

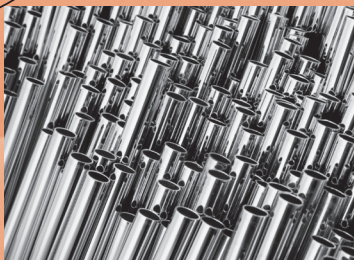
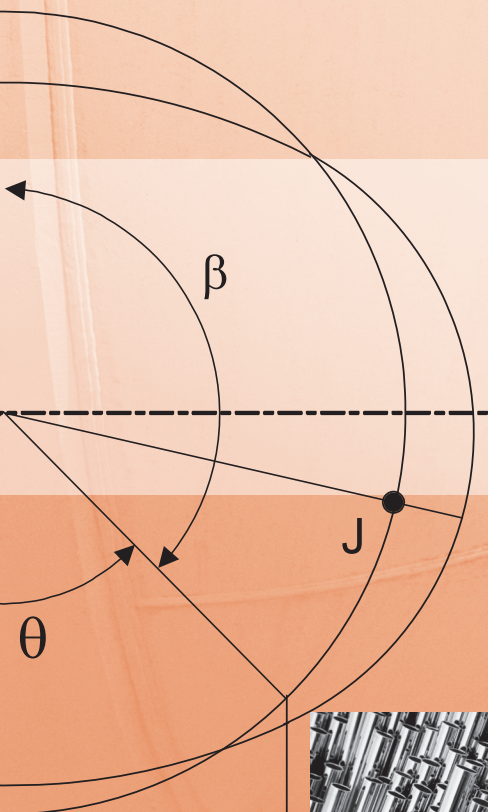
2010 ASME Boiler and Pressure Vessel Code

AN INTERNATIONAL CODE

II

Part B Nonferrous Material Specifications

Materials



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AN INTERNATIONAL CODE

2010 ASME Boiler & Pressure Vessel Code

2010 Edition

July 1, 2010

II

Part B

Nonferrous Material Specifications

MATERIALS

ASME Boiler and Pressure Vessel Committee on Materials



Three Park Avenue • New York, NY • 10016 USA



Date of Issuance: July 1, 2010
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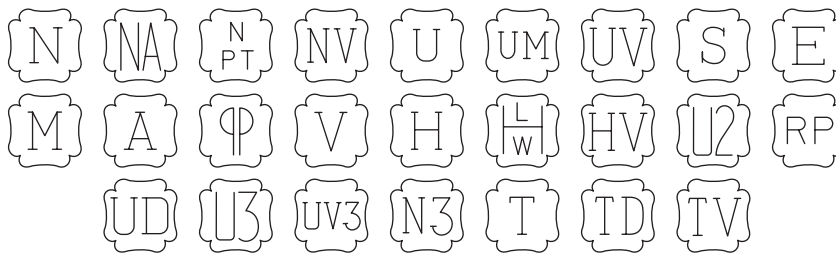
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July 1, 2011

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CONTENTS

List of Sections	viii
Foreword	x
Statement of Policy on the Use of the Certification Mark and Code Authorization in Advertising	xii
Statement of Policy on the Use of ASME Marking to Identify Manufactured Items	xii
Submittal of Technical Inquiries to the Boiler and Pressure Vessel Committee — Mandatory	xiii
Personnel	xv
ASTM Personnel	xxviii
Preface	xxix
Specifications Listed by Materials	xxx
Specification Removal	xxxv
Guideline on the Approval of New Materials Under the ASME Boiler and Pressure Vessel Code	xxxvi
Guideline on Acceptable ASTM Editions	xl
Guideline on Acceptable Non-ASTM Editions	xlvi
Guidelines on Multiple Marking of Materials	xlix
Summary of Changes	li
List of Changes in Record Number Order	lii

Specifications

SB-26/SB-26M	Aluminum-Alloy Sand Castings	1
SB-42	Seamless Copper Pipe, Standard Sizes	19
SB-43	Seamless Red Brass Pipe, Standard Sizes.....	29
SB-61	Steam or Valve Bronze Castings.....	37
SB-62	Composition Bronze or Ounce Metal Castings	39
SB-75	Seamless Copper Tube	41
SB-96/SB-96M	Copper-Silicon Alloy Plate, Sheet, Strip, and Rolled Bar for General Purposes and Pressure Vessels	51
SB-98/SB-98M	Copper-Silicon Alloy Rod, Bar, and Shapes	57
SB-108	Aluminum-Alloy Permanent Mold Castings.....	65
SB-111/SB-111M	Copper and Copper-Alloy Seamless Condenser Tubes and Ferrule Stock	81
SB-127	Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.....	95
SB-135	Seamless Brass Tube	103
SB-148	Aluminum-Bronze Sand Castings.....	111
SB-150/SB-150M	Aluminum Bronze Rod, Bar, and Shapes	117
SB-151/SB-151M	Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar.....	125
SB-152/SB-152M	Copper Sheet, Strip, Plate, and Rolled Bar.....	131
SB-160	Nickel Rod and Bar	139
SB-161	Nickel Seamless Pipe and Tube	147
SB-162	Nickel Plate, Sheet, and Strip	153
SB-163	Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes.....	167
SB-164	Nickel-Copper Alloy Rod, Bar, and Wire.....	177



SB-165	Nickel-Copper Alloy (UNS N04400) Seamless Pipe and Tube.....	191
SB-166	Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, N06045, and N06696) and Nickel-Chromium- Cobalt-Molybdenum Alloy (UNS N06617) Rod, Bar, and Wire	197
SB-167	Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, and N06045) and Nickel-Chromium-Cobalt- Molybdenum Alloy (UNS N06617) Seamless Pipe and Tube.....	209
SB-168	Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, and N06045) and Nickel-Chromium-Cobalt- Molybdenum Alloy (UNS N06617) Plate, Sheet, and Strip.....	215
SB-169/SB-169M	Aluminum Bronze Sheet, Strip, and Rolled Bar	229
SB-171/SB-171M	Copper-Alloy Plate and Sheet for Pressure Vessels, Condensers, and Heat Exchangers.....	235
SB-187/SB-187M	Copper, Bus Bar, Rod, and Shapes and General Purpose Rod, Bar, and Shapes.....	243
SB-209	Aluminum and Aluminum-Alloy Sheet and Plate	255
SB-210	Aluminum and Aluminum-Alloy Drawn Seamless Tubes.....	293
SB-211	Aluminum and Aluminum-Alloy Bar, Rod, and Wire	305
SB-221	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles, and Tubes.....	317
SB-234	Aluminum and Aluminum-Alloy Drawn Seamless Tubes for Condensers and Heat Exchangers.....	333
SB-241/SB-241M	Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube	341
SB-247	Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings	363
SB-248	General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar	379
SB-249/SB-249M	General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes, and Forgings	395
SB-251	General Requirements for Wrought Seamless Copper and Copper-Alloy Tube	413
SB-265	Titanium and Titanium Alloy Strip, Sheet, and Plate	423
SB-271	Copper-Base Alloy Centrifugal Castings.....	437
SB-283	Copper and Copper-Alloy Die Forgings (Hot-Pressed)	445
SB-308/SB-308M	Aluminum-Alloy 6061-T6 Standard Structural Profiles.....	455
SB-315	Seamless Copper Alloy Pipe and Tube	461
SB-333	Nickel-Molybdenum Alloy Plate, Sheet, and Strip.....	475
SB-335	Nickel-Molybdenum Alloy Rod	479
SB-338	Seamless and Welded Titanium and Titanium Alloy Tubes for Condensers and Heat Exchangers.....	485
SB-348	Titanium and Titanium Alloy Bars and Billets	495
SB-359	Copper and Copper-Alloy Seamless Condenser and Heat Exchanger Tubes With Integral Fins	503
SB-363	Seamless and Welded Unalloyed Titanium and Titanium Alloy Welding Fittings	511
SB-366	Factory-Made Wrought Nickel and Nickel Alloy Fittings	517
SB-367	Titanium and Titanium Alloy Castings	527
SB-369	Copper-Nickel Alloy Castings.....	535
SB-381	Titanium and Titanium Alloy Forgings.....	541
SB-395/SB-395M	U-Bend Seamless Copper and Copper-Alloy Heat Exchanger and Condenser Tubes	551
SB-407	Nickel-Iron-Chromium Alloy Seamless Pipe and Tube.....	565
SB-408	Nickel-Iron-Chromium Alloy Rod and Bar	573

SB-409	Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip.....	581
SB-423	Nickel-Iron-Chromium-Molybdenum-Copper Alloy (UNS N08825 and N08221) Seamless Pipe and Tube	589
SB-424	Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221) Plate, Sheet, and Strip.....	593
SB-425	Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221) Rod and Bar.....	605
SB-434	Nickel-Molybdenum-Chromium-Iron Alloys (UNS N10003, UNS N10242) Plate, Sheet, and Strip	613
SB-435	UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Plate, Sheet, and Strip.....	619
SB-443	Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Plate, Sheet, and Strip.....	623
SB-444	Nickel-Chromium-Molybdenum-Columbium Alloys (UNS N06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Pipe and Tube	635
SB-446	Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625), Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219), and Nickel-Chromium-Molybdenum-Tungsten Alloy (UNS N06650) Rod and Bar.....	641
SB-462	Forged or Rolled UNS N06030, UNS N06022, UNS N06035, UNS N06200, UNS N06059, UNS N06686, UNS N08020, UNS N08024, UNS N08026, UNS N08367, UNS N10276, UNS N10665, UNS N10675, UNS N10629, UNS N08031, UNS N06045, UNS N06025, and UNS R20033 Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service	649
SB-463	UNS N08020, UNS N08026, and UNS N08024 Alloy Plate, Sheet, and Strip.....	657
SB-464	Welded UNS N08020, UNS N08024, and UNS N08026 Alloy Pipe.....	661
SB-466/SB-466M	Seamless Copper-Nickel Pipe and Tube	665
SB-467	Welded Copper-Nickel Pipe.....	675
SB-468	Welded UNS N08020, N08024, and N08026 Alloy Tubes	683
SB-473	UNS N08020, UNS N08024, and UNS N08026 Nickel Alloy Bar and Wire.....	687
SB-493/SB-493M	Zirconium and Zirconium Alloy Forgings	697
SA-494/SA-494M	Castings, Nickel and Nickel Alloy	701
SB-505/SB-505M	Copper Alloy Continuous Castings.....	711
SB-511	Nickel-Iron-Chromium-Silicon Alloy Bars and Shapes.....	723
SB-514	Welded Nickel-Iron-Chromium Alloy Pipe	731
SB-515	Welded UNS N08120, UNS N08800, UNS N08810, and UNS N08811 Alloy Tubes.....	735
SB-516	Welded Nickel-Chromium-Iron Alloy (UNS N06600, UNS N06603, UNS N06025, and UNS N06045) Tubes	739
SB-517	Welded Nickel-Chromium-Iron Alloy (UNS N06600, UNS N06603, UNS N06025, and UNS N06045) Pipe.....	741
SB-523/SB-523M	Seamless and Welded Zirconium and Zirconium Alloy Tubes	743
SB-535	Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Seamless Pipe and Tube.....	749
SB-536	Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Plate, Sheet, and Strip.....	753
SB-543	Welded Copper and Copper-Alloy Heat Exchanger Tube.....	763
SB-548	Test Method for Ultrasonic Inspection of Aluminum-Alloy Plate for Pressure Vessels.....	775

SB-550/SB-550M	Zirconium and Zirconium Alloy Bar and Wire	781
SB-551/SB-551M	Zirconium and Zirconium Alloy Strip, Sheet, and Plate	789
SB-564	Nickel Alloy Forgings	803
SB-572	UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Rod.....	815
SB-573	Nickel-Molybdenum-Chromium-Iron Alloys (UNS N10003, N10242) Rod	821
SB-574	Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel- Molybdenum-Chromium-Tantalum, Low-Carbon Nickel-Chromium- Molybdenum-Copper, and Low-Carbon Nickel-Chromium- Molybdenum-Tungsten Alloy Rod.....	825
SB-575	Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel- Chromium-Molybdenum-Copper, Low-Carbon Nickel-Chromium- Molybdenum-Tantalum, and Low-Carbon Nickel-Chromium- Molybdenum-Tungsten Alloy Plate, Sheet, and Strip	831
SB-581	Nickel-Chromium-Iron-Molybdenum-Copper Alloy Rod	837
SB-582	Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip.....	843
SB-584	Copper Alloy Sand Castings for General Applications	851
SB-599	Nickel-Iron-Chromium-Molybdenum-Columbium Stabilized Alloy (UNS N08700) Plate, Sheet, and Strip	861
SB-619	Welded Nickel and Nickel-Cobalt Alloy Pipe.....	875
SB-620	Nickel-Iron-Chromium-Molybdenum Alloy (UNS N08320) Plate, Sheet, and Strip.....	883
SB-621	Nickel-Iron-Chromium-Molybdenum Alloy (UNS N08320) Rod.....	889
SB-622	Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube	895
SB-625	UNS N08904, UNS N08925, UNS N08031, UNS N08932, UNS N08926, and UNS R20033 Plate, Sheet, and Strip	901
SB-626	Welded Nickel and Nickel-Cobalt Alloy Tube	913
SB-637	Precipitation-Hardening Nickel Alloy Bars, Forgings, and Forging Stock for High-Temperature Service	919
SB-649	Ni-Fe-Cr-Mo-Cu Low-Carbon Alloy (UNS N08904), Ni-Fe-Cr-Mo-Cu-N Low-Carbon Alloys (UNS N08925, UNS N08031, and UNS N08926), and Cr-Ni-Fe-N Low-Carbon Alloy (UNS R20033) Bar and Wire.....	927
SB-653/SB-653M	Seamless and Welded Zirconium and Zirconium Alloy Welding Fittings	937
SB-658/SB-658M	Seamless and Welded Zirconium and Zirconium Alloy Pipe.....	941
SB-668	UNS N08028 Seamless Tubes.....	947
SB-672	Nickel-Iron-Chromium-Molybdenum-Columbium Stabilized Alloy (UNS N08700) Bar and Wire	949
SB-673	UNS N08904, UNS N08925, and UNS N08926 Welded Pipe	957
SB-674	UNS N08904, UNS N08925, and UNS N08926 Welded Tube.....	963
SB-675	UNS N08367 Welded Pipe.....	969
SB-676	UNS N08367 Welded Tube	971
SB-677	UNS N08904, UNS N08925, and UNS N08926 Seamless Pipe and Tube	975
SB-688	Chromium-Nickel-Molybdenum-Iron (UNS N08366 and UNS N08367) Plate, Sheet, and Strip	981
SB-690	Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08366 and UNS N08367) Seamless Pipe and Tube	989
SB-691	Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08366 and UNS N08367) Rod, Bar, and Wire	995
SB-704	Welded UNS N06625, UNS N06219, and UNS N08825 Alloy Tubes	1003

SB-705	Nickel-Alloy (UNS N06625, UNS N06219, and UNS N08825) Welded Pipe	1005
SB-709	Iron-Nickel-Chromium-Molybdenum Alloy (UNS N08028) Plate, Sheet, and Strip	1009
SB-710	Nickel-Iron-Chromium-Silicon Alloy Welded Pipe	1021
SB-729	Seamless UNS N08020, UNS N08026, and UNS N08024 Nickel-Alloy Pipe and Tube	1023
SB-751	General Requirements for Nickel and Nickel-Alloy Welded Tube	1027
SB-775	General Requirements for Nickel and Nickel-Alloy Welded Pipe	1033
SB-804	UNS N08367 and UNS N08926 Welded Pipe	1039
SB-815	Cobalt-Chromium-Nickel-Molybdenum-Tungsten Alloy (UNS R31233) Rod	1047
SB-818	Cobalt-Chromium-Nickel-Molybdenum-Tungsten Alloy (UNS R31233) Plate, Sheet, and Strip	1053
SB-824	General Requirements for Copper Alloy Castings	1057
SB-829	General Requirements for Nickel and Nickel Alloys Seamless Pipe and Tube	1065
SB-858	Test Method for Ammonia Vaport Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys	1071
SB-861	Titanium and Titanium Alloy Seamless Pipe	1077
SB-862	Titanium and Titanium Alloy Welded Pipe	1087
SB-906	General Requirements for Flat-Rolled Nickel and Nickel Alloys Plate, Sheet, and Strip	1101
SB-928/SB-928M	High Magnesium Aluminum-Alloy Sheet and Plate for Marine Service and Similar Environments	1125
SB-956	Welded Copper and Copper-Alloy Condenser and Heat Exchanger Tubes With Integral Fins	1139
SB/EN 1706	Aluminum and Alloys — Castings — Chemical Composition and Mechanical Properties	1151
SF-467	Nonferrous Nuts for General Use	1153
SF-467M	Nonferrous Nuts for General Use [Metric]	1163
SF-468	Nonferrous Bolts, Hex Cap Screws, and Studs for General Use	1173
SF-468M	Nonferrous Bolts, Hex Cap Screws, and Studs for General Use [Metric]	1185

Mandatory Appendix

I	Standard Units for Use in Equations	1197
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Nonmandatory Appendix

A	Sources of Standards	1199
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2010 ASME

BOILER AND PRESSURE VESSEL CODE

SECTIONS

- I Rules for Construction of Power Boilers
- 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 (Customary)
 - Part D — Properties (Metric)
- III Rules for Construction of Nuclear Facility Components
 - Subsection NCA — General Requirements for Division 1 and Division 2
 - 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
 - Appendices
 - Division 2 — Code for Concrete Containments
 - Division 3 — Containments for Transportation and Storage of Spent Nuclear Fuel and High Level Radioactive Material and Waste
- IV Rules for Construction of 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 Rules for Construction of Pressure Vessels
 - Division 1
 - Division 2 — Alternative Rules
 - Division 3 — Alternative Rules for Construction of High Pressure Vessels
- IX Welding and Brazing Qualifications
- X Fiber-Reinforced Plastic Pressure Vessels
- XI Rules for Inservice Inspection of Nuclear Power Plant Components
- XII Rules for Construction and Continued Service of Transport Tanks



ADDENDA

Addenda, which include additions and revisions to individual Sections of the Code, will be sent automatically to purchasers of the applicable Sections up to the publication of the 2013 Code. The 2010 Code is available only in the loose-leaf format; accordingly, the Addenda will be issued in the loose-leaf format.

INTERPRETATIONS

ASME issues written replies to inquiries concerning interpretation of technical aspects of the Code. The Interpretations for each individual Section will be published separately and will be included as part of the update service to that Section. Interpretations of Section III, Divisions 1

and 2, will be included with the update service to Subsection NCA.

Interpretations of the Code are posted in January and July at <http://cstools.asme.org/interpretations.cfm>.

CODE CASES

The Boiler and Pressure Vessel Committee meets regularly to consider proposed additions and revisions to the Code and to formulate Cases to clarify the intent of existing requirements or provide, when the need is urgent, rules for materials or constructions not covered by existing Code rules. Those Cases that have been adopted will appear in the appropriate 2010 Code Cases book: “Boilers and Pressure Vessels” and “Nuclear Components.” Supplements will be sent automatically to the purchasers of the Code Cases books up to the publication of the 2013 Code.

FOREWORD

The American Society of Mechanical Engineers set up a committee in 1911 for the purpose of formulating standard rules for the construction of steam boilers and other pressure vessels. This committee is now called the Boiler and Pressure Vessel Committee.

The Committee's function is to establish rules of safety, relating only to pressure integrity, governing the construction¹ of boilers, pressure vessels, transport tanks and nuclear components, and inservice inspection for pressure integrity of nuclear components and transport tanks, and to interpret these rules when questions arise regarding their intent. This Code does not address other safety issues relating to the construction of boilers, pressure vessels, transport tanks and nuclear components, and the inservice inspection of nuclear components and transport tanks. The user of the Code should refer to other pertinent codes, standards, laws, regulations, or other relevant documents. With few 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. Recognizing this, the Committee has approved a wide variety of construction rules in this Section to allow the user or his designee to select those which will provide a pressure vessel having a margin for deterioration in service so as to give a reasonably long, safe period of usefulness. Accordingly, it is not intended that this Section be used as a design handbook; rather, engineering judgment must be employed in the selection of those sets of Code rules suitable to any specific service or need.

This Code contains mandatory requirements, specific prohibitions, and nonmandatory guidance for construction 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 designers 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.

¹ *Construction*, as used in this Foreword, is an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and pressure relief.

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

The Code does not fully address tolerances. When dimensions, sizes, or other parameters are not specified with tolerances, the values of these parameters are considered nominal and allowable tolerances or local variances may be considered acceptable when based on engineering judgment and standard practices as determined by the designer.

The Boiler and Pressure Vessel Committee deals with the care and inspection of boilers and pressure vessels in service only to the extent of providing suggested rules of good practice as an aid to owners and their inspectors.

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 Boiler and Pressure Vessel Committee meets regularly to consider revisions of the rules, new rules as dictated by technological development, Code Cases, and requests for interpretations. Only the Boiler and Pressure Vessel Committee has the authority to provide official interpretations of this Code. Requests for revisions, new rules, Code Cases, or interpretations shall be addressed to the Secretary in writing and shall give full particulars in order to receive consideration and action (see Submittal of Technical Inquiries to the Boiler and Pressure Vessel Committee). Proposed revisions to the Code resulting from inquiries will be presented to the Standards Committees for appropriate action. The action of the Standards Committees becomes effective only after confirmation by letter ballot of the Committees and approval by ASME.

Proposed revisions to the Code approved by the Committee are submitted to the American National Standards Institute and published at <http://cstools.asme.org/csconnect/public/index.cfm?PublicReview=Revisions> to invite comments from all interested persons. After the allotted time for public review and final approval by ASME, revisions are published in updates to the Code.

Code Cases may be used in the construction of components to be stamped with the Certification Mark beginning with the date of their approval by ASME.

After Code revisions are approved by ASME, they may be used beginning with the date of issuance. Revisions, except for revisions to material specifications in Section II, Parts A and B, become mandatory six months after such date of issuance, except for boilers or pressure vessels contracted for prior to the end of the six-month period. Revisions to material specifications are originated by the American Society for Testing and Materials (ASTM) and other recognized national or international organizations, and are usually adopted by ASME. However, those revisions may or may not have any effect on the suitability of material, produced to earlier editions of specifications, for use in ASME construction. ASME material specifications approved for use in each construction Code are listed in the Guideline for Acceptable ASTM Editions and in the Guideline for Acceptable Non-ASTM Editions, in Section II, Parts A and B. These Guidelines list, for each specification, the latest edition adopted by ASME, and earlier and later editions considered by ASME to be identical for ASME construction.

The Boiler and Pressure Vessel Committee in the formulation of its rules and in the establishment of maximum design and operating pressures considers materials, construction, method of fabrication, inspection, and safety devices.

The Code 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 ASME Boiler and Pressure Vessel Committee. ASME is to be notified should questions arise concerning improper use of the Certification Mark.

The specifications for materials given in Section II are identical with or similar to those of specifications published by ASTM, AWS, and other recognized national or international organizations. When reference is made in an ASME material specification to a non-ASME specification for which a companion ASME specification exists, the reference shall be interpreted as applying to the ASME material specification. Not all materials included in the material specifications in Section II have been adopted for Code use. Usage is limited to those materials and grades adopted by at least one of the other Sections of the Code for application under rules of that Section. All materials allowed by these various Sections and used for construction within the scope of their rules shall be furnished in accordance with material specifications contained in Section II or referenced in the Guidelines for Acceptable Editions in Section II, Parts A and B, except where otherwise provided in Code Cases or in the applicable Section of the Code. Materials covered by these specifications are acceptable for use in items covered by the Code Sections only to the degree indicated in the applicable Section. Materials for Code use should preferably be ordered, produced, and documented on this basis; Guidelines for Acceptable Editions in Section II, Parts A and B list editions of ASME and year dates of specifications that meet ASME requirements and which may be used in Code construction. Material produced to an acceptable specification with requirements different from the requirements of the corresponding specifications listed in the Guidelines for Acceptable Editions in Part A or Part B may also be used in accordance with the above, provided the material manufacturer or vessel manufacturer certifies with evidence acceptable to the Authorized Inspector that the corresponding requirements of specifications listed in the Guidelines for Acceptable Editions in Part A or Part B have been met. Material produced to an acceptable material specification is not limited as to country of origin.

When required by context in this Section, the singular shall be interpreted as the plural, and vice-versa; and the feminine, masculine, or neuter gender shall be treated as such other gender as appropriate.

(10)
(a)

STATEMENT OF POLICY ON THE USE OF THE 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 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 Certification Mark for the benefit of the users, the enforcement jurisdictions, and the holders of the 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 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 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 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 Certification Mark who may also use the facsimile in advertising to show that clearly specified items will carry the Certification Mark. General usage is permitted only when all of a manufacturer’s items are constructed under the rules.

(a)

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 official Certification Mark described in the governing Section of the Code.

Markings such as “ASME,” “ASME Standard,” or any other marking including “ASME” or the 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.

SUBMITTAL OF TECHNICAL INQUIRIES TO THE BOILER AND PRESSURE VESSEL COMMITTEE — MANDATORY

(a)

1 INTRODUCTION

(a) The following information provides guidance to Code users for submitting technical inquiries to the Committee. See Guideline on the Approval of New Materials Under the ASME Boiler and Pressure Vessel Code in Section II, Parts C and D for additional requirements for requests involving adding new materials to the Code. Technical inquiries include requests for revisions or additions to the Code rules, requests for Code Cases, and requests for Code interpretations, as described below.

(1) *Code Revisions*. Code revisions are considered to accommodate technological developments, address administrative requirements, incorporate Code Cases, or to clarify Code intent.

(2) *Code Cases*. Code Cases represent alternatives or additions to existing Code rules. Code Cases are written as a question and reply, and are usually intended to be incorporated into the Code at a later date. When used, Code Cases prescribe mandatory requirements in the same sense as the text of the Code. However, users are cautioned that not all jurisdictions or owners automatically accept Code Cases. The most common applications for Code Cases are:

(a) to permit early implementation of an approved Code revision based on an urgent need

(b) to permit the use of a new material for Code construction

(c) to gain experience with new materials or alternative rules prior to incorporation directly into the Code

(3) *Code Interpretations*. Code Interpretations provide clarification of the meaning of existing rules in the Code, and are also presented in question and reply format. Interpretations do not introduce new requirements. In cases where existing Code text does not fully convey the meaning that was intended, and revision of the rules is required to support an interpretation, an Intent Interpretation will be issued and the Code will be revised.

(b) The Code rules, Code Cases, and Code Interpretations established by the Committee 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 rules.

(c) Inquiries that do not comply with these provisions or that do not provide sufficient information for the Committee's full understanding may result in the request being returned to the inquirer with no action.

2 INQUIRY FORMAT

Submittals to the Committee shall include:

(a) *Purpose*. Specify one of the following:

(1) revision of present Code rules

(2) new or additional Code rules

(3) Code Case

(4) Code Interpretation

(b) *Background*. Provide the information needed for the Committee's understanding of the inquiry, being sure to include reference to the applicable Code Section, Division, Edition, Addenda (if applicable), paragraphs, figures, and tables. Preferably, provide a copy of the specific referenced portions of the Code.

(c) *Presentations*. The inquirer may desire or be asked to attend a meeting of the Committee to make a formal presentation or to answer questions from the Committee members with regard to the inquiry. Attendance at a Committee meeting shall be at the expense of the inquirer. The inquirer's attendance or lack of attendance at a meeting shall not be a basis for acceptance or rejection of the inquiry by the Committee.

3 CODE REVISIONS OR ADDITIONS

Requests for Code revisions or additions shall provide the following:

(a) *Proposed Revisions or Additions*. For revisions, identify the rules of the Code that require revision and submit a copy of the appropriate rules as they appear in the Code, marked up with the proposed revision. For additions, provide the recommended wording referenced to the existing Code rules.



(b) *Statement of Need*. Provide a brief explanation of the need for the revision or addition.

(c) *Background Information*. Provide background information to support the revision or addition, including any data or changes in technology that form the basis for the request that will allow the Committee to adequately evaluate the proposed revision or addition. Sketches, tables, figures, and graphs should be submitted as appropriate. When applicable, identify any pertinent paragraph in the Code that would be affected by the revision or addition and identify paragraphs in the Code that reference the paragraphs that are to be revised or added.

4 CODE CASES

Requests for Code Cases shall provide a Statement of Need and Background Information similar to that defined in 3(b) and 3(c), respectively, for Code revisions or additions. The urgency of the Code Case (e.g., project underway or imminent, new procedure, etc.) must be defined and it must be confirmed that the request is in connection with equipment that will bear the Certification Mark, with the exception of Section XI applications. The proposed Code Case should identify the Code Section and Division, and be written as a *Question* and a *Reply* in the same format as existing Code Cases. Requests for Code Cases should also indicate the applicable Code Editions and Addenda (if applicable) to which the proposed Code Case applies.

5 CODE INTERPRETATIONS

(a) Requests for Code Interpretations shall provide the following:

(1) *Inquiry*. Provide a condensed and precise question, omitting superfluous background information and, when possible, composed in such a way that a “yes” or a “no” *Reply*, with brief provisos if needed, is acceptable. The question should be technically and editorially correct.

(2) *Reply*. Provide a proposed *Reply* that will clearly and concisely answer the *Inquiry* question. Preferably, the

Reply should be “yes” or “no,” with brief provisos if needed.

(3) *Background Information*. Provide any background information that will assist the Committee in understanding the proposed *Inquiry* and *Reply*.

(b) Requests for Code Interpretations must be limited to an interpretation of a particular requirement in the Code or a Code Case. The Committee cannot consider consulting type requests such as the following:

(1) a review of calculations, design drawings, welding qualifications, or descriptions of equipment or parts to determine compliance with Code requirements;

(2) a request for assistance in performing any Code-prescribed functions relating to, but not limited to, material selection, designs, calculations, fabrication, inspection, pressure testing, or installation;

(3) a request seeking the rationale for Code requirements.

6 SUBMITTALS

Submittals to and responses from the Committee shall meet the following:

(a) *Submittal*. Inquiries from Code users shall be in English and preferably be submitted in typewritten form; however, legible handwritten inquiries will also be considered. They shall include the name, address, telephone number, fax number, and e-mail address, if available, of the inquirer and be mailed to the following address:

Secretary
ASME Boiler and Pressure Vessel Committee
Three Park Avenue
New York, NY 10016-5990

As an alternative, inquiries may be submitted via e-mail to: SecretaryBPV@asme.org.

(b) *Response*. The Secretary of the ASME Boiler and Pressure Vessel Committee or of the appropriate Subcommittee shall acknowledge receipt of each properly prepared inquiry and shall provide a written response to the inquirer upon completion of the requested action by the Code Committee.

PERSONNEL

ASME Boiler and Pressure Vessel Standards Committees, Subgroups, and Working Groups

As of January 1, 2011

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PREFACE

(10)

The American Society of Mechanical Engineers (ASME) and the American Society for Testing and Materials (ASTM) have cooperated for more than fifty years in the preparation of material specifications adequate for safety in the field of pressure equipment for ferrous and nonferrous materials, contained in Section II (Part A — Ferrous and Part B — Nonferrous) of the ASME Boiler and Pressure Vessel Code.

The evolution of this cooperative effort is contained in Professor A. M. Greene's "History of the ASME Boiler Code," which was published as a series of articles in *Mechanical Engineering* from July 1952 through August 1953 and is now available from ASME in a special bound edition. The following quotations from this history, which was based upon the minutes of the ASME Boiler and Pressure Vessel Committee, will help focus on the cooperative nature of the specifications found in Section II, Material Specifications.

"General discussion of material specifications comprising Paragraphs 1 to 112 of Part 2 and the advisability of having them agree with ASTM specifications," (1914).

"ASME Subcommittee appointed to confer with ASTM," (1916).

"Because of this cooperation the specifications of the 1918 Edition of the ASME Boiler Code were more nearly in agreement with ASTM specifications. In the 1924 Edition of the Code, 10 specifications were in complete agreement with ASTM specifications, 4 in substantial agreement and 2 covered materials for which ASTM had no corresponding specifications."

"In Section II, Material Specifications, the paragraphs were given new numbers beginning with S-1 and extending to S-213," (1925).

"Section II was brought into agreement with changes made in the latest ASTM specifications since 1921," (1932).

"The Subcommittee on Material Specifications arranged for the introduction of the revisions of many of the specifications so that they would agree with the latest form of the earlier ASTM specifications....," (1935).

From the preceding, it is evident that many of the material specifications were prepared by the Boiler and Pressure Vessel Code Committees, then subsequently, by cooperative action, modified and identified as ASTM specifications. Section II, Parts A and B, currently contain many

material specifications which are identical with the corresponding ASTM specifications and some which have been modified for Code usage. Many of these specifications are published in dual format. That is, they contain both U.S. Customary units and SI units. The metrication protocols followed in the specifications are those adopted by ASTM, and are usually to the rules of IEEE/ASTM 10-1997, Standard for the Use of the International System of Units (SI): The Modern Metric System.

In 1969, the American Welding Society began publication of specifications for welding rods, electrodes, and filler metals, hitherto issued by ASTM. The Boiler and Pressure Vessel Committee has recognized this new arrangement, and is now working with AWS on these specifications. Section II, Part C, contains the welding material specifications approved for Code use.

In 1992, the ASME Board of Pressure Technology Codes and Standards endorsed the use of non-ASTM material for Boiler and Pressure Vessel Code applications. It is the intent to follow the procedures and practices currently in use to implement the adoption of non-ASTM materials.

All identical specifications are indicated by the ASME/originating organization symbols. The specifications prepared and copyrighted by ASTM, AWS, and other originating organizations are reproduced in the Code with the permission of the respective Society. The ASME Boiler and Pressure Vessel Committee has given careful consideration to each new and revised specification, and has made such changes as they deemed necessary to make the specification adaptable for Code usage. In addition, ASME has furnished ASTM with the basic requirements that should govern many proposed new specifications. Joint action will continue an effort to make the ASTM, AWS, and ASME specifications identical.

To ensure that there will be a clear understanding on the part of the users of Section II, ASME publishes both the identical specifications and those amended for Code usage in three Parts every three years, in the same page size to match the other sections of the Code, and updates are issued to provide the latest changes in Section II specifications.

The ASME Boiler and Pressure Vessel Code has been adopted into law by 50 states and many municipalities in the United States and by all of the Canadian provinces.



SPECIFICATIONS LISTED BY MATERIALS

Aluminum and Aluminum Alloys

SB-26/SB-26M	Aluminum-Alloy Sand Castings	1
SB-108	Aluminum-Alloy Permanent Mold Castings.....	65
SB-209	Aluminum and Aluminum-Alloy Sheet and Plate	255
SB-210	Aluminum and Aluminum-Alloy Drawn Seamless Tubes.....	293
SB-211	Aluminum and Aluminum-Alloy Bar, Rod, and Wire	305
SB-221	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.....	317
SB-234	Aluminum and Aluminum-Alloy Drawn Seamless Tubes for Condensers and Heat Exchangers	333
SB-241/SB-241M	Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.....	341
SB-247	Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings	363
SB-308/SB-308M	Aluminum-Alloy 6061-T6 Standard Structural Profiles	455
SB-548	Test Method for Ultrasonic Inspection of Aluminum-Alloy Plate for Pressure Vessels	775
SB-928/SB-928M	High Magnesium Aluminum-Alloy Sheet and Plate for Marine Service and Similar Environments	1125
SB/EN 1706	Aluminum and Alloys — Castings — Chemical Composition and Mechanical Properties	1151

Cobalt Alloys

SB-815	Cobalt-Chromium-Nickel-Molybdenum-Tungsten Alloy (UNS R31233) Rod	1047
SB-818	Cobalt-Chromium-Nickel-Molybdenum-Tungsten Alloy (UNS R31233) Plate, Sheet, and Strip	1053

Copper and Copper Alloy Plate, Sheet, Strip, and Rolled Bar

SB-96/SB-96M	Copper-Silicon Alloy Plate, Sheet, Strip, and Rolled Bar for General Purposes and Pressure Vessels	51
SB-152/SB-152M	Copper Sheet, Strip, Plate, and Rolled Bar.....	131
SB-169/SB-169M	Aluminum Bronze Sheet, Strip, and Rolled Bar	229
SB-171/SB-171M	Copper-Alloy Plate and Sheet for Pressure Vessels, Condensers, and Heat Exchangers.....	235
SB-248	General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar.....	379
SB-283	Copper and Copper-Alloy Die Forgings (Hot-Pressed)	445

Copper and Copper Alloy Rod, Bar, and Shapes

SB-98/SB-98M	Copper-Silicon Alloy Rod, Bar, and Shapes.....	57
SB-150/SB-150M	Aluminum Bronze Rod, Bar, and Shapes	117
SB-151/SB-151M	Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar	125



SB-187/SB-187M	Copper, Bus Bar, Rod, and Shapes and General Purpose Rod, Bar, and Shapes	243
SB-249/SB-249M	General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes, and Forgings	395

Copper and Copper Alloy Pipe and Tubes

SB-42	Seamless Copper Pipe, Standard Sizes	19
SB-43	Seamless Red Brass Pipe, Standard Sizes	29
SB-75	Seamless Copper Tube	41
SB-111/SB-111M	Copper and Copper-Alloy Seamless Condenser Tubes and Ferrule Stock	81
SB-135	Seamless Brass Tube	103
SB-251	General Requirements for Wrought Seamless Copper and Copper-Alloy Tube	413
SB-315	Seamless Copper Alloy Pipe and Tube	461
SB-359	Copper and Copper-Alloy Seamless Condenser and Heat Exchanger Tubes With Integral Fins	503
SB-395/SB-395M	U-Bend Seamless Copper and Copper-Alloy Heat Exchanger and Condenser Tubes	551
SB-466/SB-466M	Seamless Copper-Nickel Pipe and Tube	665
SB-467	Welded Copper-Nickel Pipe	675
SB-543	Welded Copper and Copper-Alloy Heat Exchanger Tube	763
SB-956	Welded Copper and Copper-Alloy Condenser and Heat Exchanger Tubes With Integral Fins	1139

Copper Alloy Castings

SB-61	Steam or Valve Bronze Castings	37
SB-62	Composition Bronze or Ounce Metal Castings	39
SB-148	Aluminum-Bronze Sand Castings	111
SB-271	Copper-Base Alloy Centrifugal Castings	437
SB-369	Copper-Nickel Alloy Castings	535
SB-505/SB-505M	Copper Alloy Continuous Castings	711
SB-584	Copper Alloy Sand Castings for General Applications	851
SB-824	General Requirements for Copper Alloy Castings	1057

Copper Test Method

SB-858	Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys	1071
--------	---	------

Nickel and Nickel Alloy Plate, Sheet, and Strip

SB-127	Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip	95
SB-162	Nickel Plate, Sheet, and Strip	153
SB-168	Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, and N06045) and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617) Plate, Sheet, and Strip	215
SB-333	Nickel-Molybdenum Alloy Plate, Sheet, and Strip	475
SB-409	Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip	581
SB-424	Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221) Plate, Sheet, and Strip	593
SB-434	Nickel-Molybdenum-Chromium-Iron Alloys (UNS N10003, UNS N10242) Plate, Sheet, and Strip	613
SB-435	UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Plate, Sheet, and Strip	619
SB-443	Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Plate, Sheet, and Strip	623



SB-463	UNS N08020, UNS N08026, and UNS N08024 Alloy Plate, Sheet, and Strip	657
SB-536	Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Plate, Sheet, and Strip	753
SB-575	Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, Low-Carbon Nickel-Chromium-Molybdenum-Tantalum, and Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Plate, Sheet, and Strip	831
SB-582	Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip	843
SB-599	Nickel-Iron-Chromium-Molybdenum-Columbium Stabilized Alloy (UNS N08700) Plate, Sheet, and Strip	861
SB-620	Nickel-Iron-Chromium-Molybdenum Alloy (UNS N08320) Plate, Sheet, and Strip	883
SB-625	UNS N08904, UNS N08925, UNS N08031, UNS N08932, UNS N08926, and UNS R20033 Plate, Sheet, and Strip	901
SB-688	Chromium-Nickel-Molybdenum-Iron (UNS N08366 and UNS N08367) Plate, Sheet, and Strip	981
SB-709	Iron-Nickel-Chromium-Molybdenum Alloy (UNS N08028) Plate, Sheet, and Strip	1009
SB-906	General Requirements for Flat-Rolled Nickel and Nickel Alloys Plate, Sheet, and Strip	1101

Nickel and Nickel Alloy Rod, Bar, and Wire

SB-160	Nickel Rod and Bar	139
SB-164	Nickel-Copper Alloy Rod, Bar, and Wire	177
SB-166	Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, N06045, and N06696) and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617) Rod, Bar, and Wire	197
SB-335	Nickel-Molybdenum Alloy Rod	479
SB-408	Nickel-Iron-Chromium Alloy Rod and Bar	573
SB-425	Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221) Rod and Bar	605
SB-446	Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625), Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219), and Nickel-Chromium-Molybdenum-Tungsten Alloy (UNS N06650) Rod and Bar	641
SB-473	UNS N08020, UNS N08024, and UNS N08026 Nickel Alloy Bar and Wire	687
SB-511	Nickel-Iron-Chromium-Silicon Alloy Bars and Shapes	723
SB-564	Nickel Alloy Forgings	803
SB-572	UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Rod	815
SB-573	Nickel-Molybdenum-Chromium-Iron Alloys (UNS N10003, N10242) Rod	821
SB-574	Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Molybdenum-Chromium-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, and Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Rod	825
SB-581	Nickel-Chromium-Iron-Molybdenum-Copper Alloy Rod	837
SB-621	Nickel-Iron-Chromium-Molybdenum Alloy (UNS N08320) Rod	889
SB-637	Precipitation-Hardening Nickel Alloy Bars, Forgings, and Forging Stock for High-Temperature Service	919
SB-649	Ni-Fe-Cr-Mo-Cu Low-Carbon Alloy (UNS N08904), Ni-Fe-Cr-Mo-Cu-N Low-Carbon Alloys (UNS N08925, UNS N08031, and UNS N08926), and Cr-Ni-Fe-N Low-Carbon Alloy (UNS R20033) Bar and Wire	927
SB-672	Nickel-Iron-Chromium-Molybdenum-Columbium Stabilized Alloy (UNS N08700) Bar and Wire	949



SB-691	Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08366 and UNS N08367) Rod, Bar, and Wire.....	995
--------	--	-----

Nickel and Nickel Alloy Pipe and Tubes

SB-161	Nickel Seamless Pipe and Tube.....	147
SB-163	Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes.....	167
SB-165	Nickel-Copper Alloy (UNS N04400) Seamless Pipe and Tube.....	191
SB-167	Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, and N06045) and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617) Seamless Pipe and Tube.....	209
SB-407	Nickel-Iron-Chromium Alloy Seamless Pipe and Tube.....	565
SB-423	Nickel-Iron-Chromium-Molybdenum-Copper Alloy (UNS N08825 and N08221) Seamless Pipe and Tube.....	589
SB-444	Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Pipe and Tube.....	635
SB-462	Forged or Rolled UNS N06030, UNS N06022, UNS N06035, UNS N06200, UNS N06059, UNS N06686, UNS N08020, UNS N08024, UNS N08026, UNS N08367, UNS N10276, UNS N10665, UNS N10675, UNS N10629, UNS N08031, UNS N06045, UNS N06025, and UNS R20033 Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service.....	649
SB-464	Welded UNS N08020, UNS N08024, and UNS N08026 Alloy Pipe.....	661
SB-468	Welded UNS N08020, N08024, and N08026 Alloy Tubes.....	683
SB-514	Welded Nickel-Iron-Chromium Alloy Pipe.....	731
SB-515	Welded UNS N08120, UNS N08800, UNS N08810, and UNS N08811 Alloy Tubes.....	735
SB-516	Welded Nickel-Chromium-Iron Alloy (UNS N06600, UNS N06603, UNS N06025, and UNS N06045) Tubes.....	739
SB-517	Welded Nickel-Chromium-Iron Alloy (UNS N06600, UNS N06603, UNS N06025, and UNS N06045) Pipe.....	741
SB-535	Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Seamless Pipe and Tube.....	749
SB-619	Welded Nickel and Nickel-Cobalt Alloy Pipe.....	875
SB-622	Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube.....	895
SB-626	Welded Nickel and Nickel-Cobalt Alloy Tube.....	913
SB-668	UNS N08028 Seamless Tubes.....	947
SB-673	UNS N08904, UNS N08925, and UNS N08926 Welded Pipe.....	957
SB-674	UNS N08904, UNS N08925, and UNS N08926 Welded Tube.....	963
SB-675	UNS N08367 Welded Pipe.....	969
SB-676	UNS N08367 Welded Tube.....	971
SB-677	UNS N08904, UNS N08925, and UNS N08926 Seamless Pipe and Tube.....	975
SB-690	Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08366 and UNS N08367) Seamless Pipe and Tube.....	989
SB-704	Welded UNS N06625, UNS N06219, and UNS N08825 Alloy Tubes.....	1003
SB-705	Nickel-Alloy (UNS N06625, UNS N06219, and UNS N08825) Welded Pipe.....	1005
SB-710	Nickel-Iron-Chromium-Silicon Alloy Welded Pipe.....	1021
SB-729	Seamless UNS N08020, UNS N08026, and UNS N08024 Nickel-Alloy Pipe and Tube.....	1023
SB-751	General Requirements for Nickel and Nickel-Alloy Welded Tube.....	1027
SB-775	General Requirements for Nickel and Nickel-Alloy Welded Pipe.....	1033
SB-804	UNS N08367 and UNS N08926 Welded Pipe.....	1039



SB-829	General Requirements for Nickel and Nickel Alloys Seamless Pipe and Tube.....	1065
Nickel Alloy Castings		
SA-494/SA-494M	Castings, Nickel and Nickel Alloy	701
Nickel and Nickel Alloy Fittings		
SB-366	Factory-Made Wrought Nickel and Nickel Alloy Fittings.....	517
Titanium and Titanium Alloys		
SB-265	Titanium and Titanium Alloy Strip, Sheet, and Plate.....	423
SB-338	Seamless and Welded Titanium and Titanium Alloy Tubes for Condensers and Heat Exchangers	485
SB-348	Titanium and Titanium Alloy Bars and Billets	495
SB-363	Seamless and Welded Unalloyed Titanium and Titanium Alloy Welding Fittings	511
SB-367	Titanium and Titanium Alloy Castings	527
SB-381	Titanium and Titanium Alloy Forgings	541
SB-861	Titanium and Titanium Alloy Seamless Pipe	1077
SB-862	Titanium and Titanium Alloy Welded Pipe	1087
Zirconium and Zirconium Alloys		
SB-493/SB-493M	Zirconium and Zirconium Alloy Forgings.....	697
SB-523/SB-523M	Seamless and Welded Zirconium and Zirconium Alloy Tubes	743
SB-550/SB-550M	Zirconium and Zirconium Alloy Bar and Wire	781
SB-551/SB-551M	Zirconium and Zirconium Alloy Strip, Sheet, and Plate	789
SB-653/SB-653M	Seamless and Welded Zirconium and Zirconium Alloy Welding Fittings....	937
SB-658/SB-658M	Seamless and Welded Zirconium and Zirconium Alloy Pipe.....	941
Other		
SF-467	Nonferrous Nuts for General Use	1153
SF-467M	Nonferrous Nuts for General Use [Metric]	1163
SF-468	Nonferrous Bolts, Hex Cap Screws, and Studs for General Use	1173
SF-468M	Nonferrous Bolts, Hex Cap Screws, and Studs for General Use [Metric].....	1185

SPECIFICATION REMOVAL

(10)

From time to time, it becomes necessary to remove specifications from this Part of Section II. This occurs because the sponsoring society (e.g., ASTM, AWS, CEN) has notified ASME that the specification has either been replaced with another specification, or that there is no known use and production of a material. Removal of a specification from this Section also results in concurrent removal of the same specification from Section IX and from all of the ASME Boiler and Pressure Vessel Construction Codes that reference the material. This action effectively prohibits further use of the material in ASME Boiler and Pressure Vessel Construction.

The following specifications will be dropped from this Section in the next Addenda (if applicable), unless information concerning current production and use of the material

is received before December 1st of this year:

None in this Edition or Addenda.

If you are currently using and purchasing new material to any of these specifications for ASME Boiler and Pressure Vessel Code Construction, and if discontinuance of one or more of these specifications would present a hardship, please notify the Secretary of the ASME Boiler and Pressure Vessel Committee, at the address shown below:

Secretary
ASME Boiler and Pressure Vessel Committee
Three Park Avenue
New York, NY 10016-5990
Tel: (212) 591-8533
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GUIDELINE ON THE APPROVAL OF NEW MATERIALS UNDER THE ASME BOILER AND PRESSURE VESSEL CODE

Code Policy. It is the policy of the ASME Boiler and Pressure Vessel Committee to adopt for inclusion in Section II only such specifications as have been adopted by the American Society for Testing and Materials (ASTM), by the American Welding Society (AWS), and by other recognized national or international organizations.

It is expected that requests for Code approval will normally be for materials for which there is a recognized national or international specification. For materials made to a recognized national or international specification other than those of ASTM or AWS, the inquirer shall give notice to the standards developing organization that a request has been made to ASME for adoption of their specification under the ASME Code and shall request that the organization grant ASME permission to reprint the specification. For other materials, a request shall be made to ASTM, AWS, or a recognized national or international organization to develop a specification that can be presented to the Code Committee.

It is the policy of the ASME Boiler and Pressure Vessel Committee to consider requests to adopt new materials only from boiler, pressure vessel, or nuclear power plant component Manufacturers or users. Further, such requests should be for materials for which there is a reasonable expectation of use in a boiler, pressure vessel, or nuclear power plant component constructed to the rules of one of the Sections of this Code. Requests for new materials shall be accompanied by a communication from an ASME Certificate Holder, an end user, or an organization that specifies materials and contracts with Certificate Holders for the construction of products to the rules of one of the sections of this Code. The letter shall state the Inquirer's name and status as one of these three types of organizations.

Application. The inquirer shall identify to the Committee the Section or Sections and Divisions of the Code in which the new material is to be incorporated, the temperature range of application, whether cyclic service is to be considered, and whether external pressure service is to be considered. The inquirer shall identify all product forms, size ranges, and specifications for which incorporation is desired.

Mechanical Properties. Together with the specification for the material, the inquirer shall furnish the Committee with adequate data on which to base design values for inclusion in the applicable tables. The data shall include values of ultimate tensile strength, yield strength, reduction of area, and elongation, at 100°F (or 50°C) intervals, from room temperature to 100°F (or 50°C) above the maximum intended use temperature, unless the maximum intended use temperature does not exceed 100°F. Any heat treatment that is required to produce the mechanical properties should be fully described.

If adoption is desired at temperatures at which time-dependent behavior may be expected to control design values, stress-rupture and creep rate data for these time-dependent properties shall be provided, starting at temperatures about 50°F (or 25°C) below the temperature where time-dependent properties may govern (see Appendix 1 of Section II, Part D) and extending to about 100°F (or 50°C) above the maximum intended use temperature. The longest rupture time at each test temperature must be in excess of 6000 hr and the shortest about 100 hr, with at least three additional tests at stresses selected to provide rupture times nominally equally spaced in log (time); i.e., times nominally of 100, 300, 800, 2200, and 6000 hr at each test temperature. Obviously, longer times and additional tests are beneficial. The interval between successive test temperatures shall be chosen such that rupture lives shall not differ by more than a factor of about 10 at any given stress for two adjacent temperatures. In general, test temperatures should be in about 50°F (or 25°C) intervals if maximum test times are no longer than 6000 hr. The goal of the testing is to facilitate data analysis to estimate the average and minimum stresses for rupture in 100,000 hr and an average creep rate of 10^{-5} %/hr for each temperature where design stresses are established. Alternative test plans that deviate from the prior description but achieve the overall objective may be considered.

Minimum creep rate data shall be provided over the same range of temperatures as above, with the lowest stress at each temperature selected to achieve a minimum creep rate of 1.0 to 2.0×10^{-4} %/hr or less. Creep rate data may be obtained in the course of stress-rupture testing or may be

obtained on additional specimens. If it can be conclusively demonstrated that creep rate does not control the design stresses, the creep rate data may be sparse in relation to the stress-rupture data. Submission of creep curves for evaluation of creep rate behavior is acceptable and encouraged.

For materials that will be used in welded applications, sufficient time-dependent data shall be provided for weldments and filler metals to allow ASME to assess the properties in comparison with the base material. In the time-dependent range, this includes providing stress-rupture data for specimen tests in excess of 6000 hr at each temperature and for each welding process. In addition, minimum creep rate data on filler metals shall also be provided to rates below 1.0 to 2.0×10^{-4} %/hr.

If adoption at temperatures below room temperature is requested, and if it is desired to take design advantage of increased strength at lower temperatures, data on the time-independent properties shall be provided at 100°F (or 50°C) intervals to and including the lowest intended use temperature.

Notch toughness data shall be provided for materials for which Code toughness rules would be expected to apply. The data shall include test results for the intended lowest service metal temperature and for the range of material thicknesses desired. For welded construction, the notch toughness data shall include the results of Code toughness tests for weld metal and heat-affected zone for weldments made by the intended welding processes.

If the material is to be used in components that operate under external pressure, stress-strain curves (tension or compression) shall be furnished, at 100°F (or 50°C) intervals over the range of design temperatures desired. External pressure charts are based on the early portion (up to 1% strain) of the stress-strain curve. The stress-strain curve (not load versus extension) shall be determined using a Class B-2 or better accuracy extensometer as defined in ASTM E 83. Numerical data, when available, should be submitted. The data should include the original cross-sectional area of the test specimen and stress-strain curves with units marked on them.

If the material is to be used in cyclic service and the construction Code in which adoption is desired requires explicit consideration of cyclic behavior, fatigue data shall also be furnished over the range of design temperatures desired.

In general, for all mechanical properties, data shall be provided from at least three heats of material meeting all of the requirements of a specification for at least one product form for which adoption is desired, for each test at each test temperature. When adoption for both cast and wrought product forms is desired, data from at least three heats each of a wrought and of a cast product form shall be submitted. It is desired that the data represent all product

forms for which adoption is desired. For product forms for which the properties may be size dependent, data from products of different sizes, including the largest size for which adoption is desired, shall be provided.

Test methods employed shall be those referenced in or by the material specifications, or shall be appropriate ASTM test methods or recommended practices for the properties tested.

Information describing service experience in the temperature range contemplated will be useful to the Committee.

Other Properties. The inquirer shall furnish to the Committee adequate data necessary to establish values for coefficient of thermal expansion, thermal conductivity and diffusivity, Young's modulus, shear modulus, and Poisson's ratio, when the construction Code in which adoption is desired requires explicit consideration of these properties. Data shall be provided over the range of temperatures for which the material is to be used.

Weldability. The inquirer shall furnish complete data on the weldability of material intended for welding, including data on procedure qualification tests made in accordance with the requirements of Section IX. Welding tests shall be made over the full range of thickness in which the material is to be used. Pertinent information, such as postweld heat treatment required, susceptibility to air hardening, effect of welding procedure and heat-affected zone and weld metal notch toughness, and the amount of experience in welding the material shall be given.

Physical Changes. For new materials, it is important to know the structural stability characteristics and the degree of retention of properties with exposure at temperature. The influence of fabrication practices, such as forming, welding, and thermal treatment, on the mechanical properties, ductility, and microstructure of the material are important, particularly where degradation in properties may occur. Where particular temperature ranges of exposure or heat treatment, cooling rates, combinations of mechanical working and thermal treatments, fabrication practices, exposure to particular environments, etc., cause significant changes in the mechanical properties, microstructure, resistance to brittle fracture, etc., it is of prime importance to call attention to those conditions that should be avoided in service or in manufacture of parts or vessels from the material.

Requests for Additional Data. The Committee may request additional data, including data on properties or material behavior not explicitly treated in the construction Code in which adoption is desired.

New Materials Checklist. To assist inquirers desiring Code coverage for new materials, or extending coverage of existing materials, the Committee has developed the following checklist of items that ought to be addressed by

each inquiry. The Committee reserves the right to request additional data and application information when considering new materials.

(a) Has a qualified inquirer request been provided?

(b) Has a request either for revision to existing Code requirements or for a Code Case been defined?

(c) Has a letter to ASTM or AWS been submitted requesting coverage of the new material in a specification, and has a copy been submitted to the Committee? Alternatively, is this material already covered by a specification issued by a recognized national or international organization and has an English language version been provided?

(d) Has the construction Code and Division coverage been identified?

(e) Has the material been defined as ferrous or nonferrous and has the application (product forms, size range, and specification) been defined?

(f) Has the range (maximum/minimum) of temperature application been defined?

(g) Has mechanical property data been submitted (ultimate tensile strength, yield strength, reduction of area, and elongation at 100°F or 50°C intervals, from room temperature to 100°F or 50°C above the maximum intended use temperature for three heats of appropriate product forms and sizes)?

(h) If requested temperatures of coverage are above those at which time-dependent properties begin to govern design values, has appropriate time-dependent property data for base metal, weld metal, and weldments been submitted?

(i) If coverage below room temperature is requested, has appropriate mechanical property data below room temperature been submitted?

(j) Have toughness considerations required by the construction Code been defined and has appropriate data been submitted?

(k) Have external pressure considerations been defined and have stress-strain curves been submitted for the establishment of external pressure charts?

(l) Have cyclic service considerations and service limits been defined and has appropriate fatigue data been submitted?

(m) Has physical properties data (coefficient of thermal expansion, thermal conductivity and diffusivity, Young's modulus, shear modulus, Poisson's ratio) been submitted?

(n) Have welding requirements been defined and has procedure qualification test data been submitted?

(o) Has influence of fabrication practices on material properties been defined?

Requirements for Requests for ASME Acceptance of Material Specifications of Recognized National or International Organizations Other Than ASTM or AWS. The Committee will consider only requests for

specifications in the English language and in U.S. or SI/metric units. The Committee will consider accepting specifications of recognized national or international organizations, such as, but not limited to, American Petroleum Institute (API), ASTM, AWS, Canadian Standards Association (CSA), European Committee for Standardization (CEN), and Japanese Standards Association (JIS). Material specifications of other than national or international organizations, such as those of material producers and suppliers, will not be considered for acceptance.

Requirements for Recognized National or International Specifications. Acceptable material specifications will be identified by date or edition. Approved edition(s) will be stated in the subtitle of the ASME specification. Eventually, acceptable previous editions will be listed in Section II, Parts A and B. Minimum requirements that must be contained in a material specification for which acceptance is being requested include such items as name of national or international organization, scope, reference documents, process, manufacture, conditions for delivery, heat treatment, chemical and tensile requirements, forming properties, testing specifications and requirements, workmanship, finish, marking, inspection, and rejection.

Publication of Recognized National or International Specifications. Specifications for which ASME has not been given permission to publish by the originating organization will be referenced on a cover sheet in Section II, Parts A and B. Information on obtaining a copy of those documents will be maintained in Nonmandatory Appendix A of those Parts. Documents that are referenced in accepted national or international material specifications will not be published by ASME. However, information on obtaining a copy of those documents will be maintained in Nonmandatory Appendix A of Section II, Parts A and B. Additions and exceptions to the material specification will be noted in the subtitle of the specification.

CEN Specifications. European standards are adopted by CEN in three official versions (English, French, and German). After the CEN adoption, to become applicable in a member country of CEN, a European standard shall be given the status of a national standard. During this process

(a) the text of the EN standard shall remain unaltered and shall be included as adopted by CEN.

(b) National Forewords and/or Annexes may be added to cover specific national practices, but shall not be in contradiction with the EN standard.

(c) a prefix XX (e.g., XX = BS for United Kingdom, NF for France, and DIN for Germany) is added to the designation of the EN standard (e.g., BS EN 10028-1 and NF EN 10028-1).

(d) the date of adoption as a national standard will differ from the date of adoption as an EN standard and may differ from one country to another.

Written or electronic copies of EN standards can only be obtained from European national standardization bodies as XX EN (CEN does not sell EN standards). Consequently, in order to maintain coherence and homogeneity in the reference system, the mentions in the subtitle of the corresponding ASME specification will refer to the EN standard number without any prefix and to the year of approval by CEN. It shall also be mentioned in the cover sheet that the national parts do not apply for the ASME specification.

Code Case. The Code Committee will consider the issuance of an ASME Code Case, permitting the use of a new material, provided that the following conditions are met:

(a) the inquirer provides evidence that a request for coverage of the material in a specification has been made to ASTM or a recognized national or international organization

(b) the material is commercially available and can be purchased within the proposed specification requirements

(c) the inquirer shows that there will be a reasonable demand for the material by industry and that there exists an urgency for approval by means of a Code Case

(d) the requests for approval of the material shall clearly describe it in specification form, including such items as scope, process, manufacture, conditions for delivery, heat treatment, chemical and tensile requirements, forming properties, testing specifications and requirements, workmanship, finish, marking, inspection, and rejection

(e) all other requirements identified previously under Code Policy and Application apply

(f) the inquirer shall furnish the Code Committee with all the data specified in this Appendix

GUIDELINE ON ACCEPTABLE ASTM EDITIONS

All material, originating from an ASTM specification, allowed by the various Code Sections and used for construction within the scope of their rules shall be furnished in accordance with the Material Specifications contained within Section II and this guideline except where otherwise provided in Code Cases or in the applicable Section of the Code. Materials covered by these Specifications are acceptable for use in items covered by the Code Sections only to the degree indicated in the applicable Section. Materials for Code use should preferably be ordered, produced, and documented on this basis; however, material produced under an ASTM Specification listed in Table

ED-1 may be used in lieu of the corresponding ASME Specification as listed in this guideline. Material produced to an ASME or ASTM Specification with requirements different from the requirements of the corresponding Specification may also be used in accordance with the above, provided the material manufacturer or vessel manufacturer certifies with evidence acceptable to the Authorized Inspector that the corresponding Specification requirements have been met. This guideline lists the Specifications, originating from ASTM, and their acceptable dates of issue as well as the Book sections of the ASME Boiler Code in which the specification is approved for use.

(10)
(a)

TABLE ED-1

Specification	Book Section							Nuc. Code Case	Non Nuc. Code Case	Latest Adopted ASTM	Other Acceptable ASTM Editions
	I	III	IV	VIII-1	VIII-2	VIII-3	XII				
SB-26/SB-26M Identical except that certification has been made mandatory and ASME welding requirements are invoked.	...	x	...	x	...	...	x	...	x	99	88 through 99
SB-42 Identical except that certification and mill test reports have been made mandatory.	x	x	x	x	...	...	x	...	...	02 ^{e1}	89 through 02 ^{e1}
SB-43 Identical except that certification and mill test reports have been made mandatory.	x	x	x	x	...	...	x	...	...	98(R04)	88 through 98(R04)
SB-61 Identical for the alloy covered except for the deletion of Appendix X1. Certification has been made mandatory.	x	x	x	x	...	...	x	...	...	02	86 through 02
SB-62 Identical for the alloy covered except for the deletion of Appendix X1. Certification has been made mandatory.	x	x	x	x	...	...	x	x	...	02	86 through 02
SB-75 Identical for the alloys and tempers covered except that mechanical testing and certification are mandatory for editions earlier than 2002.	x	x	x	x	...	...	x	...	...	02(R10)	89 through 02(R10)
SB-96/SB-96M Identical.	...	x	x	x	x	...	x	...	...	06	86 through 06
SB-98/SB-98M Identical for the alloys and tempers covered except that paras. 4.1.8, 4.2.1, 4.2.3, and 8.1.1 were removed so that tensile testing rather than Rockwell hardness testing is required to show conformance with mechanical properties. Certification has been made mandatory, and references to Supplementary Requirements for government procurement have been deleted.	...	x	x	x	x	...	x	...	...	03	84 through 03
SB-108 Identical except that certification has been made mandatory, welding is in accordance with ASME, and editorial revisions have been made to Table 1.	...	...	...	x	...	...	x	...	x	03	87 through 03

