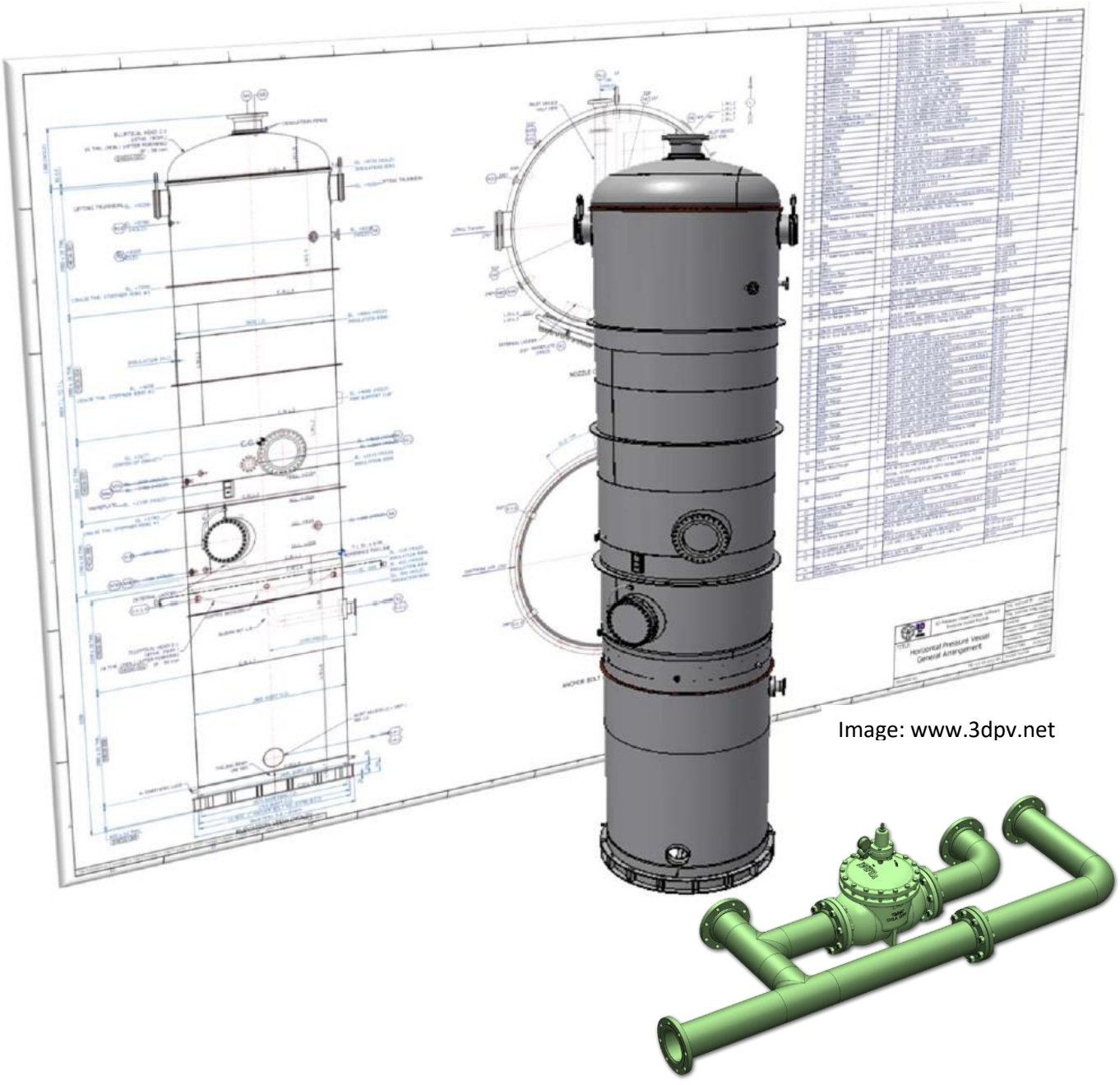
What are the ASME Codes for Pressure Vessels & Pressure Piping



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ASME PRESSURE VESSELS

ASME Section I and Section VIII

The ASME Code design criteria consist of rules for:

- Design method
- Design loads
- Allowable stress
- Acceptable materials
- Fabrication
- Testing
- Certification
- Inspection requirements

The ASME International Boiler and Pressure Vessel Code is made of 12 sections and contains over 15 divisions and subsections.

Code Sections:

I. Power Boilers

II. Materials

III. Rules for Construction of Nuclear Facility Components

IV. Heating Boilers

V. Nondestructive Examination

VI. Recommended Rules for the Care and Operation of Heating Boilers

VII. Recommended Guidelines for the Care of Power Boilers

VIII. Pressure Vessels

IX. Welding and Brazing Qualifications

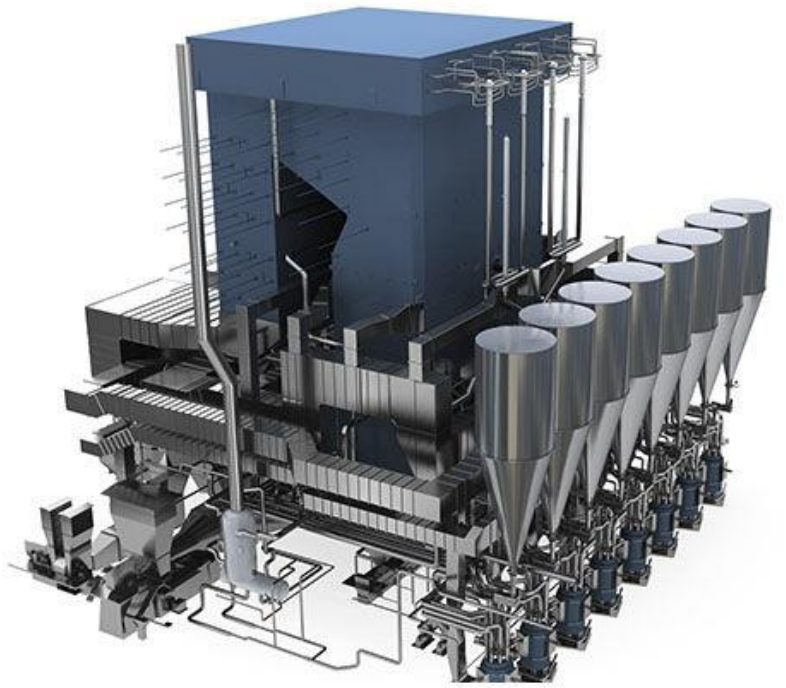
X. Fiber-Reinforced Plastic Pressure Vessels

XI. Rules for In-service Inspection of Nuclear Power Plant Components

XII. Rules for Construction and Continued Service of Transport Tanks

SECTION I - Power Boilers:

This Section 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, and traction service.



1 GE Steam Boiler

SECTION II – Materials:

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

SECTION III - Rules for Construction of Nuclear Facility Components:

Includes the “NV” (Nuclear Safety and Pressure Relief Valves), Part A, Ferrous Materials, Part B, Nonferrous Materials, Part D, Properties, Customary or Metric and “N3” (N-Type Certificates of Authorization and Certificates of Accreditation).

nucleus.iaea.org

This Subsection contains appendices, both mandatory and nonmandatory for Section III. The Division 1 includes the Subsection NCA through NH as described below.

• DIVISION 1

- Subsection NB- Class 1 Components
- Subsection NC- Class 2 Components
- 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

• DIVISION 2

- Code for Concrete Containments

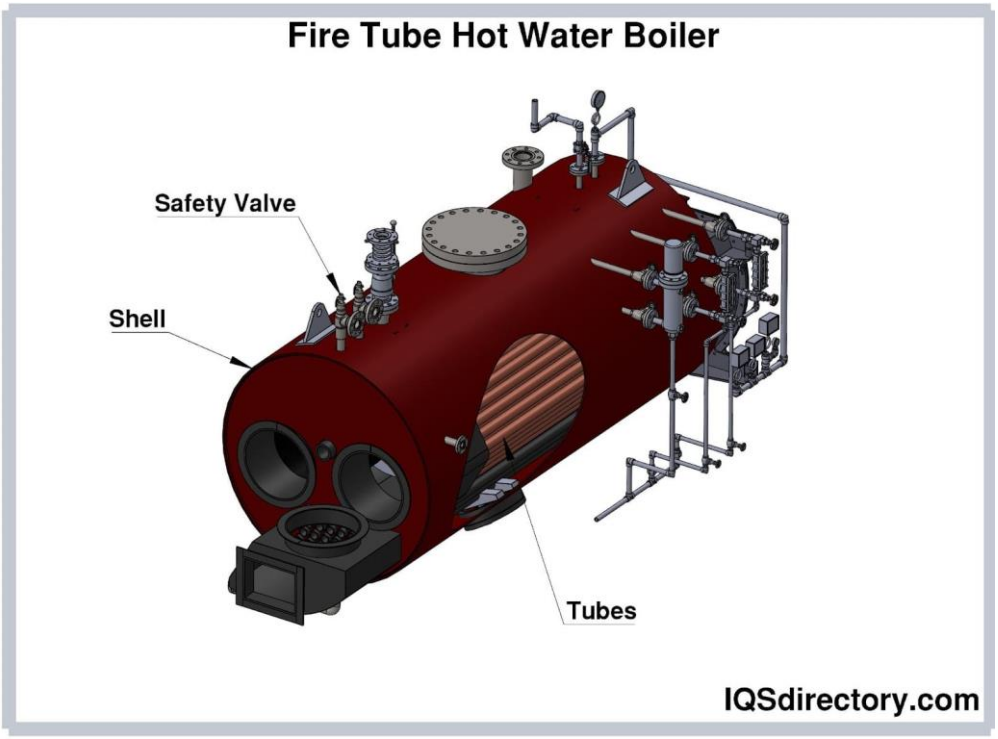
• DIVISION 3

- Containments for Transportation and Storage

SECTION IV - Heating Boilers:

Requirements for design, fabrication, installation and inspection of steam generating boilers, and hot water boilers intended for low pressure service that are directly fired by oil, gas, electricity, or coal.

It contains appendices which cover approval of new material, methods of checking safety valve, safety relief valve capacity, definitions relating to boiler design and welding and quality control systems.



SECTION V - Nondestructive Examination:

Requirements and methods for nondestructive examination which are referenced and required by other code Sections.

It also includes manufacturer's examination responsibilities, duties of authorized inspectors and requirements for qualification of personnel, inspection and examination.

SECTION VI - Recommended Rules for the Care and Operation of Heating Boilers:

It defines general descriptions, terminology and guidelines applicable to steel and cast iron boilers limited to the operating ranges of Section IV Heating Boilers.

It includes guidelines for associated controls and automatic fuel burning equipment.

SECTION VII - Recommended Guidelines for the Care of Power Boilers:

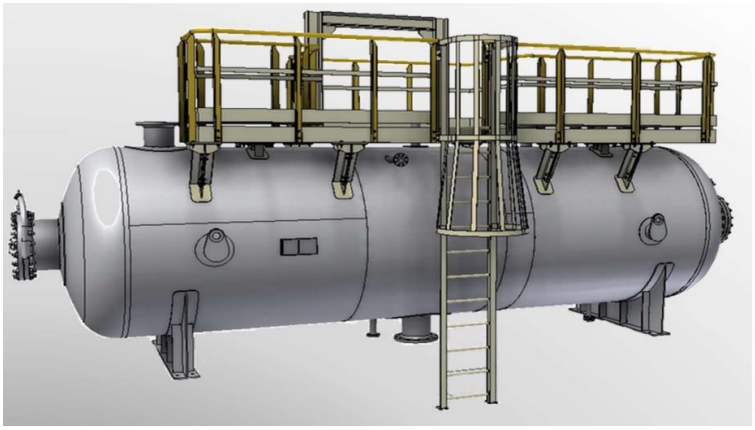
Guidelines to promote safety in the use of stationary, portable, and traction type heating boilers.

The section provides guidelines to assist operators of power boilers in maintaining their plants as safely as possible.

Contains fuels for routine operation; Operating and maintaining boiler appliances; Inspection and prevention of boiler failure; Design of installation; Operation of boiler auxiliaries; Control of internal chemical conditions

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.
- Division 2 - Alternative rules, provides requirements to the design, fabrication, inspection, testing, and certification of pressure vessels operating at either internal or external pressures exceeding 15 psig.
- 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.



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SECTION IX - Welding and Brazing Qualifications:

Rules relating to the qualification of welding and brazing procedures as required by other Code Sections for component manufacture. Covers rules are related to the qualification and re-qualification of welders and welding and brazing operators in order that they may perform welding or brazing as required by other Code Sections in the manufacture of components.

SECTION X - Fiber-Reinforced Plastic Pressure Vessels:

Requirements for construction of FRP (Fiber-Reinforced Plastic) pressure vessels in conformance with a Manufacturer's design report. It includes production, processing, fabrication, inspection and testing methods required.

SECTION XI - Rules for In-service Inspection of Nuclear Power Plant Components:

Requirements for the examination, in-service testing and inspection, and repair and replacement of components and systems in light-water cooled and liquid-metal cooled nuclear power plants.

SECTION XII - Rules for Construction and Continued Service of Transport Tanks:

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.

ASME PRESSURE PIPING

ASME-ANSI B31 Codes:

- ASME B31 was earlier known as ANSI B31. The B31 Code for Pressure Piping, covers Power Piping, Fuel Gas Piping, Process Piping, Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids, Refrigeration Piping and Heat Transfer Components and Building Services Piping.
- Piping consists of pipe, flanges, bolting, gaskets, valves, relief devices, fittings and the pressure containing parts of other piping components. It also includes hangers and supports, and other equipment items necessary to prevent overstressing the pressure containing parts. It does not include support structures such as frames of buildings, buildings stanchions or foundations.

B31.1 - Power Piping:

- Required piping for industrial plants and marine applications. This code prescribes requirements for the design, materials, fabrication, erection, test, and inspection of power and auxiliary service piping systems for electric generation stations, industrial institutional plants, central and district heating plants. The code covers boiler external piping for power boilers and high temperature, high pressure water boilers in which steam or vapor is generated at a pressure of more than 15 PSIG; and high temperature water is generated at pressures exceeding 160 PSIG and/or temperatures exceeding 250 degrees F.

B31.2 - Fuel Gas Piping:

- This has been withdrawn as a National Standard and replaced by ANSI/NFPA Z223.1, but B31.2 is still available from ASME and is a good reference for the design of gas piping systems (from the meter to the appliance).

B31.3 - Process Piping:

- Code rules for design of chemical, petroleum plants, refineries, hydrocarbons, water and steam. This Code contains rules for piping typically found in petroleum refineries; chemical, pharmaceutical, textile, paper, semiconductor, and cryogenic plants; and related processing plants and terminals. It prescribes requirements for materials and Components, design, fabrication, assembly, erection, examination, inspection, and testing of piping. Also included is piping which interconnects pieces or stages within a packaged equipment assembly.

B31.4 - Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids:

This Code prescribes requirements for the design, materials, construction, assembly, inspection, and testing of piping transporting liquids such as crude oil, condensate, natural gasoline, natural gas liquids, liquefied petroleum gas, carbon dioxide, liquid alcohol, liquid anhydrous ammonia and liquid petroleum products between producers' lease facilities, tank farms, natural gas processing plants, refineries, stations, ammonia plants, terminals (marine, rail and truck) and other delivery and receiving points. The requirements for offshore pipelines are found in Chapter IX. Also included within the scope of this Code are:

- Primary and associated auxiliary liquid petroleum and liquid anhydrous ammonia piping at pipeline terminals (marine, rail and truck), tank farms, pump stations, pressure reducing stations and metering stations, including scraper traps, strainers, and proper loops;
- Storage and working tanks including pipe-type storage fabricated from pipe and fittings, and piping interconnecting these facilities; Liquid petroleum and liquid anhydrous ammonia piping located on property which has been set aside for such piping within petroleum refinery, natural gasoline, gas processing, ammonia, and bulk plants;
- Those aspects of operation and maintenance of liquid pipeline systems relating to the safety and protection of the general public, operating company personnel, environment, property and the piping systems.

B31.5 - Refrigeration Piping and Heat Transfer Components:

- This Code prescribes requirements for the materials, design, fabrication, assembly, erection, test, and inspection of refrigerant, heat transfer components, and secondary coolant piping for temperatures as low as -320 °F (-196 °C), whether erected on the premises or factory assembled, except as specifically excluded in the following paragraphs.
- Users are advised that other piping Code Sections may provide requirements for refrigeration piping in their respective jurisdictions.

This Code shall not apply to:

- Any self-contained or unit systems subject to the requirements of Underwriters Laboratories or other nationally recognized testing laboratory:
- Water piping and piping designed for external or internal gage pressure not exceeding 15 psi (105 kPa) regardless of size; or
- Pressure vessels, compressors, or pumps, but does include all connecting refrigerant and secondary coolant piping starting at the first joint adjacent to such apparatus.

B31.8 - Gas Transmission and Distribution Piping Systems:

This Code covers the design, fabrication, installation, inspection, and testing of pipeline facilities used for the transportation of gas. This Code also covers safety aspects of the operation and maintenance of those facilities.

B31.8S - Managing System Integrity of Gas Pipelines:

This Standard applies to on-shore pipeline systems constructed with ferrous materials and that transport gas. Pipeline system means all parts of physical facilities through which gas is transported, including pipe, valves, appurtenances attached to pipe, compressor units, metering stations, regulator stations, delivery stations, holders and fabricated assemblies.

The principles and processes are applicable to all pipeline systems. This Standard is specifically designed to provide the operator (as defined in section 13) with the information necessary to develop and implement an effective integrity management program utilizing proven industry practices and processes. The processes and approaches within this Standard are applicable to the entire pipeline system.

B31.9 - Building Services Piping:

This Section has rules for the piping in industrial, institutional, commercial and public buildings, and multiunit residences, which does not require range of sizes, pressures, and temperatures covered in B31.1. This Code prescribes requirements for the design, materials, fabrication, installation, inspection, examination and testing of piping systems for building services. It includes piping systems in the building or within the property limits.

B31.11 - Slurry Transportation Piping Systems:

Rule for design, construction, inspection and security requirements of slurry piping systems. This code covers piping systems that transport aqueous slurries of no hazardous materials, such as coal, mineral ores and other solids between a slurry processing plant and the receiving plant.

B31G - Manual for Determining Remaining Strength of Corroded Pipelines:

The scope of this Manual includes all pipelines within the scope of the pipeline codes that are part of ASME B31 Code for Pressure Piping, ASME B31.4, Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols; ASME B31.8, Gas Transmission and Distribution Piping Systems; and ASME B31.11, Slurry Transportation Piping Systems. Parts 2, 3, and 4 are based on material included in ASME Guide for Gas Transmission and Distribution Piping Systems, 1983 Edition.