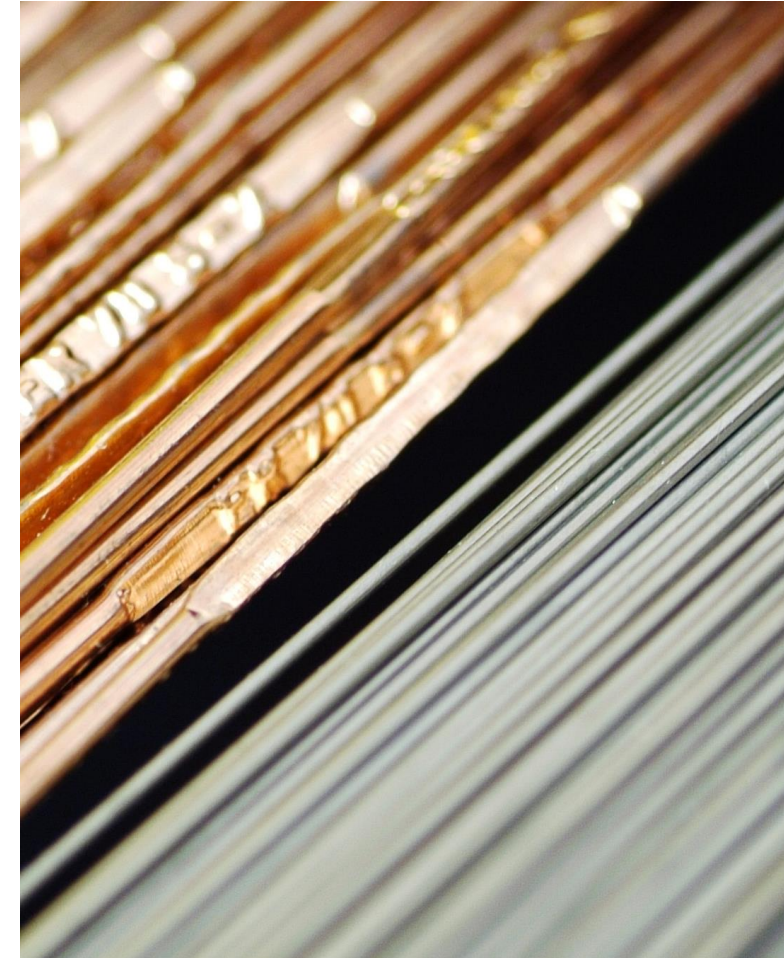
# Section II – Materials, Part B, Nonferrous Material Specifications

- 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.



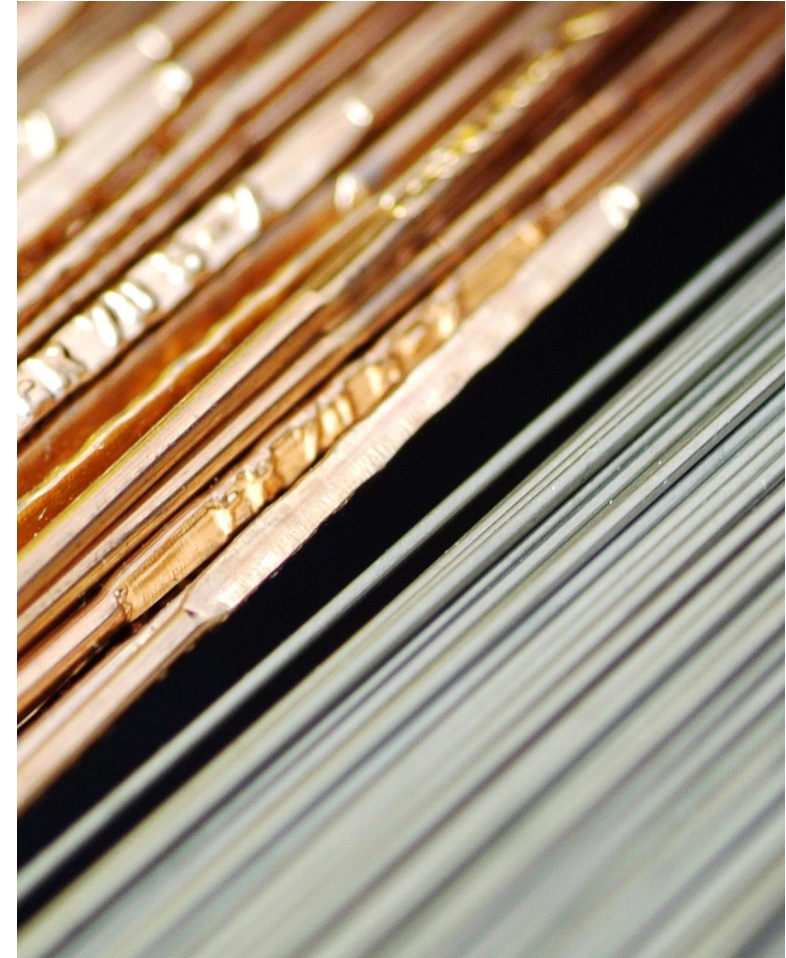
# Section II – Materials, Part C, Specifications for Welding Rods, Electrodes, and Filler Metals

- Six AWS specifications for arc welding electrodes, gas welding rods and other filler metals adopted or updated into the 2021 edition & 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, Subsection NCA, General Requirements for Division 1 and Division 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 – Rules for Construction of Nuclear Facility Components, 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 – Rules for Construction of Nuclear Facility Components, Subsection NCD, Class 2 and Class 3 Components

- Subsections NC and ND consolidated into one Subsection NCD. The new Subsection NCD contains the requirements for both Class 2 and Class 3 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 – Rules for Construction of Nuclear Facility Components, 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 – Rules for Construction of Nuclear Facility Components, 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 – Rules for Construction of Nuclear Facility Components, 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 updated 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 – Rules for Construction of Nuclear Facility Components, 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 – Rules for Construction of Nuclear Facility Components, 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 – Rules for Construction of Nuclear Facility Components, 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 – Rules for Construction of Nuclear Facility Components, 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.





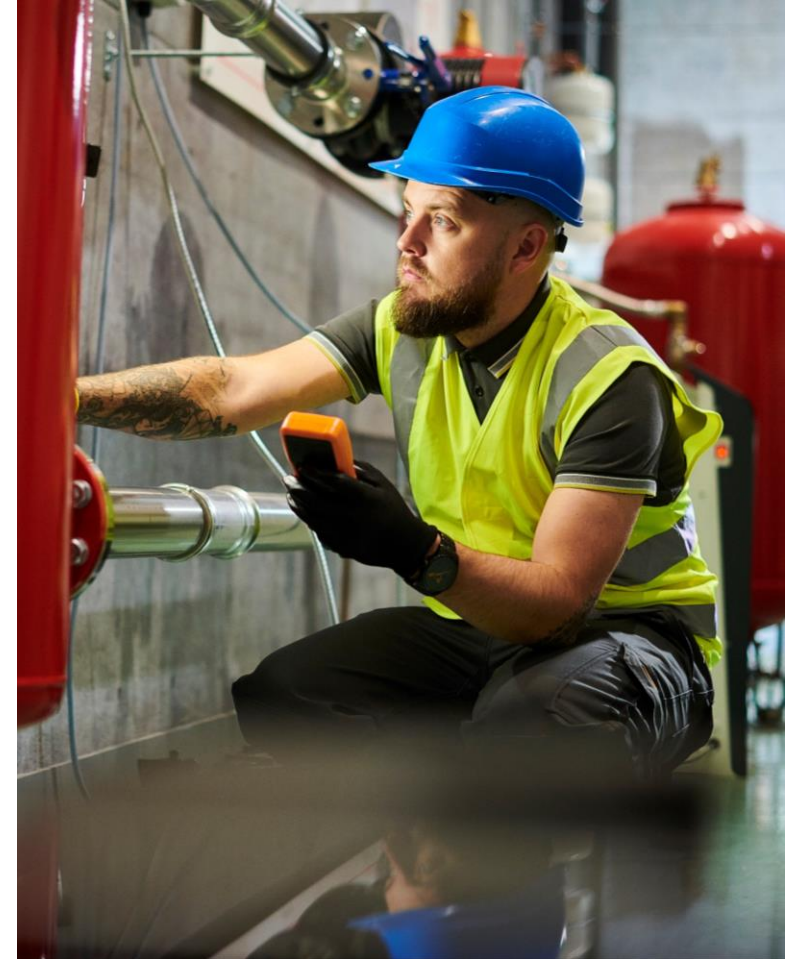
# Section IV – Rules for Construction of Heating Boilers

- 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

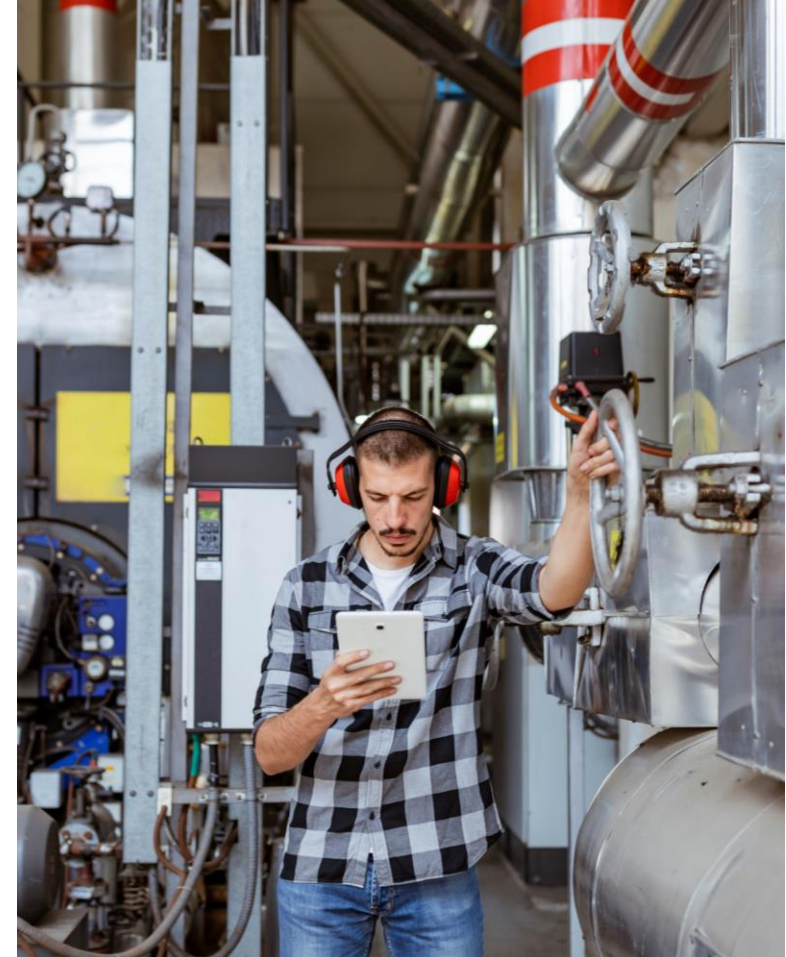
- There were no significant changes to Section VI in the 2021 Edition.



# 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.



# Section VIII – Rules for Construction of Pressure Vessels, Division 2, Alternative Rules

- 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 aligns 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.



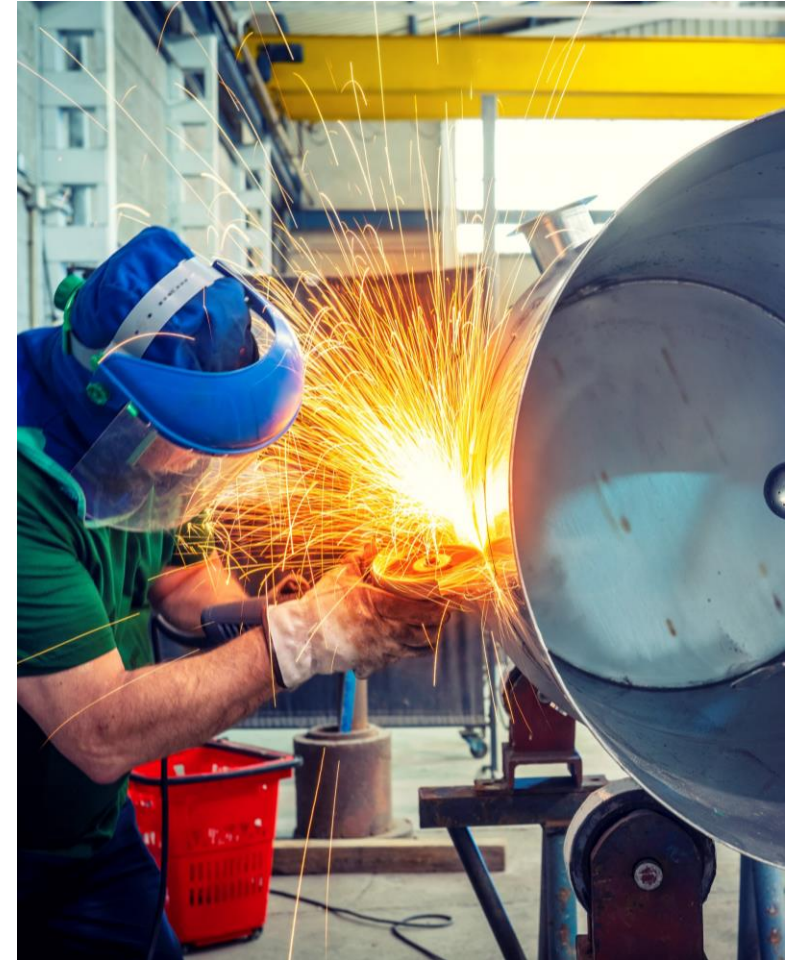
# Section VIII – Rules for Construction of Pressure Vessels, Division 3, Alternative Rules for Construction of High Pressure Vessels

- 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 Components, Division 1, Rules for Inspection and Testing of Components of Light-Water-Cooled Plants

- 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



# Section XI – Rules for Inservice Inspection of Nuclear Components, Division 2, Requirements for Reliability and Integrity Management (RIM) Programs for Nuclear Power Plants

---

- 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.



Diolch Kiitos Sheun umesc Kasih Mamnoon Todah  
 Shnorhakatutun Shokriya Mamnoon  
 Gamsahapnida Te°ekür Dekuju/Dekujeme  
 Hvala Ngiyabonga Dzekuje  
 Dank Gamsahapnida Takk Dekuju/Dekujeme  
 Kop Salamats Mercis Gra or al Xie Açi  
 Dakujem Waad Dhanyavaadaalu Dhanyavad Khopjai  
 Dankie Dhanyavaad Gra or al Xie  
 krap Daw Dhanyavaadaalu Dhanyavad Khopjai  
 Tack Thank You Kun Arigatou Faleminderit  
 Gra or al Xie  
 Grazzi raibh Gracias Nandree Blagodariya Gomapsupnida Euxaristo Kun Shukriya or Dhonebaad Asante  
 Fyrir Terima Enkosi Danke dank Euxaristo Kun Shukriya or Dhonebaad Asante  
 Hain Dhan daa