

1991



ANNUAL BOOK OF ASTM STANDARDS

SECTION

2

Nonferrous Metal Products



VOLUME

02.04

**Nonferrous Metals—Nickel,
Lead, Tin, Zinc, Cadmium Alloys;
Precious, Primary, Reactive Metals**

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Nonferrous Metals—Nickel,
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- B-10 on Reactive and Refractory Metals and Alloys

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Foreword

ASTM, founded in 1898, is a scientific and technical organization formed for “the development of standards on characteristics and performance of materials, products, systems, and services; and the promotion of related knowledge.” It is the world’s largest source of voluntary consensus standards.

The Society operates through 132 main technical committees with 2067 subcommittees. These committees function in prescribed fields under regulations that ensure balanced representation among producers, users, general interest, and consumer participants.

The Society currently has 32,800 members, of whom approximately 19,825 serve as technical experts on committees, representing 96,800 units of participation.

Membership in the Society is open to all concerned with the fields in which ASTM is active. A membership application may be found at the back of this volume. Additional information may be obtained from Member and Committee Services, ASTM, 1916 Race St., Philadelphia, PA 19103.

1991 Annual Book of ASTM Standards

The 1991 *Annual Book of ASTM Standards* consists of 68 volumes, divided among 16 sections, of which this volume is one. It contains formally approved ASTM standard classifications, guides, practices, specifications, test methods, and terminology and related material such as proposals. These terms are defined as follows in the Regulations Governing ASTM Technical Committees:

Categories:

standard—as used in ASTM, a document that has been developed and established within the consensus principles of the Society and that meets the approval requirements of ASTM procedures and regulations.

Discussion—The term “standard” serves in ASTM as an adjective in the title of documents, such as test methods or specifications, to connote specified consensus and approval. The various types of standard documents are based on the needs and usages as prescribed by the technical committees of the Society.

proposal—a document that has been approved by the sponsoring committee for publication for information and comment prior to its consideration for adoption as a standard.

Discussion—Complete balloting procedures are not required for proposals.

emergency standard—a document published by the Society to meet a demand for more rapid issuance of a specific standard document.

Discussion—The Executive Subcommittee of the sponsoring committee must recommend the publishing of an emergency standard and the Committee on Standards must concur in the recommendation. Emergency standards are not full consensus documents because they are not submitted to Society ballot.

Types:

The various types of ASTM documents are to provide a flexibility of form, communication, and usage for both the technical committees and the myriad users of ASTM documents. The type of ASTM document that is developed and titled is based on the technical content and intended use, not on the degree of consensus achieved. The three categories of ASTM documents (standard, emergency standard, and proposal) can be of the following forms and types:

classification—a systematic arrangement or division of materials, products, systems, or services into groups based on similar characteristics such as origin, composition, properties, or use.

guide—a series of options or instructions that do not recommend a specific course of action.

Discussion—Whereas a practice prescribes a general usage principle, a guide only suggests an approach. The purpose of a guide is to offer guidance, based on a consensus of viewpoints, but not to establish a fixed procedure. A guide is intended to increase the awareness of the user to available techniques in a given subject area and to provide information from which subsequent evaluation and standardization can be derived.

practice—a definitive procedure for performing one or more specific operations or functions that does not produce a test result. (Compare *test method*.)

Discussion—A practice is not a downgraded test method. Examples of practices include procedures for conducting interlaboratory testing programs or other statistical procedures; for writing statements on sampling or precision and bias; and for selection, preparation, application, inspection, necessary precautions for use or disposal, installation, maintenance, and operation of testing equipment.

specification—a precise statement of a set of requirements to be satisfied by a material, product, system, or service that indicates the procedures for determining whether each of the requirements is satisfied.

Discussion—It is desirable to express the requirements numerically in terms of appropriate units together with their limits.

terminology—a document comprising definitions of terms; descriptions of terms; explanations of symbols, abbreviations, or acronyms.

test method—a definitive procedure for the identification, measurement, and evaluation of one or more qualities, characteristics, or properties of a material, product, system, or service that produces a test result. (Compare *practice*.)

A new edition of the Book of Standards is issued annually. Each volume contains all actions approved by the Society at least six months before the issue date. New and revised standards approved by the Society between the annual appearances of any given volume are made available as separate copies. The 1991 edition of the Book of Standards comprises approximately 53,000 pages and includes over 8600 ASTM standards.

Purpose and Use of ASTM Standards

An ASTM standard represents a common viewpoint of those parties concerned with its provisions, namely, producers, users, consumers, and general interest groups. It is intended to aid industry, government agencies, and the general public. The use of an ASTM standard is purely voluntary. The existence of an ASTM standard does not intend to preclude anyone from manufacturing, marketing, or purchasing products, or using products, processes, or procedures not conforming to the standard. Because ASTM standards are subject to periodic review and revision, those who use them are cautioned to obtain the latest revision.

Consideration of Comments on ASTM Standards

An ASTM standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of any standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

Using the Annual Book of ASTM Standards

The standards are assembled in each volume in alphanumeric sequence of their ASTM designation numbers except for Volumes 11.01, 11.02, and 05.04, which are assembled by subject matter. Volume 06.03 is assembled first by committee, then in alphanumeric sequence. Each volume has a table of contents, listing the standards in alphanumeric sequence by ASTM designation; and a list by subjects, categorizing the standards according to subject. A subject index of the standards in each volume appears at the back of each volume.

Availability of Individual Standards

Each ASTM standard is available as a separate copy from ASTM. Special quantity prices and discounts for members can be obtained from Customer Services. When ordering, provide the ASTM standard designation and year of issue, title, quantity desired, and shipping instructions.

Obsolete Editions

This new edition of the *Annual Book of ASTM Standards* makes last year's edition obsolete. Each volume of the *Annual Book of ASTM Standards* is published annually because of additions of new standards and significant revisions in existing standards. On the average, about 30 % of each volume is new or revised. For practical purposes, therefore, it is not wise to use obsolete volumes. However, for teaching purposes, these outdated volumes might be useful.

Safety Hazard Caveat

In January 1990, the Board of Directors approved revisions to the ASTM Policy on Safety Precautions and modified the language of the generic caveat on Safety Hazards as follows:

This standard does not purport to address (all of) the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Inclusion of the caveat is required in test methods, specifications (where test methods are detailed other than by reference), practices, and guides.

Disclaimer of Liability as to Patents:

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in these standards. Users of these standards are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.



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NONFERROUS METALS—NICKEL, LEAD, TIN, ZINC, AND CADMIUM ALLOYS; PRECIOUS METALS; PRIMARY METALS; REACTIVE METALS

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Since the standards in this book are arranged in alphanumeric order, no page numbers are included in this list by subjects. The standards listed in italics are related documents included for information only and do not appear in this volume.

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COBALT

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§ Approved for use by agencies of the Department of Defense and, if indicated on the standard, replaces corresponding Federal or Military document. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

‡ Although this standard has been officially withdrawn from Society approval, a brief description is included for information only.

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F 289 - 81 (1987)	<i>Molybdenum Wire and Rod for Electronic Applications (see Vol 10.04)</i>
F 290 - 68 (1989)	<i>Round Wire for Winding Electron Tube Grid Laterals (see Vol 10.04)</i>

NICKEL AND NICKEL ALLOYS

Nickel

Specification for:

B 39 - 79 (1985)	Nickel
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Nickel and Nickel Alloy Castings

Specification for:

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†B 462 - 89	Forged or Rolled UNS N08020, UNS N08024, UNS N08026 and UNS N08367 Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service

Nickel Alloy Forgings

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Nickel and Nickel Alloy Pipe and Tube

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†B 423 - 90	Nickel-Iron-Chromium-Molybdenum-Copper Alloys (UNS N08825 and N08221) Seamless Pipe and Tube
†B 535 - 87	Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and UNS N08332) Seamless Pipe
B 710 - 87	Nickel-Iron-Chromium-Silicon Alloy Welded Pipe
B 739 - 87	Nickel-Iron-Chromium-Silicon Alloy Welded Tube
†B 161 - 87 [†]	Nickel Seamless Pipe and Tube
§†B 163 - 89	Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes
†B 622 - 91	Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube
B 729 - 87	Seamless UNS N08020, UNS N08026, and UNS N08024 Nickel-Alloy Pipe and Tube
†B 513 - 79 (1985)	Supplementary Requirements for Nickel Alloy Seamless Pipe and Tube for Nuclear Applications (Discontinued 1990 [†])
B 673 - 88	UNS N08904 and UNS N08925 Welded Pipe
B 675 - 90a	UNS N08366 and UNS N08367 Welded Pipe
B 804 - 89	UNS N08367 Welded Pipe
B 674 - 83 (1990)	UNS N08904 and UNS N08925 Welded Tube
B 676 - 90	UNS N08366 and UNS N08367 Welded Tube

† Adopted by or under consideration for adoption by the Boiler and Pressure Vessel Committee of the American Society of Mechanical Engineers. The ASTM Boiler and Pressure Vessel Code Specifications are identical with or based upon these ASTM Specifications.

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B 720 – 88	UNS N08310 Seamless Tube
†B 668 – 89	UNS N08028 Seamless Tubes
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†B 619 – 91	Welded Nickel and Nickel-Cobalt Alloy Pipe
†B 626 – 91	Welded Nickel and Nickel-Cobalt Alloy Tube
†B 517 – 85	Welded Nickel-Chromium-Iron-Alloy (UNS N06600) Pipe
B 516 – 85	Welded Nickel-Chromium-Iron Alloy (UNS N06600) Tubes
†B 514 – 85	Welded Nickel-Iron-Chromium Alloy Pipe
B 515 – 90	Welded UNS N08800 and UNS N08810 Alloy Tubes
B 725 – 89	Welded Nickel (UNS N02200/UNS N02201) and Nickel Copper Alloy (UNS N04400) Pipe
B 730 – 84	Welded Nickel Tube
†B 464 – 89	Welded UNS N08020, UNS N08026, and UNS N08024 Alloy Pipe
†B 468 – 89	Welded UNS N08020, UNS N08026, and UNS N08024 Alloy Tubes

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B 688 – 89	Chromium-Nickel-Molybdenum Iron (UNS N08366 and UNS N08367) Plate, Sheet, and Strip
B 709 – 91	Iron-Nickel-Chromium-Molybdenum Alloy (UNS N08028) Plate, Sheet, and Strip
‡B 168 – 90	Nickel-Chromium-Iron Alloys (UNS N06600, N06601, and N06690) Plate, Sheet, and Strip
B 519 – 87	Nickel-Chromium-Iron-Columbium-Molybdenum-Tungsten Alloy (UNS N06102) Plate, Sheet, and Strip
†B 582 – 86a	Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip
B 718 – 83 (1990)	Nickel-Chromium-Molybdenum-Cobalt-Tungsten-Iron-Silicon Alloy (UNS N06333) Plate, Sheet, and Strip
†B 443 – 90a	Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) Plate, Sheet, and Strip
B 755 – 86	Nickel-Chromium-Molybdenum-Tungsten Alloys (UNS N06110) Plate, Sheet, and Strip
‡B 127 – 85	Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
†B 409 – 91	Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip
†B 620 – 89	Nickel-Iron-Chromium-Molybdenum Alloy (UNS N08320) Plate, Sheet, and Strip
B 599 – 85	Nickel-Iron-Chromium-Molybdenum-Columbium Stabilized Alloy (UNS N08700) Plate, Sheet, and Strip
†B 424 – 87	Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and N08221) Plate, Sheet, and Strip
B 625 – 91	UNS N08904, UNS N08925, UNS N08031, and UNS N08932 Plate, Sheet, and Strip
B 536 – 87	Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Plate, Sheet, and Strip
†B 333 – 89	Nickel-Molybdenum Alloy Plate, Sheet, and Strip
†B 434 – 89	Nickel-Molybdenum-Chromium-Iron Alloy (UNS N10003) Plate, Sheet, and Strip
†B 162 – 85	Nickel Plate, Sheet, and Strip
B 670 – 85	Precipitation-Hardening Nickel Alloy (UNS N07718) Plate, Sheet, and Strip for High-Temperature Service (formerly A 670)
†B 509 – 77 (1983)	Supplementary Requirements for Nickel Alloy Plate for Nuclear Applications (Discontinued 1990‡)
†B 463 – 90	UNS N08020, UNS N08026, and UNS N08024 Alloy Plate, Sheet, and Strip
†B 435 – 87a [†]	UNS N06002, UNS N06230, and UNS R30556 Plate, Sheet, and Strip

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B 474 – 87	Electric Fusion Welded UNS N08020, UNS N08026, and UNS N08024 Nickel Alloy Pipe
B 691 – 89	Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08366 and UNS N08367) Rod, Bar, and Wire
†B 575 – 91	Low-Carbon Nickel-Molybdenum-Chromium and Low-Carbon Nickel-Chromium Molybdenum Alloy Plate, Sheet, and Strip
†B 574 – 91	Low-Carbon Nickel-Molybdenum-Chromium and Low-Carbon Nickel-Chromium Molybdenum Alloy Rod
†B 166 – 90	Nickel-Chromium-Iron Alloys (UNS N06600, N06601, and N06690) Rod, Bar, and Wire
B 518 – 87	Nickel-Chromium-Iron-Columbium-Molybdenum-Tungsten Alloy (UNS N06102) Rod and Bar
†B 581 – 86	Nickel-Chromium-Iron-Molybdenum-Copper Alloy Rod
B 719 – 83 (1990)	Nickel-Chromium-Molybdenum-Cobalt-Tungsten-Iron-Silicon Alloy (UNS N06333) Bar
B 446 – 90	Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) Rod and Bar
B 756 – 86	Nickel-Chromium-Molybdenum-Tungsten Alloy (UNS N06110) Rod and Bar
B 512 – 87	Nickel-Chromium-Silicon Alloy (UNS N08330) Billets and Bars
‡B 164 – 90	Nickel-Copper Alloy Rod, Bar, and Wire
†B 408 – 87 [†]	Nickel-Iron-Chromium Alloy Rod and Bar
†B 621 – 89	Nickel-Iron-Chromium-Molybdenum Alloy (UNS N08320) Rod
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†B 511 – 87	Nickel-Iron-Chromium-Silicon Alloy Bars and Shapes
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†B 573 – 89	Nickel-Molybdenum-Chromium-Iron Alloy (UNS N10003) Rod
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B 637 – 90	Precipitation-Hardening Nickel Alloy Bars, Forgings, and Forging Stock for High-Temperature Service (formerly A 637)
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†B 510 – 77 (1983)	Supplementary Requirements for Nickel Alloy Rod and Bar for Nuclear Applications (Discontinued 1990‡)

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B 475 – 87	UNS N08020, UNS N08026, and UNS N08024 Nickel Alloy Round Weaving Wire
B 471 – 87	UNS N08020, UNS N08026, and UNS N08024 Nickel Alloy Spring Wire
B 572 – 87a ^{€1}	UNS N06002, UNS N06230, and UNS R30556 Rod
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§†B 363 – 83 (1987)	Seamless and Welded Unalloyed Titanium and Titanium Alloy Welding Fittings
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B 367 – 87	Titanium and Titanium Alloy Castings
†B 381 – 87	Titanium and Titanium Alloy Forgings
†B 265 – 90	Titanium and Titanium Alloy Strip, Sheet, and Plate
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This contents includes only those standards included in Volume 02.04 and those standards that appeared previously that have been superseded or discontinued within the past five years. Since the standards in this book are arranged in alphanumeric sequence, no page numbers are given in this contents.

In the serial designations prefixed to the following titles, the number following the dash indicates the year of original adoption as standard or, in the case of revision, the year of last revision. Thus, standards adopted or revised during the year 1990 have as their final number, 90. A letter following this number indicates more than one revision during the year, that is, 90a indicates the second revision in 1990, 90b the third revision, etc. Standards that have been reapproved without change are indicated by the year of last reapproval in parentheses as part of the designation number, for example, (1990). A superscript epsilon indicates an editorial change since the last revision or reapproval— $\epsilon 1$ for the first change, $\epsilon 2$ for the second change, etc.

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§B 339 - 90	Specification for Pig Tin
†B 348 - 90	Specification for Titanium and Titanium Alloy Bars and Billets
B 349 - 80 (1987)	Specification for Zirconium Sponge and Other Forms of Virgin Metal for Nuclear Application

† Adopted by or under consideration for adoption by the Boiler and Pressure Vessel Committee of the American Society of Mechanical Engineers. The ASME Boiler and Pressure Vessel Code Specifications are identical with or based upon these ASTM Specifications.

§ Approved for use by agencies of the Department of Defense and, if indicated on the standard, replaces corresponding Federal or Military document. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

‡ Although this standard has been officially withdrawn from Society approval, a brief description is included for information only.