

SECTION III

Rules for Construction of
Nuclear Facility Components

2025

ASME Boiler and
Pressure Vessel Code
An International Code

Division 1 — Subsection NB
Class 1 Components

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AN INTERNATIONAL CODE

2025 ASME Boiler & Pressure Vessel Code

2025 Edition

July 1, 2025



RULES FOR CONSTRUCTION OF NUCLEAR FACILITY COMPONENTS

Division 1 - Subsection NB

Class 1 Components

ASME Boiler and Pressure Vessel Committee
on Construction of Nuclear Facility Components



The American Society of
Mechanical Engineers

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This international code or standard was developed under procedures accredited as meeting the criteria for American National Standards and it is an American National Standard. The standards committee that approved the code or standard was balanced to ensure that individuals from competent and concerned interests had an opportunity to participate. The proposed code or standard was made available for public review and comment, which provided an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large

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FOREWORD*

In 1911, The American Society of Mechanical Engineers established the Boiler and Pressure Vessel Committee to formulate standard rules for the construction of steam boilers and other pressure vessels. In 2009, the Boiler and Pressure Vessel Committee was superseded by the following committees:

- (a) Committee on Power Boilers (I)
- (b) Committee on Materials (II)
- (c) Committee on Construction of Nuclear Facility Components (III)
- (d) Committee on Heating Boilers (IV)
- (e) Committee on Nondestructive Examination (V)
- (f) Committee on Pressure Vessels (VIII)
- (g) Committee on Welding, Brazing, and Fusing (IX)
- (h) Committee on Fiber-Reinforced Plastic Pressure Vessels (X)
- (i) Committee on Nuclear Inservice Inspection (XI)
- (j) Committee on Transport Tanks (XII)
- (k) Committee on Overpressure Protection (XIII)
- (l) Technical Oversight Management Committee (TOMC)

Where reference is made to “the Committee” in this Foreword, each of these committees is included individually and collectively.

The Committee’s function is to establish rules of safety relating to pressure integrity. The rules govern the construction** of boilers, pressure vessels, transport tanks, and nuclear components, and the inservice inspection of nuclear components and transport tanks. For nuclear items other than pressure-retaining components, the Committee also establishes rules of safety related to structural integrity. The Committee also interprets these rules when questions arise regarding their intent. The technical consistency of the Sections of the Code and coordination of standards development activities of the Committees is supported and guided by the Technical Oversight Management Committee. The Code does not address other safety issues relating to the construction of boilers, pressure vessels, transport tanks, or nuclear components, or the inservice inspection of nuclear components or transport tanks. Users of the Code should refer to the pertinent codes, standards, laws, regulations, or other relevant documents for safety issues other than those relating to pressure integrity and, for nuclear items other than pressure-retaining components, structural integrity. Except for Sections XI and XII, and with a few other exceptions, the rules do not, of practical necessity, reflect the likelihood and consequences of deterioration in service related to specific service fluids or external operating environments. In formulating the rules, the Committee considers the needs of users, manufacturers, and inspectors of components addressed by the Code. The objective of the rules is to afford reasonably certain protection of life and property, and to provide a margin for deterioration in service to give a reasonably long, safe period of usefulness. Advancements in design and materials and evidence of experience have been recognized.

The Code contains mandatory requirements, specific prohibitions, and nonmandatory guidance for construction activities and inservice inspection and testing activities. The Code does not address all aspects of these activities and those aspects that are not specifically addressed should not be considered prohibited. The Code is not a handbook and cannot replace education, experience, and the use of engineering judgment. The phrase *engineering judgment* refers to technical judgments made by knowledgeable engineers experienced in the application of the Code. Engineering judgments must be consistent with Code philosophy, and such judgments must never be used to overrule mandatory requirements or specific prohibitions of the Code.

The Committee recognizes that tools and techniques used for design and analysis change as technology progresses and expects engineers to use good judgment in the application of these tools. The designer is responsible for complying with Code rules and demonstrating compliance with Code equations when such equations are mandatory. The Code neither requires nor prohibits the use of computers for the design or analysis of components constructed to the requirements of the Code. However, designers and engineers using computer programs for design or analysis are cautioned that they are

* The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI’s requirements for an ANS. Therefore, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Code.

** *Construction*, as used in this Foreword, is an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and overpressure protection.

responsible for all technical assumptions inherent in the programs they use and the application of these programs to their design.

The rules established by the Committee are not to be interpreted as approving, recommending, or endorsing any proprietary or specific design, or as limiting in any way the manufacturer's freedom to choose any method of design or any form of construction that conforms to the Code rules.

The Committee meets regularly to consider revisions of the rules, new rules as dictated by technological development, Code cases, and requests for interpretations. Only the Committee has the authority to provide official interpretations of the Code. Requests for revisions, new rules, Code cases, or interpretations shall be addressed to the staff secretary in writing and shall give full particulars in order to receive consideration and action (see the Correspondence With the Committee page). Proposed revisions to the Code resulting from inquiries will be presented to the Committee for appropriate action. The action of the Committee becomes effective only after confirmation by ballot of the Committee and approval by ASME. Proposed revisions to the Code approved by the Committee are submitted to the American National Standards Institute (ANSI) and published at <http://go.asme.org/BPVCPublicReview> to invite comments from all interested persons. After public review and final approval by ASME, revisions are published at regular intervals in Editions of the Code.

The Committee does not rule on whether a component shall or shall not be constructed to the provisions of the Code. The scope of each Section has been established to identify the components and parameters considered by the Committee in formulating the Code rules.

Questions or issues regarding compliance of a specific component with the Code rules are to be directed to the ASME Certificate Holder (Manufacturer). Inquiries concerning the interpretation of the Code are to be directed to the Committee. ASME is to be notified should questions arise concerning improper use of the ASME Single Certification Mark.

When required by context in the Code, the singular shall be interpreted as the plural, and vice versa.

The words "shall," "should," and "may" are used in the Code as follows:

- *Shall* is used to denote a requirement.
- *Should* is used to denote a recommendation.
- *May* is used to denote permission, neither a requirement nor a recommendation.

STATEMENT OF POLICY ON THE USE OF THE ASME SINGLE CERTIFICATION MARK AND CODE AUTHORIZATION IN ADVERTISING

ASME has established procedures to authorize qualified organizations to perform various activities in accordance with the requirements of the ASME Boiler and Pressure Vessel Code. It is the aim of the Society to provide recognition of organizations so authorized. An organization holding authorization to perform various activities in accordance with the requirements of the Code may state this capability in its advertising literature.

Organizations that are authorized to use the ASME Single Certification Mark for marking items or constructions that have been constructed and inspected in compliance with the ASME Boiler and Pressure Vessel Code are issued Certificates of Authorization. It is the aim of the Society to maintain the standing of the ASME Single Certification Mark for the benefit of the users, the enforcement jurisdictions, and the holders of the ASME Single Certification Mark who comply with all requirements.

Based on these objectives, the following policy has been established on the usage in advertising of facsimiles of the ASME Single Certification Mark, Certificates of Authorization, and reference to Code construction. The American Society of Mechanical Engineers does not “approve,” “certify,” “rate,” or “endorse” any item, construction, or activity and there shall be no statements or implications that might so indicate. An organization holding the ASME Single Certification Mark and/or a Certificate of Authorization may state in advertising literature that items, constructions, or activities “are built (produced or performed) or activities conducted in accordance with the requirements of the ASME Boiler and Pressure Vessel Code,” or “meet the requirements of the ASME Boiler and Pressure Vessel Code.” An ASME corporate logo shall not be used by any organization other than ASME.

The ASME Single Certification Mark shall be used only for stamping and nameplates as specifically provided in the Code. However, facsimiles may be used for the purpose of fostering the use of such construction. Such usage may be by an association or a society, or by a holder of the ASME Single Certification Mark who may also use the facsimile in advertising to show that clearly specified items will carry the ASME Single Certification Mark.

STATEMENT OF POLICY ON THE USE OF ASME MARKING TO IDENTIFY MANUFACTURED ITEMS

The ASME Boiler and Pressure Vessel Code provides rules for the construction of boilers, pressure vessels, and nuclear components. This includes requirements for materials, design, fabrication, examination, inspection, and stamping. Items constructed in accordance with all of the applicable rules of the Code are identified with the ASME Single Certification Mark described in the governing Section of the Code.

Markings such as “ASME,” “ASME Standard,” or any other marking including “ASME” or the ASME Single Certification Mark shall not be used on any item that is not constructed in accordance with all of the applicable requirements of the Code.

Items shall not be described on ASME Data Report Forms nor on similar forms referring to ASME that tend to imply that all Code requirements have been met when, in fact, they have not been. Data Report Forms covering items not fully complying with ASME requirements should not refer to ASME or they should clearly identify all exceptions to the ASME requirements.

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January 1, 2025

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K. R. May	

Task Group on Pressurized Heavy Water Reactor (SG-CD) (BPV III)

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D. E. Matthews	C. A. Sanna
B. McGlone	V. Sehgal
J. B. Ossmann	S. Singh
S. B. Parkash	

Task Group to Improve Section III/XI Interface (SG-CD) (BPV III)

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E. Henry, <i>Secretary</i>	T. Nuoffer
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D. Chowdhury	J. Sciulli
J. Honcharik	A. Udyawar
J. Hurst	S. Willoughby-Braun
J. Lambin	

Working Group on Core Support Structures (SG-CD) (BPV III)

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R. Z. Ziegler, <i>Secretary</i>	R. O. Vollmer
G. W. Delpont	T. M. Wiger
L. C. Hartless	C. Wilson
D. Keck	Y. Wong
T. R. Liszkai	K. Hsu, <i>Alternate</i>
M. Nakajima	H. S. Mehta, <i>Contributing Member</i>

Working Group on Design of Division 3 Containment Systems (SG-CD) (BPV III)

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S. Klein, <i>Secretary</i>	C. R. Sydnor
J. Bignell	R. Sypulski
G. Bjorkman	R. Williamson
V. Broz	X. Zhai
D. D. Imholte	X. Zhang
D. W. Lewis	J. Smith, <i>Alternate</i>
A. Rigato	J. C. Minichiello, <i>Contributing Member</i>
P. Sakalaukus, Jr.	

Working Group on HDPE Design of Components (SG-CD) (BPV III)

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J. R. Hebeisen	D. P. Munson
P. Krishnaswamy	R. Stakenborgs
M. Kuntz	B. Lin, <i>Alternate</i>

Working Group on Piping (SG-CD) (BPV III)

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R. W. Haupt	A. N. Nguyen, <i>Contributing Member</i>
A. Hirano	M. S. Sills, <i>Contributing Member</i>
P. Hirschberg	N. C. Sutherland, <i>Contributing Member</i>
M. Kassir	G. Z. Tokarski, <i>Contributing Member</i>
D. Lieb	E. A. Wais, <i>Contributing Member</i>
M. Moenssens	C.-I. Wu, <i>Contributing Member</i>
I.-K. Nam	
K. E. Reid II	
B. Still	
D. Vlaicu	

Working Group on Pressure Relief (SG-CD) (BPV III)

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T. Patel	

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T. Johnson	N. Chandran, <i>Alternate</i>

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G. A. Jolly	K. E. Reid II
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T. Lippucci	Y. Wong, <i>Alternate</i>

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L. Constantinescu	M. R. Breach, <i>Alternate</i>
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Working Group on Magnets (SG-FED) (BPV III)

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Working Group on Vacuum Vessels (SG-FED) (BPV III)

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Working Group on General Requirements for Graphite and Ceramic Composite Core Components and Assemblies (SG-GR) (BPV III)

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Y. Diaz-Castillo	W. Windes
J. Lang	B. Lin, <i>Alternate</i>

Subgroup on High Temperature Reactors (BPV III)

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W. J. Geringer	J. Bass, <i>Alternate</i>
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W. Li	
M. C. Messner	

Special Working Group on High Temperature Reactor Stakeholders (SG-HTR) (BPV III)

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G. C. Deleanu	R. M. Iyengar, <i>Alternate</i>
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Task Group on Alloy 709 Code Case (SG-HTR) (BPV III)

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Working Group on Allowable Stress Criteria (SG-HTR) (BPV III)

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K. Kimura	R. M. Iyengar, <i>Alternate</i>
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Task Group on Class A Rewrite (SG-HTR) (BPV III)

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Working Group on Analysis Methods (SG-HTR) (BPV III)

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P. Carter	J. Bass, <i>Alternate</i>
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M. Petkov	S. Krishnamurthy, <i>Contributing Member</i>
K. Pigg	
H. Qian	M. J. Swindeman, <i>Contributing Member</i>
T. Riordan	

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Z. Feng	B. Sutton
S. Lawler	I. J. Van Rooyen
X. Lou	Yanli Wang
M. McMurtrey	X. Wei
M. C. Messner	R. Bass, <i>Alternate</i>

Working Group on Creep-Fatigue and Negligible Creep (SG-HTR) (BPV III)

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J. I. Duo	Yanli Wang
R. I. Jetter	X. Wei
G. H. Koo	J. Young
H. Mahajan	R. Bass, <i>Alternate</i>

Task Group on Graphite Design Analysis (SG-HTR) (BPV III)

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S. Baylis	J. Quick
G. Beirnaert	M. Saitta
O. Booler	A. Walker

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C. Contescu	J. Bass, <i>Alternate</i>
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Task Group on High Temperature Piping Design (SG-HTR) (BPV-III)

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D. Bankston, Jr.	C. D. Weary
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A. Cardillo	W. Windes
S. Cho	R. Wright
P. J. Coco	H. Xu
R. H. Davis	S. Yee
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J. Grimm	J. Wise
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M. Golliet	R. Stakenborghs
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P. Krishnaswamy	J. Wright
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B. Lin	

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M. Carlson	T. Wagner, <i>Alternate</i>
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B. Ahee	M. Washington
E. Alexis	B. J. Iske, <i>Alternate</i>
L. Badziagowski	M. J. Melita, <i>Alternate</i>
B. Calderon	T. J. Wagner, <i>Alternate</i>
M. Carlson	P. A. Molvie, <i>Contributing Member</i>
C. Dinic	

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P. L. Brown	C. Vorwald
M. A. Burns	M. Carlson, <i>Alternate</i>
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C. Emslander	T. Clausing, <i>Contributing Member</i>
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V. F. Godinez-Azcuaga	J. F. Halley, <i>Contributing Member</i>
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R. W. Hardy	L. E. Mullins, <i>Contributing Member</i>
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B. Han	Y. Yang
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S. W. Choi	R. Stakenborghs
M. Golliet	P. Vibien
J. Johnston, Jr.	M. P. Marohl, <i>Contributing Member</i>
T. M. Musto	A. Pridmore, <i>Contributing Member</i>

Subgroup on Water-Cooled Systems (BPV XI)

M. J. Ferlisi, <i>Chair</i>	D. W. Lamond
J. Nygaard, <i>Secretary</i>	T. Nomura
S. T. Chesworth	S. A. Norman
J. Collins	M. A. Pyne
H. Q. Do	H. M. Stephens, Jr.
K. W. Hall	M. Weis
P. J. Hennessey	B. K. Welch
A. Keller	I. A. Anchondo-Lopez, <i>Alternate</i>
A. E. Keyser	Y.-K. Chung, <i>Contributing Member</i>
S. D. Kulat	

**Task Group on Repair by Carbon Fiber Composites
(WG-NMRR) (SG-RRA) (BPV XI)**

S. W. Choi, <i>Chair</i>	R. P. Ojdrovic
W. Bushika	J. E. O'Sullivan
D. Cimock	N. Otten
M. J. Constable	A. Pridmore
M. Elen	S. Rios
M. Golliet	J. Sealey
P. Krishnaswamy	R. Stakenborghs
M. Kuntz	D. J. Swaim
H. Lu	M. Tatkowski
L. Nadeau	M. F. Uddin
C. A. Nove	J. Wen

Task Group on High Strength Nickel Alloys Issues (SG-WCS) (BPV XI)

H. Malikowski, <i>Chair</i>	H. Kobayashi
C. Waskey, <i>Secretary</i>	S. E. Marlette
T. Cinson	J. Robinson
J. Collins	D. Van Allen
O. Cruz	G. White
K. Dietrich	K. A. Whitney

Working Group on Containment (SG-WCS) (BPV XI)

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S. Walden, <i>Secretary</i>	P. C. Smith
H. T. Hill	R. S. Spencer
S. Johnson	A. Staller
A. E. Keyser	J. Swan
P. Leminger	C. Tillotson
A. Munshi	G. Z. Wang
S. Richter	M. Weis

**Working Group on Welding and Special Repair Processes
(SG-RRA) (BPV XI)**

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D. Barborak	S. E. Marlette
K. Dietrich	S. L. McCracken
S. J. Findlan	L. A. Melder
R. C. Folley	J. E. O'Sullivan
M. L. Hall	A. Patel
J. Honcharik	

**Working Group on Inspection of Systems and Components
(SG-WCS) (BPV XI)**

H. Q. Do, <i>Chair</i>	A. Keller
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R. W. Blyde	S. D. Kulat
J. Collins	E. Lantz
M. J. Ferlisi	J. C. Nygaard
M. L. Garcia Heras	S. Orita
K. W. Hall	R. S. Spencer
E. Henry	M. Walter
J. Howard	A. W. Wilkens

**Task Group on Temper Bead Welding
(WG-W&SRP) (SG-RRA) (BPV XI)**

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J. Tatman, <i>Secretary</i>	S. L. McCracken
D. Barborak	N. Mohr
D. Barton	G. T. Olson
R. C. Folley	J. E. O'Sullivan
J. Graham	A. Patel
M. L. Hall	J. G. Weicks
D. Jacobs	

Working Group on Pressure Testing (SG-WCS) (BPV XI)

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M. Moenssens, <i>Secretary</i>	R. A. Nettles
T. Anselmi	J. Swan
A. Knighton	K. Whitney
D. W. Lamond	

Task Group on Weld Overlay (WG-W&SRP) (SG-RRA) (BPV XI)

S. L. McCracken, <i>Chair</i>	S. E. Marlette
S. Hunter, <i>Secretary</i>	S. K. Min
D. Barborak	G. T. Olson
D. Barton	A. Patel
S. J. Findlan	D. W. Sandusky
J. Graham	J. Tatman
M. L. Hall	J. G. Weicks
D. Jacobs	

Working Group on Risk-Informed Activities (SG-WCS) (BPV XI)

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S. T. Chesworth, <i>Secretary</i>	S. D. Kulat
G. Brouette	D. W. Lamond
R. Fougereousse	E. Lantz
J. Hakii	P. J. O'Regan
K. W. Hall	N. A. Palm
M. J. Homiack	S. E. Woolf

Working Group on General Requirements (BPV XI)

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S. E. Woolf, <i>Secretary</i>	G. Ramaraj
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R. Hinkle	B. K. Welch
K. A. Kavanagh	B. Harris, <i>Alternate</i>

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S. Staniszewski, <i>Secretary</i>	R. C. Sallash
P. Chilukuri	D. G. Shelton
N. J. Paulick	Y. Doron, <i>Contributing Member</i>
M. Pitts	

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P. Chilukuri	

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N. J. Paulick	Y. Doron, <i>Contributing Member</i>
M. D. Rana	M. Pitts, <i>Contributing Member</i>
T. J. Rishel	D. G. Shelton, <i>Contributing Member</i>
T. A. Rogers	B. E. Spencer, <i>Contributing Member</i>
R. C. Sallash	J. Zheng, <i>Contributing Member</i>
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S. Staniszewski	

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Y. Doron	K. Mansker, <i>Contributing Member</i>
M. Koprivnak	G. McRae, <i>Contributing Member</i>
O. Mulet	T. A. Rogers, <i>Contributing Member</i>
T. J. Rishel	

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P. Chilukuri	Y. Doron, <i>Contributing Member</i>
J. L. Freiler	S. L. McWilliams, <i>Contributing Member</i>
O. Mulet	T. A. Rogers, <i>Contributing Member</i>
B. F. Pittel	D. G. Shelton, <i>Contributing Member</i>
M. Pitts	

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K. R. May	M. Mullavey, <i>Contributing Member</i>
D. Miller	J. Phillips, <i>Contributing Member</i>
T. Patel	S. Ruesenberg, <i>Contributing Member</i>
B. F. Pittel	K. Shores, <i>Contributing Member</i>
T. R. Tarbay	D. E. Tezzo, <i>Contributing Member</i>
D. E. Tompkins	A. Wilson, <i>Contributing Member</i>
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M. Edwards, <i>Alternate</i>	

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B. K. Nutter, <i>Vice Chair</i>	T. Patel
C. E. Rodrigues, <i>Staff Secretary</i>	B. F. Pittel
T. Beirne	

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A. Williams, <i>Secretary</i>	J. A. West
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W. E. Chapin	R. D. Danzy, <i>Contributing Member</i>
B. Joergensen	M. Mullavey, <i>Contributing Member</i>
R. Krithivasan	G. Ramirez, <i>Contributing Member</i>
J. Latshaw	S. Zalar, <i>Contributing Member</i>

Subgroup on General Requirements (BPV XIII)

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J. Grace, <i>Secretary</i>	D. E. Tompkins
R. Antoniuk	J. F. White
J. F. Ball	M. Edwards, <i>Alternate</i>
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J. Horne	E. Pearson, <i>Contributing Member</i>
R. Klimas, Jr.	J. Phillips, <i>Contributing Member</i>
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D. Mainiero-Cessna	S. Zalar, <i>Contributing Member</i>
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J. Mize	
L. Moedinger	
M. Mullavey	
A. Peck	

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K. R. May, <i>Chair</i>	S. Jones
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M. Brown	B. J. Yonsky
J. W. Dickson	J. Yu, <i>Alternate</i>
N. Hansing	S. T. French, <i>Contributing Member</i>

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R. V. Wielgoszinski	

CORRESPONDENCE WITH THE COMMITTEE

General

ASME codes and standards are developed and maintained by committees with the intent to represent the consensus of concerned interests. Users of ASME codes and standards may correspond with the committees to propose revisions or cases, report errata, or request interpretations. Correspondence for this Section of the ASME Boiler and Pressure Vessel Code (BPVC) should be sent to the staff secretary noted on the Section's committee web page, accessible at <https://go.asme.org/CSCcommittees>.

NOTE: See ASME BPVC Section II, Part D for guidelines on requesting approval of new materials. See Section II, Part C for guidelines on requesting approval of new welding and brazing materials ("consumables").

Revisions and Errata

The committee processes revisions to this Code on a continuous basis to incorporate changes that appear necessary or desirable as demonstrated by the experience gained from the application of the Code. Approved revisions will be published in the next edition of the Code.

In addition, the committee may post errata and Special Notices at <http://go.asme.org/BPVCerrata>. Errata and Special Notices become effective on the date posted. Users can register on the committee web page to receive email notifications of posted errata and Special Notices.

This Code is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number, the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

Cases

- (a) The most common applications for cases are
 - (1) to permit early implementation of a revision based on an urgent need
 - (2) to provide alternative requirements
 - (3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Code
 - (4) to permit use of a new material or process
- (b) Users are cautioned that not all jurisdictions or owners automatically accept cases. Cases are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or owners to choose any method of design or any form of construction that conforms to the Code.
- (c) The committee will consider proposed cases concerning the following topics only:
 - (1) equipment to be marked with the ASME Single Certification Mark, or
 - (2) equipment to be constructed as a repair/replacement activity under the requirements of Section XI
- (d) A proposed case shall be written as a question and reply in the same format as existing cases. The proposal shall also include the following information:
 - (1) a statement of need and background information
 - (2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)
 - (3) the Code Section and the paragraph, figure, or table number to which the proposed case applies
 - (4) the editions of the Code to which the proposed case applies
- (e) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Cases that have been approved will appear in the next edition or supplement of the Code Cases books, "Boilers and Pressure Vessels" or "Nuclear Components." Each Code Cases book is updated with seven Supplements.

Supplements will be sent or made available automatically to the purchasers of the Code Cases books until the next edition of the Code. Annulments of Code Cases become effective six months after the first announcement of the annulment in a Code Case Supplement or Edition of the appropriate Code Case book. The status of any case is available at <http://go.asme.org/BPVCCDatabase>. An index of the complete list of Boiler and Pressure Vessel Code Cases and Nuclear Code Cases is available at <http://go.asme.org/BPVCC>.

Interpretations

(a) Interpretations clarify existing Code requirements and are written as a question and reply. Interpretations do not introduce new requirements. If a revision to resolve conflicting or incorrect wording is required to support the interpretation, the committee will issue an intent interpretation in parallel with a revision to the Code.

(b) Upon request, the committee will render an interpretation of any requirement of the Code. An interpretation can be rendered only in response to a request submitted through the online Inquiry Submittal Form at <http://go.asme.org/InterpretationRequest>. Upon submitting the form, the inquirer will receive an automatic email confirming receipt.

(c) ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Code requirements. If, based on the information submitted, it is the opinion of the committee that the inquirer should seek assistance, the request will be returned with the recommendation that such assistance be obtained. Inquirers may track the status of their requests at <http://go.asme.org/Interpretations>.

(d) ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME committee or subcommittee. ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

(e) Interpretations are published in the ASME Interpretations Database at <http://go.asme.org/Interpretations> as they are issued.

Committee Meetings

The ASME BPVC committees regularly hold meetings that are open to the public. Persons wishing to attend any meeting should contact the secretary of the applicable committee. Information on future committee meetings can be found at <http://go.asme.org/BCW>.

ORGANIZATION OF SECTION III

1 GENERAL

Section III consists of Division 1, Division 2, Division 3, Division 4, and Division 5. These Divisions are broken down into Subsections and are designated by capital letters preceded by the letter "N" for Division 1, by the letter "C" for Division 2, by the letter "W" for Division 3, by the letter "F" for Division 4, and by the letter "H" for Division 5. Each Subsection is published separately, with the exception of those listed for Divisions 2, 3, 4, and 5.

- Subsection NCA — General Requirements for Division 1 and Division 2
- Appendices
- Division 1
 - Subsection NB — Class 1 Components
 - Subsection NCD — Class 2 and Class 3 Components
 - Subsection NE — Class MC Components
 - Subsection NF — Supports
 - Subsection NG — Core Support Structures
- Division 2 — Code for Concrete Containments
 - Subsection CC — Concrete Containments
- Division 3 — Containment Systems for Transportation and Storage of Spent Nuclear Fuel and High-Level Radioactive Material
 - Subsection WA — General Requirements for Division 3
 - Subsection WB — Class TC Transportation Containments
 - Subsection WC — Class SC Storage Containments
 - Subsection WD — Class ISS Internal Support Structures
- Division 4 — Fusion Energy Devices
 - Subsection FA — Fusion Energy Device Facilities
 - Subsection FB — Pressure Boundary Components
- Division 5 — High Temperature Reactors
 - Subsection HA — General Requirements
 - Subpart A — Metallic Materials
 - Subpart B — Graphite Materials
 - Subpart C — Composite Materials
 - Subsection HB — Class A Metallic Pressure Boundary Components
 - Subpart A — Low Temperature Service
 - Subpart B — Elevated Temperature Service
 - Subsection HC — Class B Metallic Pressure Boundary Components
 - Subpart A — Low Temperature Service
 - Subpart B — Elevated Temperature Service
 - Subsection HF — Class A and B Metallic Supports
 - Subpart A — Low Temperature Service
 - Subsection HG — Class SM Metallic Core Support Structures
 - Subpart A — Low Temperature Service
 - Subpart B — Elevated Temperature Service
 - Subsection HH — Class SN Nonmetallic Core Components
 - Subpart A — Graphite Materials
 - Subpart B — Composite Materials

2 SUBSECTIONS

Subsections are divided into Articles, subarticles, paragraphs, and, where necessary, subparagraphs and subsubparagraphs.

3 ARTICLES

Articles are designated by the applicable letters indicated above for the Subsections followed by Arabic numbers, such as NB-1000. Where possible, Articles dealing with the same topics are given the same number in each Subsection, except NCA, in accordance with the following general scheme:

Article Number	Title
1000	Introduction or Scope
2000	Material
3000	Design
4000	Fabrication and Installation
5000	Examination
6000	Testing
7000	Overpressure Protection
8000	Nameplates, Stamping With Certification Mark, and Reports

The numbering of Articles and the material contained in the Articles may not, however, be consecutive. Due to the fact that the complete outline may cover phases not applicable to a particular Subsection or Article, the rules have been prepared with some gaps in the numbering.

4 SUBARTICLES

Subarticles are numbered in units of 100, such as NB-1100.

5 SUBSUBARTICLES

Subsubarticles are numbered in units of 10, such as NB-2130, and generally have no text. When a number such as NB-1110 is followed by text, it is considered a paragraph.

6 PARAGRAPHS

Paragraphs are numbered in units of 1, such as NB-2121.

7 SUBPARAGRAPHS

Subparagraphs, when they are *major* subdivisions of a paragraph, are designated by adding a decimal followed by one or more digits to the paragraph number, such as NB-1132.1. When they are *minor* subdivisions of a paragraph, subparagraphs may be designated by lowercase letters in parentheses, such as NB-2121(a).

8 SUBSUBPARAGRAPHS

Subsubparagraphs are designated by adding lowercase letters in parentheses to the *major* subparagraph numbers, such as NB-1132.1(a). When further subdivisions of *minor* subparagraphs are necessary, subsubparagraphs are designated by adding Arabic numerals in parentheses to the subparagraph designation, such as NB-2121(a)(1).

9 REFERENCES

References used within Section III generally fall into one of the following four categories:

(a) *References to Other Portions of Section III.* When a reference is made to another Article, subarticle, or paragraph, all numbers subsidiary to that reference shall be included. For example, reference to Article NB-3000 includes all material in Article NB-3000; reference to NB-3100 includes all material in subarticle NB-3100; reference to NB-3110 includes all paragraphs, NB-3111 through NB-3113.

(b) *References to Other Sections.* Other Sections referred to in Section III are the following:

(1) *Section II, Materials.* When a requirement for a material, or for the examination or testing of a material, is to be in accordance with a specification such as SA-105, SA-370, or SB-160, the reference is to material specifications in Section II. These references begin with the letter "S."

(2) *Section V, Nondestructive Examination.* Section V references begin with the letter "T" and relate to the nondestructive examination of material or welds.

(3) *Section IX, Welding and Brazing Qualifications.* Section IX references begin with the letter "Q" and relate to welding and brazing requirements.

(4) *Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components.* When a reference is made to inservice inspection, the rules of Section XI shall apply.

(c) *Reference to Specifications and Standards Other Than Published in Code Sections*

(1) Specifications for examination methods and acceptance standards to be used in connection with them are published by ASTM International (ASTM). At the time of publication of Section III, some such specifications were not included in Section II of this Code. A reference to ASTM E94 refers to the specification so designated by and published by ASTM (www.astm.org).

(2) Dimensional standards covering products such as valves, flanges, and fittings are sponsored and published by The American Society of Mechanical Engineers and approved by the American National Standards Institute.* When a product is to conform to such a standard, for example ASME B16.5, the standard is approved by the American National Standards Institute. The applicable year of issue is that suffixed to its numerical designation in Table NCA-7100-1, for example ASME B16.5-2003. Standards published by The American Society of Mechanical Engineers are available from ASME (www.asme.org).

(3) Dimensional and other types of standards covering products such as valves, flanges, and fittings are also published by the Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) and are known as Standard Practices. When a product is required by these rules to conform to a Standard Practice, for example MSS SP-100, the Standard Practice referred to is published by MSS (<https://msshq.org>). The applicable year of issue of such a Standard Practice is that suffixed to its numerical designation in Table NCA-7100-1, for example MSS SP-58-2009.

(4) Specifications for welding and brazing materials are published by the American Welding Society (AWS) (www.aws.org). Specifications of this type are incorporated in Section II and are identified by the AWS designation with the prefix "SF," for example SFA-5.1.

(5) Standards applicable to the design and construction of tanks and flanges are published by the American Petroleum Institute (API) and have designations such as API-605. When documents so designated are referred to in Section III, for example API-605-1988, they are standards published by API (www.api.org) and are listed in Table NCA-7100-1.

(d) *References to Appendices.* Section III uses two types of appendices that are designated as either Section III Appendices or Subsection Appendices. Either of these appendices is further designated as either Mandatory or Nonmandatory for use. Mandatory Appendices are referred to in the Section III rules and contain requirements that must be followed in construction. Nonmandatory Appendices provide additional information or guidance when using Section III.

(1) Section III Appendices are contained in a separate book titled "Appendices." These appendices have the potential for multiple subsection applicability. Mandatory Appendices are designated by a Roman numeral followed, when appropriate, by Arabic numerals to indicate various articles, subarticles, and paragraphs of the appendix, such as II-1500 or XIII-1210. Nonmandatory Appendices are designated by a capital letter followed, when appropriate, by Arabic numerals to indicate various articles, subarticles, and paragraphs of the appendix, such as D-1200 or Y-1440.

(2) Subsection Appendices are specifically applicable to just one subsection and are contained within that subsection. Subsection-specific mandatory and nonmandatory appendices are numbered in the same manner as Section III Appendices, but with a subsection identifier (e.g., NF, NH, D2, etc.) preceding either the Roman numeral or the capital

*The American National Standards Institute (ANSI) was formerly known as the American Standards Association. Standards approved by the Association were designated by the prefix "ASA" followed by the number of the standard and the year of publication. More recently, the American National Standards Institute was known as the United States of America Standards Institute. Standards were designated by the prefix "USAS" followed by the number of the standard and the year of publication. While the letters of the prefix have changed with the name of the organization, the numbers of the standards have remained unchanged.

letter for a unique designation. For example, NF-II-1100 or NF-A-1200 would be part of a Subsection NF mandatory or nonmandatory appendix, respectively. For Subsection CC, D2-IV-1120 or D2-D-1330 would be part of a Subsection CC mandatory or nonmandatory appendix, respectively.

(3) It is the intent of this Section that the information provided in both Mandatory and Nonmandatory Appendices may be used to meet the rules of any Division or Subsection. In case of conflict between Appendix rules and Division/Subsection rules, the requirements contained in the Division/Subsection shall govern. Additional guidance on Appendix usage is provided in the front matter of Section III Appendices.

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SUMMARY OF CHANGES

Changes listed below are identified on the pages by a margin note, **(25)**, placed next to the affected area.

<i>Page</i>	<i>Location</i>	<i>Change</i>
vii	List of Sections	Title of Section XI, Division 1 revised
viii	Foreword	Third, fourth, seventh, tenth, and eleventh paragraphs editorially revised
xi	Personnel	Updated
xxxvi	Organization of Section III	Paragraphs 9(c)(1) through 9(c)(5) editorially revised
7	NB-2110	Subparagraph (a) revised
8	NB-2122	Second paragraph revised
10	NB-2211	Revised
12	NB-2311	(1) Subparagraphs (a)(1)(-d) and (a)(2) revised (2) Subparagraph (a)(1)(-f) added
17	NB-2431.1	Subparagraph (c) revised
27	NB-2561	(1) Subparagraphs (a), (b), and (b)(2) revised (2) Subparagraphs (c) and (d) added
32	NB-2576	Subparagraphs (b), (c)(3), and (c)(4) revised
32	NB-2577	Subparagraph (b) revised
35	NB-2583.2	Subparagraph (a) revised
35	NB-2584.2	Revised
36	NB-2610	(1) Subparagraphs (b), (c), and (c)(1) revised (2) Subparagraph (c)(2) added and subsequent subparagraphs redesignated
38	NB-3125	Revised
81	NB-3554	In subpara. (c) equation, S_n corrected by errata to $S_{n(max)}$
114	NB-3683.4	Subparagraph (c)(1) revised
132	NB-4243	Revised
143	Figure NB-4250-2	(1) Illustration and General Note (e) revised (2) General Note (f) added
144	Figure NB-4250-3	(1) Revised (2) General Notes (d) and (e) added
145	NB-4333	Revised
150	NB-4422	Title revised and first paragraph deleted
150	NB-4424.1	Subparagraph (b) revised and subpara. (g) added
151	NB-4424.2	Subparagraph (a) revised
153	Figure NB-4427-1	In Note (3), "x min." revised to "x, min."
154	NB-4435	Subparagraph (b)(3) revised
162	NB-4622.9	In subpara. (a)(9)(-b), "F-No. 3" corrected by errata to "F-No. 43"
171	NB-5242	Revised
173	NB-5281	(1) In subpara. (a), "N-5 Data Report" revised to "N-3 Data Report" (2) Subparagraphs (c) through (f) added
174	NB-5332	Subparagraph (a)(2) corrected by errata
174	NB-5341	Subparagraph (b) revised
174	NB-5351	Subparagraph (b) revised
180	NB-6412	Subparagraph (a) revised
180	NB-6622	Subparagraph (a) revised

CROSS-REFERENCING IN THE ASME BPVC

Paragraphs within the ASME BPVC may include subparagraph breakdowns, i.e., nested lists. The following is a guide to the designation and cross-referencing of subparagraph breakdowns:

(a) Hierarchy of Subparagraph Breakdowns

- (1) First-level breakdowns are designated as (a), (b), (c), etc.
- (2) Second-level breakdowns are designated as (1), (2), (3), etc.
- (3) Third-level breakdowns are designated as (-a), (-b), (-c), etc.
- (4) Fourth-level breakdowns are designated as (-1), (-2), (-3), etc.
- (5) Fifth-level breakdowns are designated as (+a), (+b), (+c), etc.
- (6) Sixth-level breakdowns are designated as (+1), (+2), etc.

(b) Cross-References to Subparagraph Breakdowns. Cross-references within an alphanumerically designated paragraph (e.g., PG-1, UIG-56.1, NCD-3223) do not include the alphanumeric designator of that paragraph. The cross-references to subparagraph breakdowns follow the hierarchy of the designators under which the breakdown appears. The following examples show the format:

- (1) If X.1(c)(1)(-a) is referenced in X.1(c)(1), it will be referenced as (-a).
- (2) If X.1(c)(1)(-a) is referenced in X.1(c)(2), it will be referenced as (1)(-a).
- (3) If X.1(c)(1)(-a) is referenced in X.1(e)(1), it will be referenced as (c)(1)(-a).
- (4) If X.1(c)(1)(-a) is referenced in X.2(c)(2), it will be referenced as X.1(c)(1)(-a).

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ARTICLE NB-1000

INTRODUCTION

NB-1100 SCOPE

NB-1110 ASPECTS OF CONSTRUCTION COVERED BY THESE RULES

(a) Subsection NB contains rules for the material, design, fabrication, examination, testing, overpressure relief, marking, stamping, and preparation of reports by the Certificate Holder of items that are intended to conform to the requirements for Class 1 construction.

(b) The rules of Subsection NB cover the requirements for strength and pressure integrity of items, the failure of which would violate the pressure-retaining boundary. The rules cover initial construction requirements, but do not cover deterioration that may occur in service as a result of corrosion, radiation effects, or instability of material. NCA-1130 gives further limitations to the rules of this Subsection.

NB-1120 TEMPERATURE LIMITS

The rules of Subsection NB shall not be used for items that are to be subjected to metal temperatures that exceed the temperature limit in the applicability column shown in Section II, Part D, Subpart 1, Tables 2A, 2B, and 4 for design stress intensity values. Above those temperatures, the creep and stress rupture characteristics of materials permitted to be used become significant factors that are not presently covered by the rules of this Subsection. Fatigue design curves and specified methods for fatigue analysis are not applicable above 700°F (370°C) for materials covered by Section III Appendices, Mandatory Appendix I, Figures I-9.1 and I-9.4, and above 800°F (425°C) for materials covered by Section III Appendices, Mandatory Appendix I, Figures I-9.2 and I-9.3.

NB-1130 BOUNDARIES OF JURISDICTION APPLICABLE TO THIS SUBSECTION

NB-1131 Boundary of Components

The Design Specification shall define the boundary of a component to which piping or another component is attached. The boundary shall be not closer to a vessel, tank, pump, or valve than:

(a) the first circumferential joint in welded connections (the connecting weld shall be considered part of the piping);

(b) the face of the first flange in bolted connections (the bolts shall be considered part of the piping);

(c) the first threaded joint in screwed connections.

NB-1132 Boundary Between Components and Attachments

NB-1132.1 Attachments

(a) An *attachment* is an element in contact with or connected to the inside or outside of the pressure-retaining portion of a component.

(b) Attachments may have either a pressure-retaining or a non-pressure-retaining function.

(1) Attachments with a pressure-retaining function include items such as pressure boundary stiffeners and branch pipe and vessel opening reinforcement.

(2) Attachments with a non-pressure-retaining function include items such as:

(-a) valve guides, thermal sleeves, and turning vanes

(-b) core support structures, internal structures, or other permanent structures within the reactor pressure vessel; and

(-c) vessel saddles, support and shear lugs, brackets, pipe clamps, trunnions, skirts, and other items in the support load path.

(c) Attachments may also have either a structural or nonstructural function.

(1) Attachments with a structural function (structural attachments):

(-a) perform a pressure-retaining function;

(-b) are core support structures, internal structures, or other permanent structures within the reactor pressure vessel; or

(-c) are in the support load path.

(2) Attachments with a nonstructural function (nonstructural attachments):

(-a) do not perform a pressure-retaining function;

(-b) are not in the support load path;

(-c) may be permanent or temporary.

Nonstructural attachments include items such as nameplates, insulation supports, and locating and lifting lugs.

NB-1132.2 Jurisdictional Boundary. The jurisdictional boundary between a pressure-retaining component and an attachment defined in the Design Specification shall not be any closer to the pressure-retaining portion of the

component than as defined in (a) through (g) below. Figures NB-1132.2-1 through NB-1132.2-4 are provided as an aid in defining the boundary and construction requirements of this Subsection.

(a) Attachments cast or forged with the component and weld buildup on the component surface shall be considered part of the component.

(b) Attachments, welds, and fasteners having a pressure-retaining function shall be considered part of the component.

(c) Except as provided in (d) and (e) below, the boundary between a pressure-retaining component and an attachment not having a pressure-retaining function shall be at the surface of the component.

(d) The first connecting weld of a non-pressure-retaining structural attachment to a component shall be considered part of the component unless the weld is more than $2t$ from the pressure-retaining portion of the component, where t is the nominal thickness of the pressure-retaining material. Beyond $2t$ from the pressure-retaining portion of the component, the first weld shall be considered part of the attachment.

(e) The first connecting weld of a welded nonstructural attachment to a component shall be considered part of the attachment. At or within $2t$ from the pressure-retaining portion of the component, the first connecting weld shall conform to NB-4430.

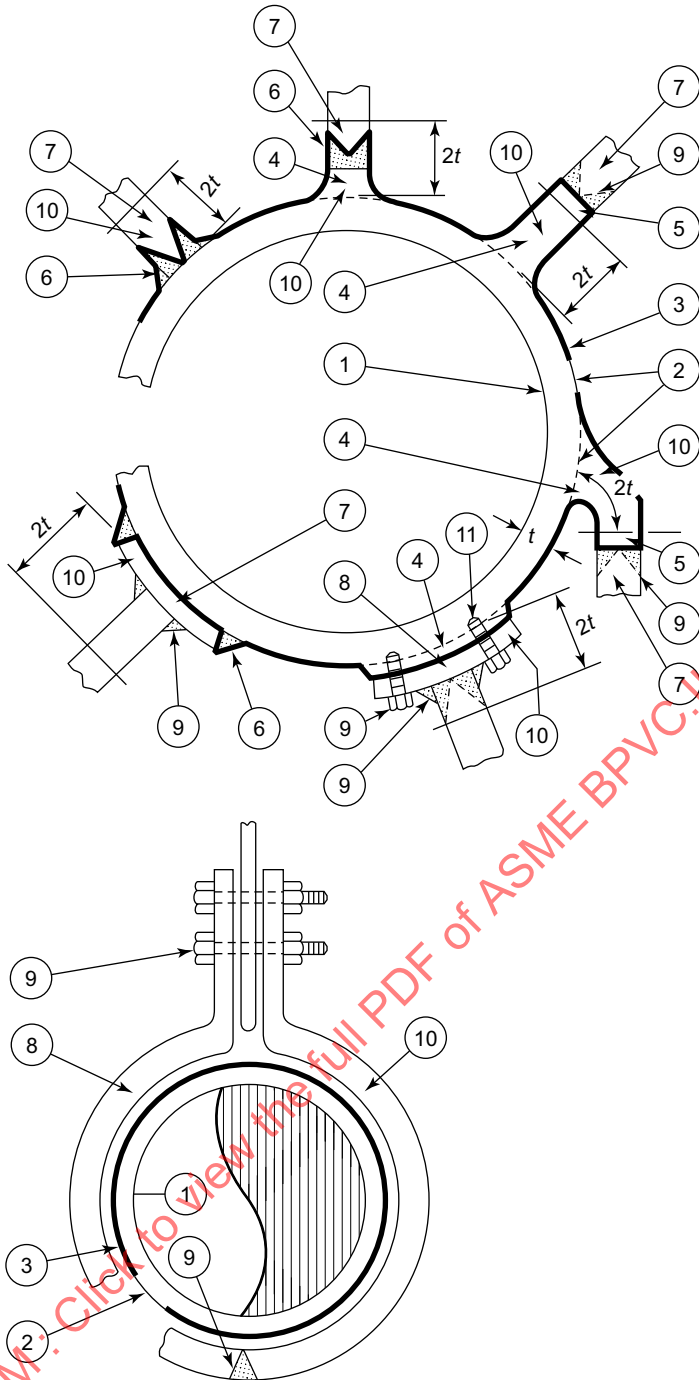
(f) Mechanical fasteners used to connect a non-pressure-retaining attachment to the component shall be considered part of the attachment.

(g) The boundary may be located further from the pressure-retaining portion of the component than as defined in (a) through (f) above when specified in the Design Specification.

NB-1140 ELECTRICAL AND MECHANICAL PENETRATION ASSEMBLIES

Electrical and mechanical penetration assemblies shall be constructed in accordance with the rules for vessels, except that the design and the material performing the electrical conducting and insulating functions need not meet the requirements of this Subsection.

Figure NB-1132.2-1
Attachments in the Component Support Load Path That Do Not Perform a Pressure-Retaining Function



- ① Component shall conform to Subsection NB.
- ② Pressure-retaining portion of the component.
- ③ Jurisdictional boundary (heavy line).
- ④ Cast or forged attachment or weld buildup shall conform to Subsection NB.
- ⑤ Beyond $2t$ from the pressure-retaining portion of the component, the design rules of Article NF-3000 may be used as a substitute for the design rules of Article NB-3000.
- ⑥ At or within $2t$ from the pressure-retaining portion of the component, the first connecting weld shall conform to Subsection NB.
- ⑦ Beyond $2t$ from the pressure-retaining portion of the component or beyond the first connecting weld, the attachment shall conform to Subsection NF [see Note (1)].
- ⑧ Bearing, clamped, or fastened attachment shall conform to Subsection NF [see Note (1)].
- ⑨ Attachment connection shall conform to Subsection NF [see Note (1)].
- ⑩ At or within $2t$ from the pressure-retaining portion of the component, the interaction effects of the attachment shall be considered in accordance with NB-3135.
- ⑪ Drilled holes shall conform to Subsection NB.

GENERAL NOTE: These sketches are intended to show jurisdictional concepts and should not be considered as recommended configurations.

NOTE: (1) If the attachment is an intervening element [NF-1110(c)], material, design, and connections, as appropriate, are outside Code jurisdiction.