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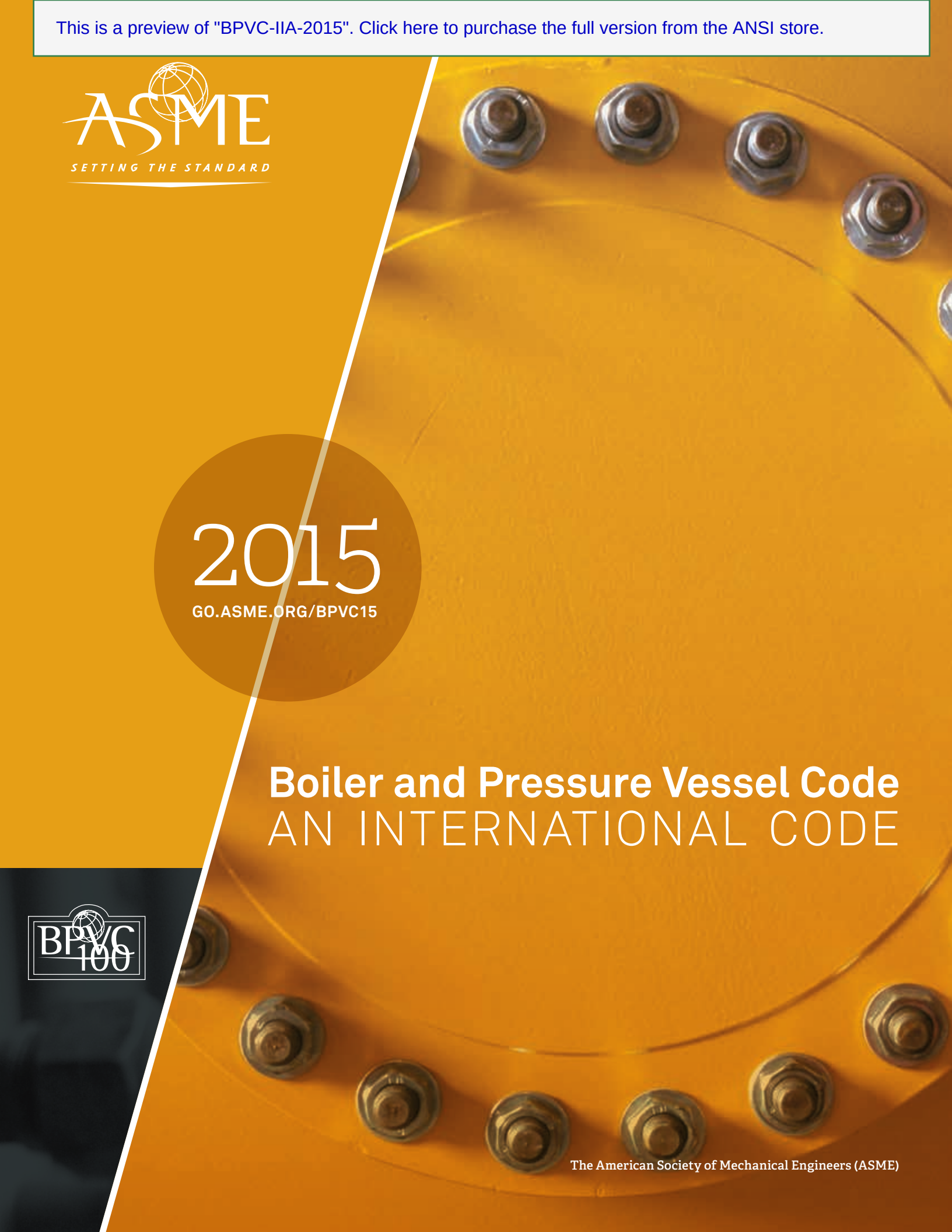
ASME
SETTING THE STANDARD

2015

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Boiler and Pressure Vessel Code
AN INTERNATIONAL CODE

BPVC 100



The American Society of Mechanical Engineers (ASME)

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Please note: ASME's Boiler and Pressure Vessel Code (BPVC) begins it bi-annual publishing cycle with this Edition in 2015. User feedback was clear that assimilating all the changes every two years would spare the need for yearly changes through addenda; and produce a more user-friendly reference that eliminates the need for interfiling of replacement pages.

ASME issued its first Standard, *Code for the Conduct of Trials of Steam Boilers*, in 1884. This paper evolved into *Rules for the Construction of Stationary Boilers and for Allowable Working Pressure* – the first edition of ASME's now-legendary Boiler and Pressure Vessel Code (BPVC) – issued in 1914 and published in 1915.

The BPVC has grown over the decades to include 31 books and 17,000 pages covering industrial and residential boilers as well as nuclear reactor components, transport tanks, and other forms of pressure vessels. It is kept current by nearly 1,000 volunteer technical experts – drawn from a balance of interests among industry, government and R&D – who operate in a fully open and transparent manner via consensus process.

The resulting "living document" remains a worldwide model for assuring the safety, reliability and operational efficiency first envisioned by ASME's founders more than a century ago.

BOILERS AND PRESSURE VESSELS

Since its first issuance in 1914, ASME's BPVC has pioneered modern standards-development, maintaining a commitment to enhance public safety and technological advancement to meet the needs of a changing world. This "International Historic Mechanical Engineering Landmark" now has been incorporated into the laws of state and local jurisdictions of the United States and nine Canadian provinces.

The BPVC is in use in 100 countries around the world, with translations into a number of languages. The boiler and pressure-vessel sections of the BPVC have long been considered essential within such industries as electric power-generation, petrochemical, and transportation, among others.

NUCLEAR

ASME has played a vital role in supporting the nuclear industry since its inception, when ASME codes, standards and conformity assessment programs, originally developed for fossil fuel-fired plants, were applied to nuclear power-plant construction. Its widely-adopted BPVC Section III, *Rules for Construction of Nuclear Facility Components*, celebrated 50 years in 2013.

Presently, half of the world's nuclear power plants incorporate all or portions of ASME nuclear codes and standards in their construction, operation, and/or maintenance. Sixty nations generally recognize and apply the BPVC, while 30 of the 44 nuclear nations purchase their nuclear components to specifications contained within ASME's nuclear codes and standards. The nuclear sections of the BPVC reflect the best-practices of industry, while contributing to more than a half-century of safety for the general public.

Visit **go.asme.org/BPVC15**

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POWER BOILERS

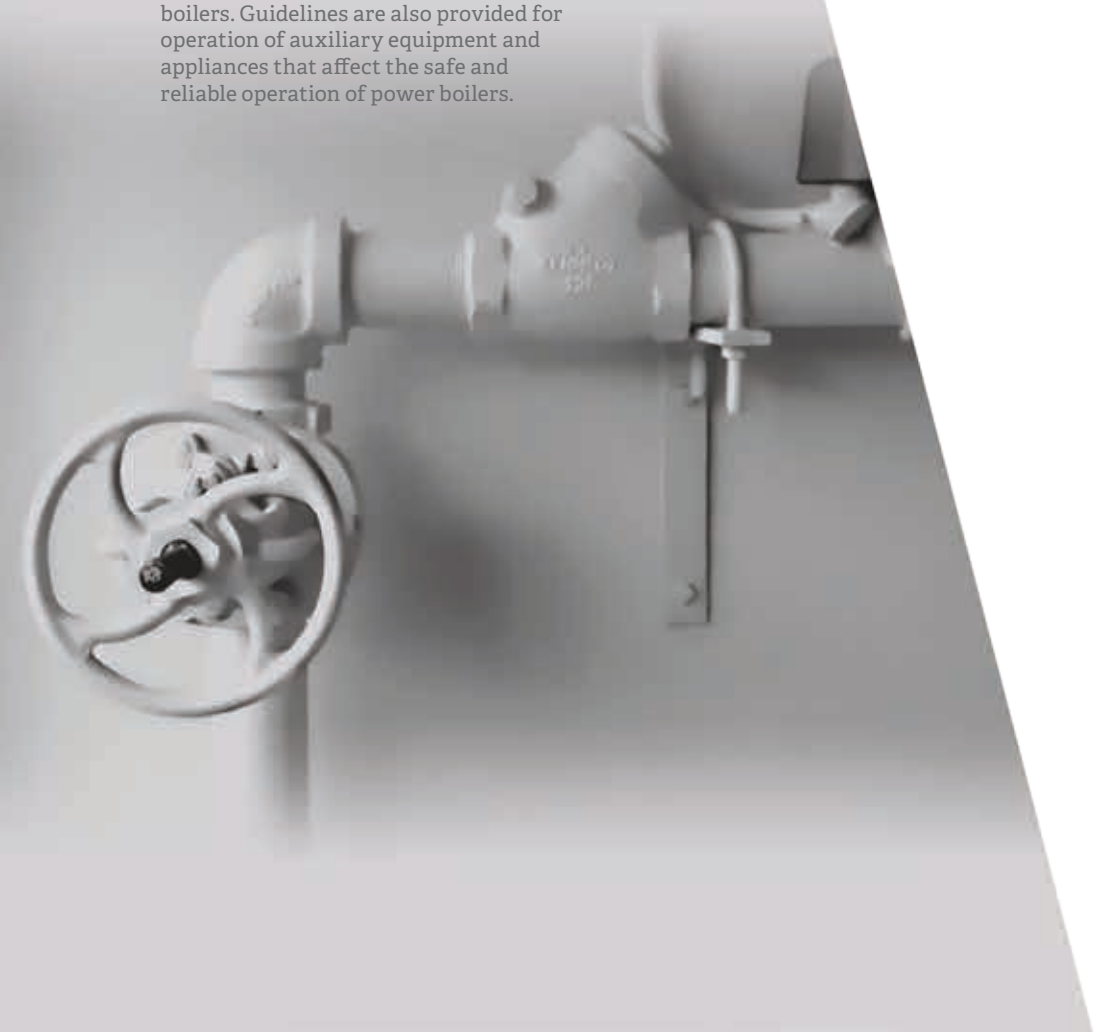
SECTION I
POWER BOILERS

Provides requirements for all methods of construction of power, electric, and miniature boilers; high temperature water boilers, heat recovery steam generators, and certain fired pressure vessels to be used in stationary service; and power boilers used in locomotive, portable, and traction service. Rules pertaining to use of the single ASME certification mark with the V, A, M, PP, S, and E designators are also included.

Seccion I – Reglas para la construccion de calderas de energia (BPVC-I_ES – 2010).

SECTION VII
CARE OF POWER BOILERS

Provides guidelines to assist those directly responsible for operating, maintaining, and inspecting power boilers. These boilers include stationary, portable, and traction type boilers, but not locomotive and high-temperature water boilers, nuclear power-plant boilers (see Section XI), heating boilers (see Section VI), pressure vessels, or marine boilers. Guidelines are also provided for operation of auxiliary equipment and appliances that affect the safe and reliable operation of power boilers.



REFERENCED
BPVC SECTIONS

BPVC-II, A, B, C,D
Section II, Materials, Parts A through D.

BPVC-V
Section V, Nondestructive Examination.

BPVC-VIII-1
Section VIII, Rules for Construction of Pressure Vessels, Division 1.

BPVC-IX
Section IX, Welding, Brazing, and Fusing Qualifications.

REFERENCED
ASME STANDARDS

B1.20.1
Pipe Threads, General Purpose, Inch.

Twelve Standards from the B16 Series on pipe flanges and fittings.

B31.1
Power Piping.

B36.10M
Welded and Seamless Wrought Steel Pipe.

PTC 25
Pressure Relief Devices.

QAI-1
Qualifications for Authorized Inspection.

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HEATING BOILERS

SECTION IV – HEATING BOILERS

Provides requirements for design, fabrication, installation and inspection of steam heating, hot water heating, hot water supply boilers, and potable water heaters intended for low pressure service that are directly fired by oil, gas, electricity, coal or other solid or liquid fuels. Rules pertaining to use of the single ASME certification mark with the H, HV, and HLW designators are also included.

SECTION VI – CARE AND OPERATION OF HEATING BOILERS

Covers operation guidelines applicable to steel and cast-iron boilers limited to the operating ranges of Section IV Heating Boilers. Section VI includes guidelines for associated controls and automatic fuel-burning equipment. Also included is a glossary of terms commonly associated with boilers, controls, and fuel-burning equipment.





REFERENCED BPVC SECTIONS

BPVC-I
Section I, Rules for Construction of Power Boilers

BPVC-II, A, B, C, D
Section II, Materials, Parts A through D

BPVC-IX
Section IX, Welding, Brazing, and Fusing Qualifications

REFERENCED ASME STANDARDS

Seven Standards from the B16 Series on pipe flanges and fittings

PTC 25
Pressure Relief Devices

QAI-1
Qualifications for Authorized Inspection

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PRESSURE VESSELS







SECTION VIII PRESSURE VESSELS

Division 1 provides requirements applicable to the design, fabrication, inspection, testing, and certification of pressure vessels operating at either internal or external pressures exceeding 15 psig. Such vessels may be fired or unfired. 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. Specific requirements apply to several classes of material used in pressure vessel construction, and also to fabrication methods such as welding, forging and brazing.

Division 1 contains mandatory and non-mandatory appendices detailing supplementary design criteria, nondestructive examination and inspection acceptance standards. Rules pertaining to the use of the single ASME certification mark with the U, UM and UV designators are also included.

Division 2 requirements on materials, design, and nondestructive examination are more rigorous than in Division 1; however, higher design stress intensity values are permitted. These rules may also apply to human occupancy pressure vessels typically in the diving industry. Rules pertaining to the use of the single ASME certification mark with the U2 and UV designators are also included.

Division 3 requirements are applicable to pressure vessels operating at either internal or external pressures generally above 10,000 psi. It does not establish maximum pressure limits for either Section VIII, Divisions 1 or 2, nor minimum pressure limits for this Division. Rules pertaining to the use of the single ASME certification mark with the U3 and UV3 designator are also included.

REFERENCED BPVC SECTIONS

BPVC-II, A, B, C, D
Section II, Materials, Parts A through D.

BPVC-V
Section V, Nondestructive Examination.

BPVC-IX
Section IX, Welding, Brazing, and Fusing Qualifications.

ASME'S PRESSURE TECHNOLOGY BOOKS

Applicable to pressure equipment Standards.

ASME Section VIII Division 2 Criteria and Commentary (PTB-1 - 2014).

Guide to Life Cycle Management of Pressure Equipment Integrity (PTB-2 - 2009).

ASME Section VIII-Division 2 Example Problem Manual (PTB-3 - 2013).

ASME Section VIII-Division 1 Example Problem Manual (PTB-4 - 2013).

ASME Section VIII-Division 3 Example Problem Manual (PTB-5 - 2013) .

Guidelines for Strain Gaging of Pressure Vessels Subjected to External Pressure Loading in the PVHO-1 Standard (PTB-6 - 2013).

Criteria for Shell-and-Tube Heat Exchangers According to Part UHX of ASME Section VIII-Division 1 (PTB-7 - 2014).

Procurement Guidelines for Metallic Materials (PTB-8 - 2014).

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REFERENCED ASME STANDARDS

DIVISION 1

Five Standards from the B1 Series on screw threads.

Thirteen Standards from the B16 Series on pipe flanges and fittings.

Nine Standards from the B18 Series on hex bolts.

B36.10M
Welded and Seamless Wrought Steel Pipe.

B36.19M
Stainless Steel Pipe.

NQA-1
Quality Assurance Program Requirements for Nuclear Facilities.

QAI-1
Qualifications for Authorized Inspection.

PCC-1
Guidelines for Pressure Boundary Bolted Flange Joint Assembly.

PCC-2
Repair of Pressure Equipment and Piping.

PTC 25
Pressure Relief Devices.

QAI-1
Qualifications for Authorized Inspection.

DIVISION 2

API 579-1/ASME FFS-1
Fitness-For-Service.

Three Standards from the B1 Series on screw threads.

Nine Standards from the B16 Series on pipe flanges and fittings.

Four Standards from the B18 Series on hex bolts.

B36.10M
Welded and Seamless Wrought Steel Pipe.

B36.19M
Stainless Steel Pipe.

NQA-1
Quality Assurance Program Requirements for Nuclear Facilities.

PCC-1
Guidelines for Pressure Boundary Bolted Flange Joint Assembly.

PTC 25
Pressure Relief Devices.

QAI-1
Qualifications for Authorized Inspection.

DIVISION 3

API 579-1/ASME FFS-1
Fitness-For-Service.

Three Standards from the B1 Series on screw threads.

Four Standards from the B16 Series on pipe flanges and fittings.

Seven Standards from the B18 Series on hex bolts.

B36.10M
Welded and Seamless Wrought Steel Pipe.

B46.1
Surface Texture (Surface Roughness, Waviness and Lay).

PTC 25
Pressure Relief Devices.

QAI-1
Qualifications for Authorized Inspection.



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PRESSURE VESSELS

SECTION XII TRANSPORT TANKS

Provides 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" refers to inspection, testing, repair, alteration, and recertification of a transport tank that has been in service. Rules pertaining to the use of the single ASME certification mark with the T, TD, and TV designators are included.

REFERENCED BPVC SECTIONS

BPVC-II, A, B, C, D
Section II, Materials, Parts A through D.

BPVC-V
Section V, Nondestructive Examination.

BPVC-VIII-1-2
Section VIII, Pressure Vessels, Division 1 and Division 2.

BPVC-IX
Section IX, Welding, Brazing, and Fusing Qualifications.

REFERENCED ASME STANDARDS

B1.1
Unified Inch Screw Threads (UN and UNR Thread Form).

B1.20.1
Pipe Threads, General Purpose, Inch.

Nine Standards from the B16 Series on pipe flanges and fittings.

B18.2.2
Square and Hex Nuts.

B36.10M
Welded and Seamless Wrought Steel Pipe.

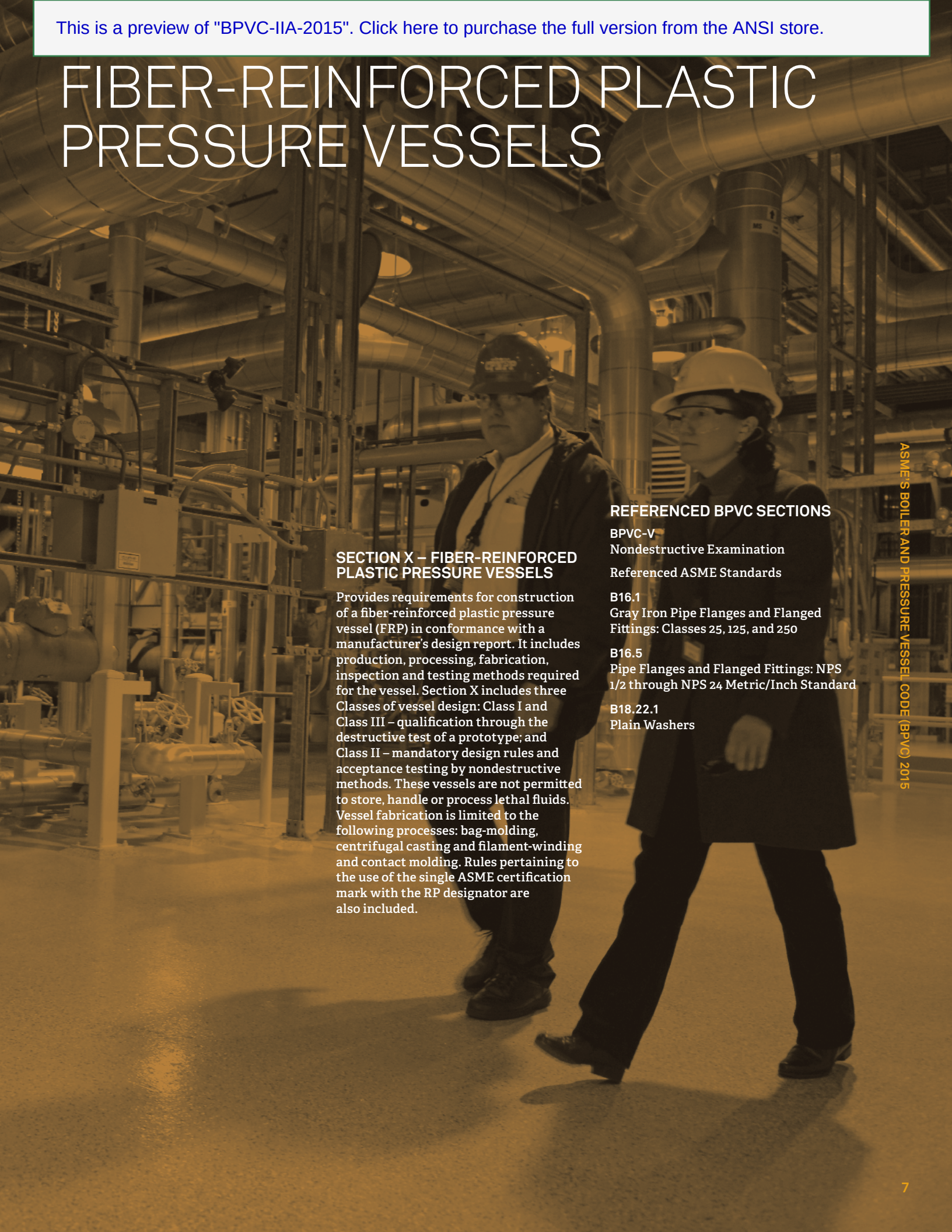
PTC 25
Pressure Relief Devices.

QAI-1
Qualifications for Authorized Inspection.



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FIBER-REINFORCED PLASTIC PRESSURE VESSELS



SECTION X – FIBER-REINFORCED PLASTIC PRESSURE VESSELS

Provides requirements for construction of a fiber-reinforced plastic pressure vessel (FRP) 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. Rules pertaining to the use of the single ASME certification mark with the RP designator are also included.

REFERENCED BPVC SECTIONS

BPVC-V
Nondestructive Examination

Referenced ASME Standards

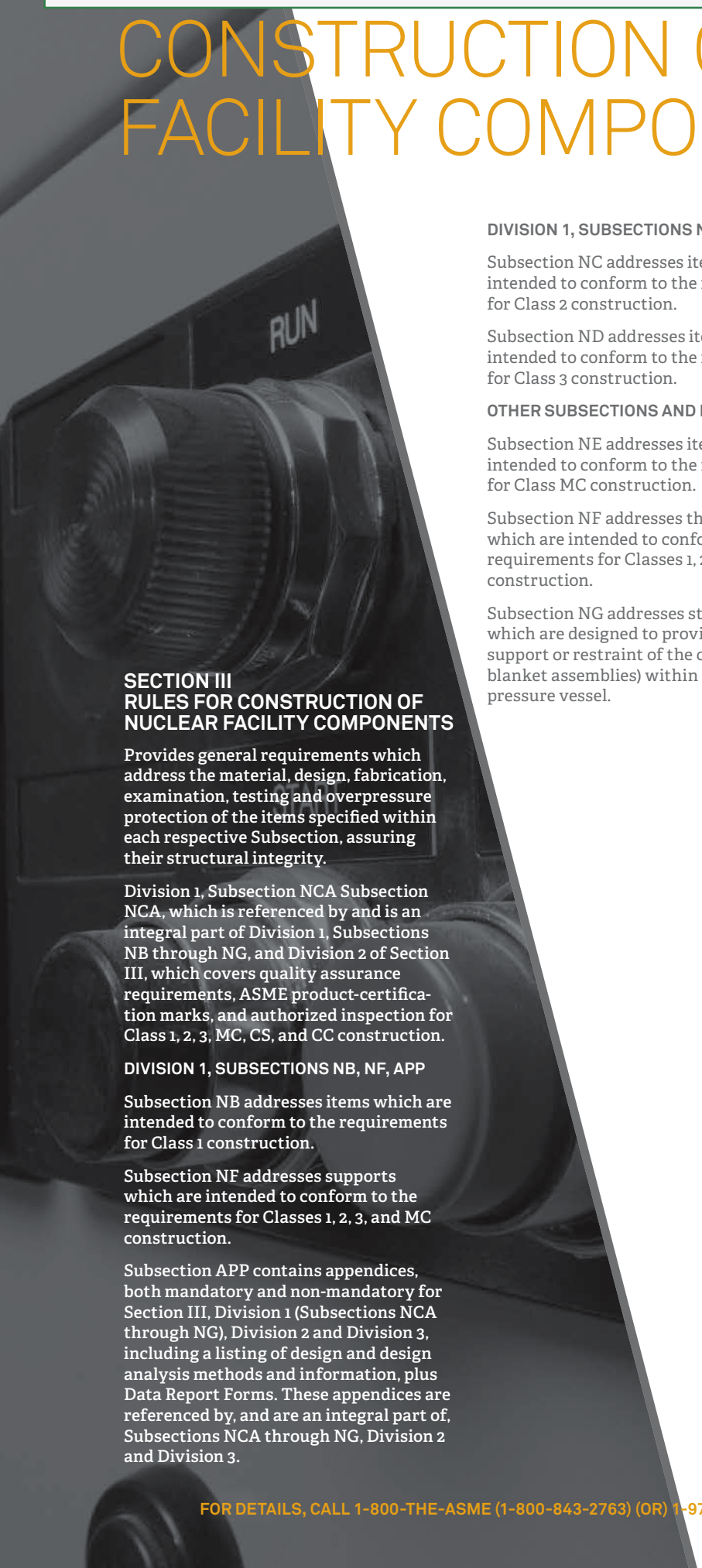
B16.1
Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250

B16.5
Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard

B18.22.1
Plain Washers

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CONSTRUCTION OF NUCLEAR FACILITY COMPONENTS



SECTION III
RULES FOR CONSTRUCTION OF NUCLEAR FACILITY COMPONENTS

Provides general requirements which address the material, design, fabrication, examination, testing and overpressure protection of the items specified within each respective Subsection, assuring their structural integrity.

Division 1, Subsection NCA Subsection NCA, which is referenced by and is an integral part of Division 1, Subsections NB through NG, and Division 2 of Section III, which covers quality assurance requirements, ASME product-certification marks, and authorized inspection for Class 1, 2, 3, MC, CS, and CC construction.

DIVISION 1, SUBSECTIONS NB, NF, APP

Subsection NB addresses items which are intended to conform to the requirements for Class 1 construction.

Subsection NF addresses supports which are intended to conform to the requirements for Classes 1, 2, 3, and MC construction.

Subsection APP contains appendices, both mandatory and non-mandatory for Section III, Division 1 (Subsections NCA through NG), Division 2 and Division 3, including a listing of design and design analysis methods and information, plus Data Report Forms. These appendices are referenced by, and are an integral part of, Subsections NCA through NG, Division 2 and Division 3.

DIVISION 1, SUBSECTIONS NC, ND

Subsection NC addresses items, which are intended to conform to the requirements for Class 2 construction.

Subsection ND addresses items, which are intended to conform to the requirements for Class 3 construction.

OTHER SUBSECTIONS AND DIVISIONS

Subsection NE addresses items, which are intended to conform to the requirements for Class MC construction.

Subsection NF addresses the supports, which are intended to conform to the requirements for Classes 1, 2, 3, and MC construction.

Subsection NG addresses structures, which are designed to provide direct support or restraint of the core (fuel and blanket assemblies) within the reactor pressure vessel.

Subsection NH addresses Class 1 components, parts, and appurtenances which are expected to function even when metal temperatures exceed those covered by the rules and stress limits of Subsection NB and Tables 2A, 2B, and 4 of Section II, Part D, Subpart 1.

Division 2 addresses concrete containment structures, pre-stressed or reinforced. These requirements are applicable only to those components that are designed to provide a pressure retaining or containing barrier.

Division 3 addresses the design and construction of the containment system of a nuclear spent fuel or high level radioactive waste transport packaging.

Division 5 provides construction rules for high-temperature reactors, including both high-temperature, gas-cooled reactors (HTGRs) and liquid-metal reactors (LMRs).

REFERENCED BPVC SECTIONS

BPVC-II, A, B, C, D
Section II, Materials, Parts A through D.

BPVC-V
Section V, Nondestructive Examination.

BPVC-IX
Section IX, Welding, Brazing, and Fusing Qualifications.

BPVC-XI
Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components.

REFERENCED ASME STANDARDS

Three Standards from the B1 Series on screw threads.

Eight Standards from the B16 Series on pipe flanges and fittings.

Three Standards from the B18 Series on hex bolts.

B36.10M
Welded and Seamless Wrought Steel Pipe.

B36.19M
Stainless Steel Pipe.

NQA-1
Quality Assurance Program Requirements for Nuclear Facilities.

QAI-1
Qualifications for Authorized Inspection.

FOR DETAILS, CALL 1-800-THE-ASME (1-800-843-2763) (OR) 1-973-882-1170 (OR) VISIT GO.ASME.ORG/BPVC15.

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NUCLEAR INSERVICE

SECTION XI RULES FOR INSERVICE INSPECTION OF NUCLEAR POWER PLANT COMPONENTS

Contains Divisions 1 and 3, in one volume, and provides rules for the examination, inservice testing and inspection, and repair and replacement of components and systems in light water cooled and liquid metal cooled nuclear power plants. Application of Section XI begins when the requirements of the "construction code" (e.g., Section III) have been satisfied.

Section XI constitutes requirements to maintain the nuclear power plant while in operation and to return the plant to service, following plant outages, and repair or replacement activities. These rules require a mandatory program of scheduled examinations, testing, and inspections to evidence adequate safety. The method of nondestructive examination to be used and flaw size characterization are also contained within this Section.



REFERENCED BPVC SECTIONS

BPVC-II, A, B, C, D
Section II, Materials, Parts A through D.

BPVC-III
Section III, Rules for Construction of Nuclear Facility Components:

Subsection NCA, General Requirements for Division 1 and Division 2.

Subsection NB, Class 1 Components.

Subsection NC, Class 2 Component.

Subsection ND, Class 3 Components.

Subsection NE, Class MC Components.

Subsection NF, Supports.

Subsection NG, Core Support Structures.

Subsection NH, Class 1 Components in Elevated Temperature Service.

Appendices.

Division 2-Code for Concrete Containments.

Division 3-Containments for Transportation & Storage of Spent Nuclear Fuel and High Level Radioactive Material & Waste.

Division 5, High Temperature Reactors.

BPVC-V
Section V, Nondestructive Examination.

BPVC-VIII-1-2
Section VIII, Pressure Vessels, Division 1 and Division 2.

BPVC-IX
Section IX, Welding, Brazing, and Fusing Qualifications.

REFERENCED ASME STANDARDS

NQA-1
Quality Assurance Requirements for Nuclear Facilities Applications (QA).

QAI-1
Qualifications for Authorized Inspection.

RA-S
Standard for Level 1 / Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications.

NQA-1
Quality Assurance Requirements for Nuclear Facility Applications (QA).

Provides requirements and guidelines for the establishment and execution of quality assurance programs during siting, design, construction, operation and decommissioning of nuclear facilities. This Standard reflects industry experience and current understanding of the quality assurance requirements necessary to achieve safe, reliable, and efficient utilization of nuclear energy, and management and processing of radioactive materials.

NQA-1 focuses on the achievement of results, and emphasizes the role of the individual and line management in the achievement of quality. It fosters the application of these requirements in a manner consistent with the relative importance of the item or activity.



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SERVICE SECTIONS







SECTION II – MATERIALS

Part A covers Ferrous Material; Part B covers Nonferrous Material; Part C covers Welding Rods, Electrodes, and Filler Metals; and Part D covers Material Properties in both Customary and Metric units of measure.

Together, these four parts of Section II comprise a "service Code" to other BPVC Sections, providing material specifications adequate for safety in the field of pressure equipment. These specifications contain requirements for chemical and mechanical properties, heat treatment, manufacture, heat and product analyses, and methods of testing. Part A and Part B specifications are designated by SA or SB numbers, respectively, and are identical with or similar to those of specifications published by ASTM and other recognized national or international organizations. Part C specifications are designated by SFA numbers and are derived from AWS specifications.

SECTION V NONDESTRUCTIVE EXAMINATION

…Is another "service Code" – containing requirements and methods for nondestructive examination which are referenced and required by other BPVC Sections. It also includes manufacturer's examination responsibilities, duties of authorized inspectors and requirements for qualification of personnel, inspection and examination. Examination methods are intended to detect surface and internal discontinuities in materials, welds, and fabricated parts and components. A glossary of related terms is included.

SECTION IX

Welding, Brazing, and Fusing Qualifications

…Is another "service Code" – containing rules relating to the qualification of welding, brazing, and fusing procedures as required by other BPVC Sections. It also covers rules relating to the qualification and requalification of welders, brazers, and welding and brazing operators in order that they may perform welding or brazing in component manufacture. Welding, brazing and fusing data cover essential and nonessential variables specific to the welding, brazing or fusing process used.

CODE CASES PRESSURE TECHNOLOGY / NUCLEAR

Starting with this 2015 Edition, the BPVC will be revised every two years. But what happens in the interim with new materials or alternative constructions? How does the BPVC keep current with the latest in technology and applications?

Code Cases are approved actions by the BPVC Committees on these alternatives, intended to allow early and urgent implementation of any revised requirements. They are issued four times per year in two categories: Boiler and Pressure Vessels (CC-BPV) and Nuclear (CC-NUC). Users may purchase individual publications at any time. Or they may subscribe to receive full sets of Code Cases as they are published for the duration of that BPVC edition's cycle.

This responsiveness to requests illustrates the unique openness and transparency of ASME's code-development process – striving to reflect best-practices of industry, while contributing to safety for the general public.

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ASME CONFORMITY ASSESSMENT – BECAUSE YOU HAVE HIGH STANDARDS



Currently, there are more than **7,000 ASME certificate holders** in 75 countries.

As of August 2014

ASME's product certification programs qualify the manufacture or assembly of a company's products to ASME standards. These programs are designed to enhance public safety and facilitate international commerce.

Manufacturers who achieve product certification by ASME may:

- Increase the quality and safety of their products
- Enable business in the global marketplace
- Achieve production efficiencies
- Use an ASME Certification Mark on their product*

Visit **go.asme.org/CERTIFICATIONS**

*Not all product certifications include an ASME designator.

BOILER AND PRESSURE VESSEL CERTIFICATION

The ASME BPV Certification Program conforms to the rules governing the design, fabrication, assembly, and inspection of boiler and pressure vessel components during construction. In 1916, shortly after the first publication of the Rules for the Construction of Stationary Boilers and for Allowable Working Pressures, known today as the ASME BPVC, ASME began offering certification to companies in the pressure equipment industry to certify their quality control systems. Products manufactured by ASME BPV Certificate Holders are certified and stamped with the Certification Mark (a.k.a., Designator or Stamp) in accordance with the applicable ASME BPVC Section.

SECTION I POWER BOILERS

"S" Designator – Power Boilers

"A" Designator – Assembly of Power Boilers

"E" Designator – Electric Boilers

"M" Designator – Miniature Boilers

"PP" Designator – Pressure Piping

"V" Designator – Boiler Safety Relief Valves

SECTION IV – HEATING BOILERS

"H" Designator – Heating Boilers

"HLW" Designator – Lined Potable Water Heaters

"HV" Designator – Heating Boiler Safety Relief Valves

SECTION VIII DIVISION 1 PRESSURE VESSELS

"U" Designator – Pressure Vessels

"UM" Designator – Miniature Pressure Vessels

"UV" Designator – Pressure Vessel Pressure Relief Valves

"UD" Designator – Pressure Vessel Rupture Disk Devices

SECTION VIII DIVISION 2 PRESSURE VESSELS

"U2" Designator – Pressure Vessels (Alternative Rules for Pressure Vessels)

SECTION VIII DIVISION 3 PRESSURE VESSELS

"U3" Designator – High Pressure Vessels

"UV3" Designator – High Pressure Vessel Pressure Relief Valves

"UD3" Designator – High Pressure Vessel Pressure Rupture Disk Devices (New)

SECTION X FIBER-REINFORCED PLASTIC VESSELS

"RP" Designator – Fiber-Reinforced Plastic Vessels

SECTION XII TRANSPORTS TANKS

"T" Designator – Transport Tanks

"TV" Designator – Transport Tanks Pressure Relief Valves

"TD" Designator – Transport Tanks Pressure Relief Devices

FOR DETAILS, CALL 1-800-THE-ASME (1-800-843-2763) (OR) 1-973-882-1170 (OR) VISIT GO.ASME.ORG/BPVC15.

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NUCLEAR COMPONENT CERTIFICATION

Nuclear-type Certificates of Authorization issued by ASME verify the adequacy of an organization's quality assurance program and allow the Certificate Holder to design, fabricate, and install components and supports used in nuclear power plants and other nuclear facilities. These components will be certified and stamped with the Certification Mark in accordance with Section III of the ASME BPVC.

ASME issues six different N-type certificates, and an owner's certificate that authorizes the following scope of activities:

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

NUCLEAR MATERIAL ORGANIZATION CERTIFICATION

The Nuclear Material Organization Certification Program certifies organizations that provide materials and services to the nuclear power industry. The rules for this certification program were first introduced in the 1973 Winter Addenda of the ASME BPVC for Material Manufactures and Material Suppliers, which currently are referred to as Material Organizations.

Quality System Certificates (QSC) issued by ASME verify the adequacy of a Material Organization's quality system program. This quality system program provides assurance that the organization's operations, processes, and services related to the procurement, manufacture, and supply of material, source material, and unqualified source material are performed in accordance with the requirements of the ASME BPVC, Section III, NCA-3800 and NCA-3900.

View the **ASME codes and standards** required for each certification. Visit **go.asme.org/REQUIREDCODEBOOKS.**



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NQA-1 Certification Your Quality Begins With **Quality Assurance**

Entering the nuclear supply chain can be a daunting and costly task. To support the nuclear industry, ASME developed its new NQA-1 certification program to assess and certify companies that are committed to understanding quality and producing high-quality products and services. The ASME NQA-1 certification is designed to assess a supplier's capability in implementing a quality assurance program that meets the requirements of the NQA-1 Standard.

Suppliers who achieve NQA-1 certification, may:

- Gain a competitive edge in the marketplace.
- Save time and money by reducing length and frequency of audits.
- Inspire confidence in the safety of your company and its products.

"When potential clients hear that our quality assurance program has been certified by ASME, it's automatic for them to understand what requirements the program meets. Premier's business opportunities have grown exponentially since we achieved our NQA-1 certification."

– Mathew Burke,
Quality Assurance Manager, Premier Technology Inc., Blackfoot, Idaho

Visit **go.asme.org/NQA-1**

THE NEW CA CONNECT HAS ARRIVED

Conformity Assessment At Your Fingertips
caconnect.asme.org

CA Connect, ASME's online system for managing certification and accreditation programs, has been completely redesigned with you in mind.

The New CA Connect:

- Is easier to navigate
- Demonstrates increased speed and performance
- Improves the user experience

For general certification and accreditation information, please visit **go.asme.org/certifications**



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VOLUNTEERING

BENEFITS OF VOLUNTEERING FOR BPVC COMMITTEES

For more than 100 years, ASME has successfully attracted volunteer technical experts to develop, maintain and disseminate ASME codes and standards. Participation by volunteers is the lifeblood of the BPVC.

INDIVIDUALS

As a BPVC Committee volunteer, you gain:

- Early Awareness ... of critical technical and regulatory issues that could directly impact your business.
- Benchmarking ... leading organizations in your industry, to see how your business practices measure up.
- Professional Networking ... with nearly 1,000 "best of the best" nuclear technical experts from across the country and around the world.

COMPANIES

Involvement on BPVC committees provides companies with critical information, plus opportunities to expand their global networks and strengthen involvement in the decision-making process.

Being involved in the development of ASME codes and standards provides early and ongoing awareness of technical issues in industry and how others are dealing with them. This awareness allows participants to avoid these issues within their own organizations or to have solutions prepared should problems arise.

GOVERNMENT

ASME also helps governments ensure the safety of their citizens and their environment through the adoption of ASME codes and standards to satisfy regulation. Use of ASME codes and standards lessens the burden on government by providing a technically-sound basis for achieving regulatory goals without imposing an unnecessary burden on industry. Government involvement on BPVC committees provides officials with critical information and strengthens involvement in the decision-making process, so that regulations are understood and enforceable.

"BOILER CODE WEEKS"

The BPVC is kept current by the BPVC Committee, a volunteer group of nearly 1,000 technical experts, balanced between the interests of industry, government and R&D. The Committee meets in person four times per year during "Boiler Code Weeks" to consider requests for interpretations, revisions, and to develop new rules. Its activities culminate in a new edition of the BPVC, now issued and published every two years.

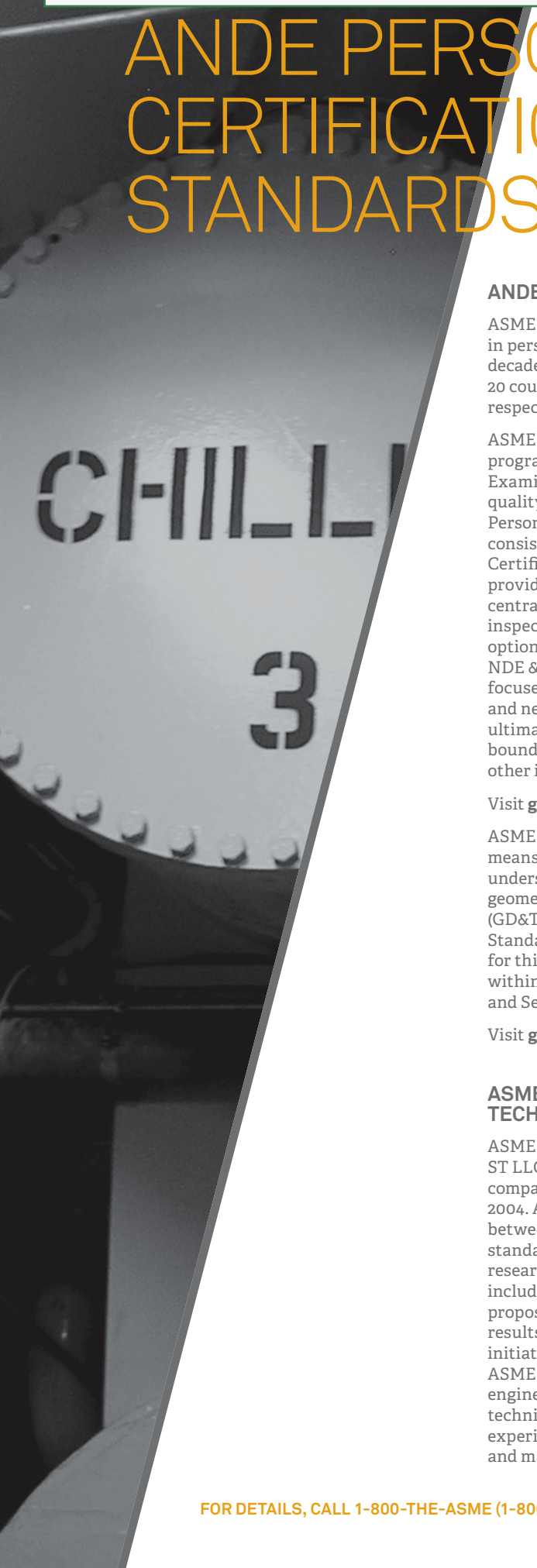
In the formation of its rules and the establishment of maximum design and operating pressures, the Committee considers technological advances including materials, construction, methods of fabrication, inspection, certification, and overpressure protection. It functions in a fully open and transparent manner via consensus process. The results of this methodology have resulted in ASME codes and standards proven safe, reliable and effective worldwide, across dozens of major industries, for more than a century.

The Committee benefits from a broad range of volunteer experience, from department heads and the top technical experts in their fields all the way to young engineers in their early-career stages. This mix helps assure that the resulting standards are truly visionary, while also being practical and applicable for everyday end-users. All those interested are welcome to apply.

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ANDE PERSONNEL CERTIFICATION / ASME STANDARDS TECHNOLOGY, LLC

ANDE PERSONNEL CERTIFICATION

ASME has been setting the standard in personnel certification for over two decades. Over 3,000 professionals in 20 countries have achieved these respected credentials.

ASME NDE (ANDE) is a certification program for Non-Destructive Examination (NDE) personnel and quality control (QC) inspectors. ANDE Personnel Certification includes features consistent with other ASME Personnel Certification best-practices. This program provides independent, third-party centralized certification for NDE & QC inspection personnel as an alternate option to the historical, employer-based NDE & QC certification systems. It focuses on nuclear in-service inspection and new nuclear construction. ANDE will ultimately expand to include pressure-boundary and structural applications in other industries throughout the globe.

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ASME GDTP Certification provides the means to recognize proficiency in the understanding and application of geometric dimensioning and tolerancing (GD&T) principles. ASME's Y14.5-1994 Standard provides the body of knowledge for this exam. There are two certifications within this program, Technologist and Senior.

Visit **go.asme.org/GDTP**

ASME STANDARDS TECHNOLOGY, LLC

ASME Standards Technology, LLC (ASME ST LLC) is a subsidiary not-for-profit company under ASME established in 2004. ASME ST LLC bridges the gap between new technology and applicable standards development by managing research projects through all key steps, including: (a) identification of need, (b) proposal creation, (c) project initiation, (d) results review and publication, and (e) initiation of ASME standards actions. ASME ST LLC's project managers, project engineers, and consultants (e.g., scientists, technical experts) possess the hands-on experience necessary to develop, perform, and manage the most challenging research project. Technology proponents can be confident in the results: every ASME ST LLC project goes through a rigorous qualification, validation, and peer review process.

EXCEED RESEARCH GOALS WITH A TEAM OF HANDS-ON INDUSTRY EXPERTS

ASME ST LLC approaches its projects as well as meets client needs with the following capabilities:

- Standards and certification involvement in research projects helps ensure results will be relevant to standards committees.
- Collaborative research projects minimize individual investment while maximizing benefits.
- International partnerships of government, industry and academia help build consensus leading to technically relevant standards.
- Experienced project managers and project engineers successfully coordinate a project to meet stakeholder needs, including meeting project milestones, schedule, and budget as well as providing complete oversight of publishing of final reports.

COMMERCIALIZATION THROUGH STANDARDS DEVELOPMENT

The commercialization of new technology is critical to meeting many global challenges, and the role of codes and standards in bringing technology to market is changing. ASME ST LLC projects help knowledge make the transition from science to engineering, which allows technology proponents to achieve their vision.

Conducting relevant research is important to getting standards written or updated and approved. ASME ST LLC has contributed significantly to the advancement of industry through its dozens of published research projects. With new technologies constantly being proposed, the appropriate research plays a critical role in getting standards developed for these technologies and to be used ultimately by industry owners, operators, and regulators.

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TRAINING AND DEVELOPMENT COURSES

ASME appreciates that an organization's most valuable asset is its workforce. As a recognized leader in workforce learning solutions for engineers and technical professionals, our goal is to help individuals expand their knowledge and organizations develop their core human assets.

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BOILERS AND PRESSURE VESSELS LEARNING MATRIX

	FUNDAMENTAL	INTERMEDIATE	ADVANCED
BOILERS AND PRESSURE VESSELS	BPV Code, Section I: Power Boilers (LC) **PD665** BPV Code, Section VIII, Division 1: Design & Fabrication of Pressure Vessels (LC) **PD442** (**Also online – EL501**) BPV Code, Section VIII, Division 1 Combo Course (combines **PD441** and **PD442**) (LC) **PD443** Pressure Relief Devices: Design, Sizing, Construction, Inspection & Maintenance (LC) **PD583** Non-Destructive Examination – Applying ASME Code Requirements (BPV Code, Section V) (LC) **PD389** B31.1 Power Code (LC) **PD013**	BPV Code, Section VIII, Division 2: Alternative Rules – Design and Fabrication of Pressure Vessels (LC) **PD448** (Also online – **EL502**) Design by Analysis Requirements in ASME Boiler and Pressure Vessel Code Section VIII, Division 2 – Alternative Rules (MC) **MC121** Inspections, Repairs and Alterations of Pressure Equipment (LC) **PD441** (Also online – **EL503**) Failure Prevention, Repair & Life Extension of Piping, Vessels and Tanks (LC) **PD077** Repair Strategies and Considerations for Pressure Vessels and Piping (MC) **MC114** API 579-1/ASME FFS-1 Fitness-for-Service (LC) **PD395** How to Predict Thermal-Hydraulic Loads on Pressure Vessels & Piping (LC) **PD382** Seismic Design and Retrofit of Equipment and Piping (LC) **PD394**	BPV Code: Plant Equipment Requirements (LC) **PD662** Bases and Application of Heat Exchanger Mechanical Design Rules in Section VIII of the Boiler and Pressure Vessel Code (MC) **MC104** Flow Induced Vibration with Applications to Failure Analysis (LC) P**D146** Structural Materials and Design for Elevated to High Temperatures (MC) **MC112** Techniques and Methods Used in API 579-1/ASME FFS-1 for Advanced Fitness-For-Service (FFS) Assessments (MC) **MC113**
PIPING	BPV Code, Section III, Division 1: Class 1 Piping Design (SS) **EL542** BPV Code, Section III, Division 1: Class 2 & 3 Piping Design (SS) **EL543** B31 Piping Fabrication and Examination (LC) **PD445** B31.1 Power Piping Code (LC) **PD013** B31.3 Process Piping Design (LC) **PD014** B31.3 Process Piping Materials Fabrication, Examination and Testing (LC) **PD457** B31.3 Process Piping Design, Materials, Fabrication, Examination and Testing Combo Course (combines **PD014** and **PD457**) (LC) **PD581** Processes (LC) **PD593 (Also online – PD593)** Non-Destructive Examination – Applying ASME Code Requirements (BPV Code, Section V) (LC) **PD389**	Failure Prevention, Repair & Life Extension of Piping, Vessels and Tanks (LC) **PD077** Repair Strategies and Considerations for Pressure Vessels and Piping (MC) **MC114** API 579-1/ASME FFS-1 Fitness-for-Service (LC) **PD395** How to Predict Thermal-Hydraulic Loads on Pressure Vessels & Piping (LC) **PD382** Seismic Design and Retrofit of Equipment and Piping (LC) **PD394**	Flow Induced Vibration with Applications to Failure Analysis (LC) **PD146** Techniques and Methods Used in API 579-1/ASME FFS-1 for Advanced Fitness-For-Service (FFS) Assessments (MC) **MC113**
WELDING	BPV Code, Section IX: Welding, Brazing and Fusing Qualifications (LC) **PD190** (**Also online – EL516**) Practical Welding Technology (LC) **PD359**		

KEY FOR COURSE TYPE: LC = Live Course MC = MasterClass Series IS = Instructor-Supported eLearning SS = Self-study eLearning

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NUCLEAR LEARNING MATRIX

ASME'S BOILER AND PRESSURE VESSEL CODE (BPVC) 2015

	FUNDAMENTAL	INTERMEDIATE	ADVANCED
FACILITY CONSTRUCTION	BPV Code, Section III: Introduction (IS) **EL509** BVP Code, Section III, Division 1: Rules for Construction of Nuclear Facility Components (LC) **PD184** Overview of Codes & Standards in Nuclear Power Plant Construction (LC) **PD633** Design in Codes, Standards and Regulations for Nuclear Power Plant Construction (LC) **PD632**	Manufacturing, Fabrication & Examination Responsibilities in Codes, Standards and Regulations for Nuclear Power Plant Construction (LC) **PD631** BPV Code, Section III, Division 1: Class 1, 2, & 3 Piping Design (LC) **PD615** Design of Buried High Density Polyethylene (HDPE) Piping Systems (LC) **PD617 (Also online – EL544)**	Advanced Design & Construction of Nuclear Facility Components per BVP Code, Section III (LC) **PD644 (Also online –EL524)** Design Basis vs Beyond Design Basis Considerations in Nuclear Plants (MC) **MC120** Structural Materials and Design for Elevated to High Temperatures (MC) **MC112** Techniques and Methods Used in API 579-1/ASME FFS-1 for Advanced Fitness-For-Service (FFS) Assessments (MC) **MC113**
QUALITY ASSURANCE	NQA-1 Quality Assurance for Nuclear Facility Applications (LC) **PD635** Quality Assurance (QA) Considerations for New Nuclear Facility Construction (LC) **PD523** NQA-1 Requirements for Computer Software Used in Nuclear Facilities (LC) P**D606** ASME NQA-1 Lead Auditor Training (LC) **PD675** ASME NQA-1 and DOE Quality Assurance Rule 10 CFR 830 (LC) **PD711** Comparison of Global Quality Assurance & Management System Standards used for Nuclear Applications (LC) **PD634 (Also online – EL526)**		Real World Application of Commercial Grade Dedication (MC) **MC102** Identifying and Preventing the Use of Counterfeit, Fraudulent, and Suspect Items (MC) **MC103** Software Dedication Training on Use of Commercial Grade Computer Programs for Design and Analysis in Nuclear Applications (MC) **MC105**
BALANCE OF PLANT	BPV Code, Section VIII, Division 1: Design & Fabrication of Pressure Vessels (LC) **PD442 (Also online – EL501)** Inspection, Repairs and Alterations of Pressure Vessels (LC) **PD441 (Also online – EL503)** BVP Code, Section VIII, Division 2: Alternative Rules – Design and Fabrication of Pressure Vessels (LC) **PD448** (Also online – **EL502**) Flow-Induced Vibration with Applications to Failure Analysis (LC) **PD146** Non-Destructive Examination – Applying ASME Code Requirements (BPV Code, Section V) (LC) **PD389** Pressure Relief Devices: Design, Sizing, Construction, Inspection & Maintenance (LC) **PD583** B31.1 Power Piping Code (LC) **PD013**	How to Predict Thermal-Hydraulic Loads on Pressure Vessels & Piping (LC) **PD382** Seismic Design and Retrofit of Equipment and Piping (LC) **PD394**	Bases and Application of Heat Exchanger Mechanical Design Rules in Section VIII of the ASME Boiler and Pressure Vessel Code (MC) **MC104** Bases and Application of Piping Flexibility Analysis to ASME B31 Codes (MC) **MC110** Piping Vibration Causes and Remedies – A Practical Approach (MC) **MC111** Piping Failures - Causes and Prevention (MC) **MC117**
INSERVICE	Overview of Probabilistic Risk Assessment (PRA) Standard (SS) **EL541** Developing a 10-Year Pump Inservice Test Program (LC) **PD595** Developing a 10-Year Valve IST Program (LC) **PD596** Inservice Testing of Pumps (IS) **EL523** Inservice Testing of Valves (IS) **EL521**	BPV Code, Section XI: Inservice Inspection of Nuclear Power Plant Components (LC) **PD192** Risk-Informed Inservice Testing Program (LC) **PD597 (Also online –ZI309)**	Run-or-Repair Operability Decisions for Pressure Equipment and Piping Systems in Nuclear Plants (MC) **MC115** Life Cycle Management of Pressure Equipment and Piping Integrity (MC) **MC116** Environmentally-Assisted Fatigue Analysis, Monitoring and Management of Nuclear Plant Components (MC) **MC118** Corrosion and its Mitigation in Light Water Reactors MC) **MC119**

KEY FOR COURSE TYPE: LC = Live Course MC = MasterClass Series IS = Instructor-Supported eLearning SS = Self-study eLearning

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PUBLISHING



The ASME Digital Collection is ASME's repository of current and archival literature comprising ASME's Transaction Journals, Conference Proceedings, and eBooks. Boilers and Pressure Vessels is one of the Collection's main Topic areas; it includes more than 15,000 papers and chapters drawn from all publications.

ASME sponsors more than 30 conferences annually and publishes approximately 100 proceedings volumes -- much of this content is relevant to Boilers and Pressure Vessels. These proceedings include:

- ASME Pressure Vessels and Piping Conference (PVP).
- International Conference on Nuclear Engineering (ICONE).
- ASME International Mechanical Engineering Congress and Exposition (IMECE).
- ASME International Conference on Offshore Mechanics and Arctic Engineering (OMAE).
- ASME Power Conference.
- ASME Fluids Engineering Division Summer Meeting.
- ASME Turbo Expo: Turbine Technical Conference and Exposition.
- International Pipeline Conference (IPC).

The ASME Journal Program has been established to further the progress of science through the sharing the latest engineering research. Each ASME Journal title publishes the highest quality, peer-reviewed literature in its respective field of mechanical engineering. Specific Journals related to Boilers and Pressure Vessels include:

- Journal of Engineering Resources Technology.
- Journal of Engineering for Gas Turbines and Power.
- Journal of Fluids Engineering.
- Journal of Heat Transfer.
- Journal of Manufacturing Science and Engineering.
- Journal of Solar Energy Engineering.
- Journal of Pressure Vessel Technology.
- Journal of Turbomachinery.

ASME Press has over 150 eBooks now available. Specific titles related to Boilers and Pressure Vessels include:

- Primer on Engineering Standards (2014).
- Fluid Mechanics, Water Hammer, Dynamic Stresses, and Piping Design (2013).
- Companion Guide to the ASME Boiler and Pressure Vessel and Piping Codes, Fourth Edition-Volumes 1 & 2 (2012).
- Power Boilers: A Guide to Section I of the ASME Boiler and Pressure Vessel Code, Second Edition (2011).
- Quick Guide to API 510 Certified Pressure Vessel Inspector Syllabus: Example Questions and Worked Answers (2010).
- Guidebook for the Design of ASME Section VIII Pressure Vessels, Fourth Edition (2010).
- Design and Analysis of ASME Boiler and Pressure Vessel Components in the Creep Range (2009).

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ASME also publishes Mechanical Engineering magazine, Mechanical Advantage, ME Today, and ASME News, the Society's online newspaper.



FOR DETAILS, CALL 1-800-THE-ASME (1-800-843-2763) (OR) 1-973-882-1170 (OR) VISIT GO.ASME.ORG/BPVC15.

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ASME
SETTING THE STANDARD

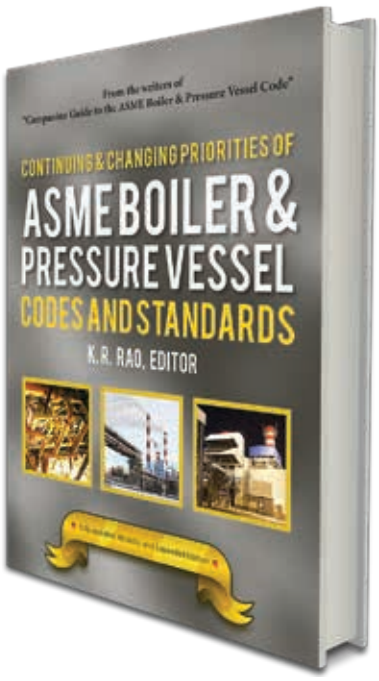
2015 ASME
Boiler and Pressure Vessel Code
An International Code

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Continuing and Changing Priorities of the ASME Boiler and Pressure Vessel Codes and Standards

This comprehensive work written by ASME Codes and Standards experts was originally published as part of Volume 3 of the Companion Guide to the ASME Boiler & Pressure Vessel Code. This fully updated and expanded volume is now a stand-alone publication that addresses Continuing and Changing Priorities for the success of current and next generation Nuclear Reactors and Internals, License Renewal, Public Safety, and PRA issues.

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