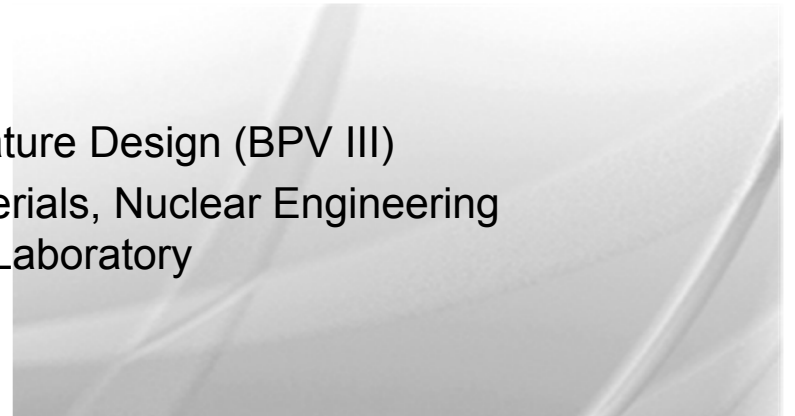




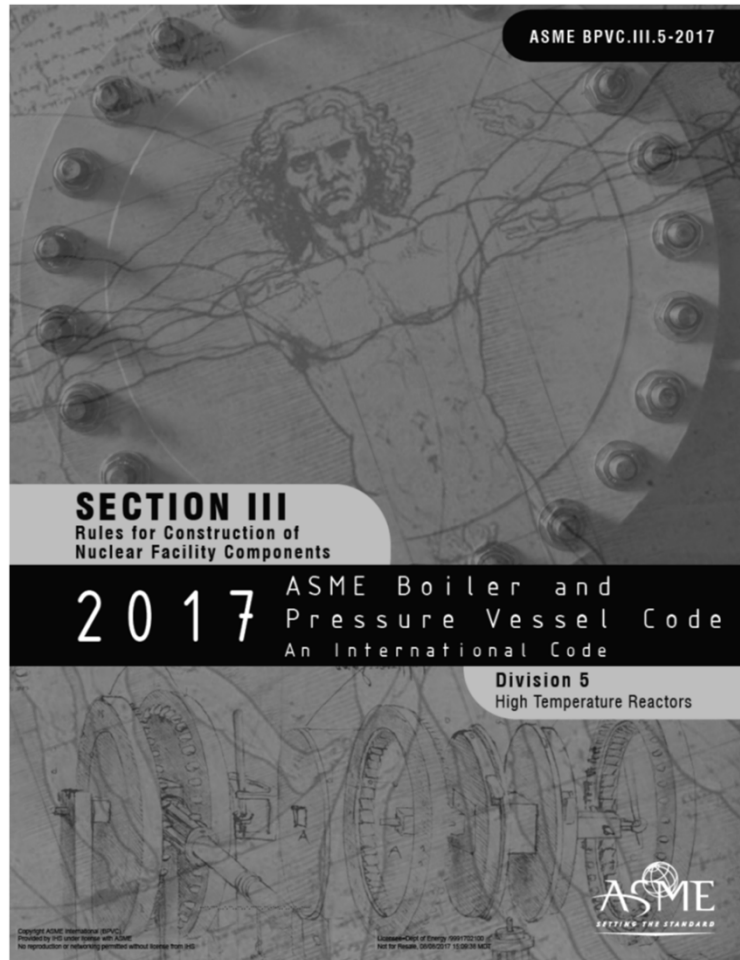
Task Groups on ASME/NRC Liaison for Division 5

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ASME Boiler and Pressure Vessel Code



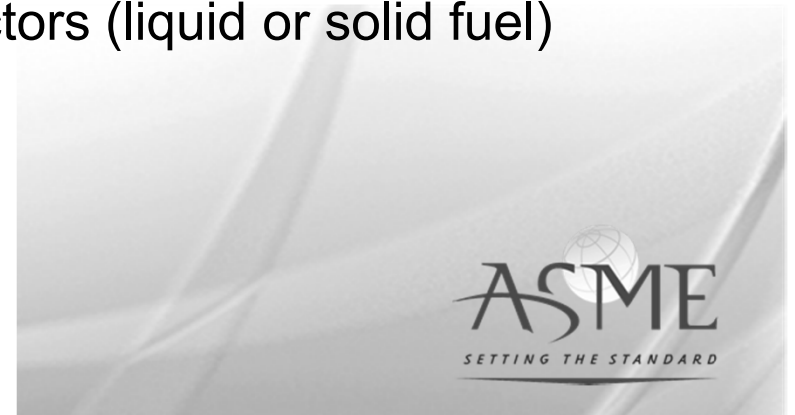
Section III
Rules for Construction of
Nuclear Facility
Components

Division 5 (2017 Edition)
High Temperature Reactors



Section III Division 5 (2017 Edition) Scope

- Division 5 rules govern the construction of vessels, storage tanks, piping, pumps, valves, supports, core support structures and nonmetallic core components for use in high temperature reactor systems and their supporting systems
 - Construction, as used here, is an all-inclusive term that includes material, design, fabrication, installation, examination, testing, overpressure protection, inspection, stamping, and certification
 - High temperature reactors include gas-cooled reactors, liquid metal reactors and molten salt reactors (liquid or solid fuel)



Section III Division 5 (2017 Edition)

Organization

Class	Subsection	Subpart	Subsection ID	Title	Scope
General Requirements *					
Class A, B, & SM	HA	A	HAA	Metallic Materials	Metallic
Class SN		B	HAB	Graphite and Composite Materials	Nonmetallic
Class A Metallic Pressure Boundary Components					
Class A	HB	A	HBA	Low Temperature Service	Metallic
Class A		B	HBB	Elevated Temperature Service	Metallic
Class B Metallic Pressure Boundary Components					
Class B	HC	A	HCA	Low Temperature Service	Metallic
Class B		B	HCB	Elevated Temperature Service	Metallic
Class A and Class B Metallic Supports					
Class A & B	HF	A	HFA	Low Temperature Service	Metallic
Class SM Metallic Core Support Structures *					
Class SM	HG	A	HGA	Low Temperature Service	Metallic
Class SM		B	HGB	Elevated Temperature Service	Metallic
Class SN Nonmetallic Core Components *					
Class SN	HH	A	HHA	Graphite Materials	Graphite
Class SN		B	HHB	Composite Materials	Composite

* Class designation being balloted

Division 5 Rules for Metallic Components (1/2)

- The 2017 edition of Division 5 construction rules for metallic components were developed to guard against time independent and time dependent structural failure modes
- The construction rules for Division 5 Class A components are common to all qualified Class A materials
 - If additional applicable data for a specific qualified material in the 2017 edition of Division 5 are available that would permit extension to longer design lifetimes, or if a new qualified material is added, the construction rules of the 2017 edition of Division 5 would remain the same
 - Extension of design lifetimes for qualified materials or incorporation of new qualified materials is considered as “optimization” rather than affecting the “adequacy” of the 2017 edition of the Division 5 construction rules
 - Guidelines for design data needs for new materials are provided in Appendix HBB-Y of the 2017 edition of Division 5

Division 5 Rules for Metallic Components (2/2)

- Design procedures and materials data not contained in the 2017 edition of Division 5 may be required to ensure the integrity or the continued functioning of the structural part during the specified service life
 - E.g., rules do not provide methods to evaluate deterioration that may occur in service as a result of corrosion, mass transfer phenomena, radiation effects, or other material instabilities
 - Owner/operator has the responsibility to demonstrate to the regulator that these effects are accounted for in the design of the components



ASME Actions to Optimize 2017 Edition of Division 5 Rules

- Various actions are being taken to extend qualified lifetimes of Class A materials to support 60-year design life
- New Class A material, Alloy 617, is being incorporated into Division 5 to expand design envelope
- Elastic, perfectly plastic methods are being developed to modernize and simplify Division 5 design analyses
- Inelastic analysis methods are being developed for incorporation into Division 5 Appendix HBB-Z
- Design rules for integrally clad components with weld overlay on Class A materials are being developed to support molten salt reactor applications
- Graphite irradiation data are being incorporated into Division 5 to support use of graphite design rules
- Ceramic composite design rules are being incorporated into Division 5

ASME/NRC Liaison Task Groups for Division 5

- Two ASME/NRC liaison task groups for Division 5, one on metallic and the second on nonmetallic, were formed to develop roadmaps to assist NRC's internal assessment of endorsing the 2017 edition of Division 5



Task Group Activities - Metallic

- Phase I (by August 2018)
 - White paper on the technical bases of the current rules for metallic components
 - High level exposition through reference to relevant references
 - White paper to assess the issue lists identified previously by NRC and ACRS at various times *
 - Will separate issues into two categories, one that is within the 2017 edition of the ASME Division 5 scope and the other outside the ASME space (e.g., irradiation effects)
 - Will categorize the ASME code space items into basic rules issues and issues relating to the optimization of the 2017 edition of the Division 5 rules
 - Will assess how the issues are addressed by the 2017 edition of the Division 5 rules and identify gaps, if any
 - These white papers would provide an important input for NRC's internal assessment of endorsing the 2017 edition of Division 5
- Phase II (by February 2019)
 - Roadmap on ASME actions and schedule to dress the identified gaps for metallic components

* O'Donnell, Hull and Malik, "Structural Integrity Code and Regulatory Issues in the Design of High Temperature Reactors," Proceedings of the 4th International Topical Meeting on High Temperature Reactor Technology, HTR-2008, Paper HTR2008-58061, American Society of Mechanical Engineers, New York, NY (2008)



Task Group Activities - Nonmetallic

- NGNP high temperature materials white paper was issued in 2009
 - There were subsequent interactions between NGNP and NRC to address NRC's RAIs
 - Revision 1 including the NRC comments and DOE/vendor responses was issued August 2012*
- The information is being used to develop a roadmap on ASME actions and schedule to address any identified gaps for nonmetallic core components (February 2019)
- This would provide an important input for NRC's internal assessment of endorsing the 2017 edition of Division 5

* NGNP High Temperature Materials White Paper, INL/EXT-09-17187, Revision 1, August 2012

