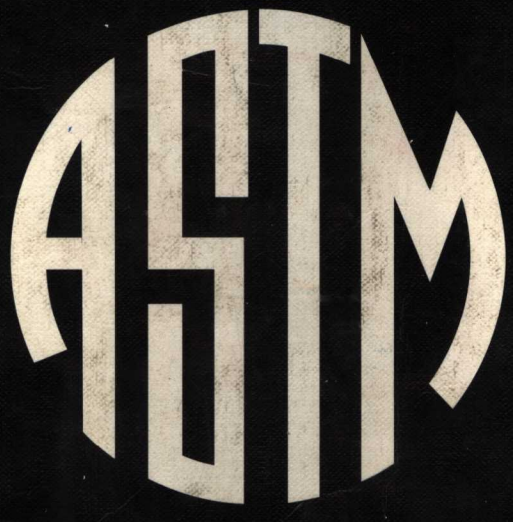
1996

ANNUAL BOOK OF ASTM STANDARDS

SECTION 1

Iron and Steel Products



VOLUME 01.04

Steel—Structural, Reinforcing, Pressure Vessel, Railway

Revision issued annually

1996 ANNUAL BOOK OF ASTM STANDARDS

SECTION 1

Iron and Steel Products

VOLUME 01.04

Steel—Structural, Reinforcing, Pressure Vessel, Railway

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Foreword

Organized in 1898, ASTM has grown into one of the largest voluntary standards development systems in the world. ASTM is a not-for-profit organization which provides a forum for producers, users, ultimate consumers, and those having a general interest (representatives of government and academia) to meet on common ground and write standards for materials, products, systems, and services.

From the work of 132 standards-writing committees, ASTM publishes more than 9,800 standards each year. These standards and other related technical information are sold throughout the world.

ASTM Headquarters has no technical research or testing facilities; such work is done voluntarily by 35,000 technically qualified ASTM members located throughout the world. 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, 100 Barr Harbor Drive, West Conshohocken, PA 19428; tel. (610) 832-9693.

1996 Annual Book of ASTM Standards

The 1996 *Annual Book of ASTM Standards* consists of 71 volumes, divided among 16 sections, of which this volume is one. It contains approved ASTM standards, provisional standards, and related material. 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.

provisional standard—a document published for a limited period of time by the Society to meet a demand for more rapid issuance of specific documents, such as an emergency situation, regulatory requirements, or other special circumstances.

Discussion—Provisional standards are not full consensus documents because they require subcommittee consensus only. (These documents replace emergency standards and proposals.)

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 two categories of ASTM documents (standard and provisional standard) 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; and 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 published annually because of additions of new standards and significant revisions to existing standards. Approximately 30 % of each volume is new or revised. Each volume contains all actions approved by the Society at least six months before the publication date. New and revised standards approved by the Society between the annual editions of any given volume are made available as separate copies. Users are cautioned to follow the most current issue of a standard except when a specific edition of a standard is cited, for example, as in a contract.

Development and Use of ASTM Standards

ASTM believes that technically competent standards result when a full consensus of all concerned parties is achieved and rigorous due process procedures are followed. This philosophy and standards development system ensure technically competent standards having the highest credibility when critically examined and used as the basis for commercial, legal, or regulatory actions.

ASTM standards are developed voluntarily and used voluntarily. Standards become legally binding only when a government body references them in regulations, or when they are cited in a contract. Any item that is produced and marked as conforming to an ASTM standard must meet all applicable requirements of that standard.

ASTM standards are used by thousands of individuals, companies, and agencies. Purchasers and sellers incorporate standards into contracts; scientists and engineers use them in laboratories; architects and designers use them in plans; government agencies reference them in codes, regulations, and laws; and many others refer to standards for guidance.

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, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

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. Volumes 03.06, 05.03, and 06.03 are 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 can be obtained from Customer Services. When ordering, provide the ASTM standard designation and year of issue, title, quantity desired, and shipping instructions.

Caveat Statements and Policies in Standards

ASTM caveat statements on Safety Hazards and Fire Hazards are required to appear in standards where appropriate. They are located in the scope section of applicable standards. The caveats on General Statement of ASTM Policy and Patents are contained in all standards and located at the end of each standard disclaimer. For more information on the caveats see Section F2 of the *Form and Style for ASTM Standards.*

ANNUAL BOOK OF ASTM STANDARDS

Listed by Section and Volume

ANNUAL BOOK OF ASTM STANDARDS
Listed by Subjects

List by Subjects

1996 ANNUAL BOOK OF ASTM STANDARDS, VOLUME 01.04

STRUCTURAL STEEL; CONCRETE REINFORCING STEEL; PRESSURE VESSEL PLATE AND FORGINGS; STEEL RAILS, WHEELS, AND TIRES

A complete Subject Index begins on p. 531

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

STRUCTURAL STEEL

Specifications for:

§†A	829/A 829M – 94	Alloy Structural Steel Plates
§†A	710/A 710M – 94	Age-Hardening Low-Carbon Nickel-Copper-Chromium-Molybdenum-Columbium, Nickel-Copper-Columbium, and Nickel-Copper-Manganese-Molybdenum-Columbium Alloy Structural Steel Plates
§†A	709/A 709M – 95a	Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched and Tempered Alloy Structural Steel Plates for Bridges
§†A	36/A 36M – 94	Carbon Structural Steel
A	769/A 769M – 94	Electric Resistance Welded Steel Shapes
§†A	6/A 6M – 95c	General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
§A	529/A 529M – 94	High-Strength Carbon-Manganese Steel of Structural Quality
A	808/A 808M – 93a	High-Strength Low-Alloy Carbon, Manganese, Columbium, Vanadium Steel of Structural Quality with Improved Notch Toughness
§A	572/A 572M – 94c	High-Strength Low-Alloy Columbium-Vanadium Structural Steels
§A	690/A 690M – 94	High-Strength Low-Alloy Steel H-Piles and Sheet Piling for Use in Marine Environments
A	913/A 913M – 95	High-Strength, Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST)
§A	242/A 242M – 93a	High-Strength Low-Alloy Structural Steel
§A	588/A 588M – 94	High-Strength Low-Alloy Structural Steel with 50 ksi [345 MPa] Minimum Yield Point to 4 in. [100 mm] Thick
§A	514/A 514M – 94a	High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding
A	656/A 656M – 93a	Hot-Rolled, Structural Steel, High Strength Low-Alloy Plate with Improved Formability
§†A	283/A 283M – 93a	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes, and Bars
A	633/A 633M – 95	Normalized High-Strength Low-Alloy Structural Steel Plates
A	827/A 827M – 93a	Plates, Carbon Steel, for Forging and Similar Applications
A	830/A 830M – 93a	Plates, Carbon Steel, Structural Quality, Furnished to Chemical Composition Requirements
A	678/A 678M – 94a	Quenched-and-Tempered Carbon and High-Strength Low-Alloy Structural Steel Plates
A	852/A 852M – 94	Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi [485 MPa] Minimum Yield Strength to 4 in. [100 mm] Thick
A	786/A 786M – 93	Rolled Steel Floor Plates
§A	673/A 673M – 95	Sampling Procedure for Impact Testing of Structural Steel
§A	328/A 328M – 93a	Steel Sheet Piling
A	857 – 93a	Steel Sheet Piling, Cold Formed, Light Gage
A	898/A 898M – 91	Straight Beam Ultrasonic Examination of Rolled Steel Structural Shapes
A	573/A 573M – 93a	Structural Carbon Steel Plates of Improved Toughness
A	131/A 131M – 94	Structural Steel for Ships
A	871/A 871M – 95	Structural Steel Plate with Atmospheric Corrosion Resistance
A	*499 – 89*	*Steel Bars and Shapes, Carbon, Rolled from T Rails (Discontinued. See 1995 Vol 01.05)*
A	*252 – 93*	*Welded and Seamless Steel Pipe Piles (see Vol 01.01)*

STEEL FOR CONCRETE REINFORCEMENT AND PRESTRESSED CONCRETE

Specifications for:

§A	617/A 617M – 95b	Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
§A	615/A 615M – 95b	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

§ 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.

† 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.

Specifications for:

PLATE AND FORGINGS FOR BOILERS AND PRESSURE VESSELS

(Other products used in boilers and pressure vessels are listed under their appropriate product headings.)

Specifications for:

Specifications for:

§†A	770/A 770M – 86 (1991)$^{\epsilon 1}$	Steel Plates for Special Applications, Through-Thickness Tension Testing of
†A	578/A 578M – 92	Straight-Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Applications
†A	435/A 435M – 90	Straight-Beam Ultrasonic Examination of Steel Plates
†A	577/A 577M – 90	Ultrasonic Angle-Beam Examination of Steel Plates

STEEL RAILS AND ACCESSORIES, WHEELS, AXLES, AND TIRES

Specifications for:

A	729 – 93	Alloy Steel Axles, Heat-Treated, for Mass Transit and Electric Railway Service
A	383 – 87	Axles, Railway, Carbon Steel, Untreated for Export and General Industrial Use
A	21 – 94	Carbon Steel Axles, Non-Heat-Treated and Heat-Treated, for Railway Use
A	759 – 85 (1992)	Carbon Steel Crane Rails
§A	2 – 90	Carbon Steel Girder Rails of Plain, Grooved, and Guard Types
§A	1 – 92	Carbon Steel Tee Rails
§A	183 – 83 (1990)	Carbon Steel Track Bolts and Nuts
A	583 – 93	Cast Steel Wheels for Railway Service
A	730 – 93	Forgings, Carbon and Alloy Steel, for Railway Use
§A	49 – 95	Heat-Treated Carbon Steel Joint Bars
A	67 – 92	Low-Carbon and High-Carbon Hot-Worked Steel Tie Plates
§A	3 – 87 (1995)	Low, Medium, and High Carbon (Non-Heat-Treated) Steel Joint Bars
A	65 – 87 (1995)	Steel Track Spikes
§A	66 – 87 (1995)	Steel Screw Spikes
A	551 – 94	Steel Tires
A	504 – 93	Wrought Carbon Steel Wheels

FASTENERS

The standards covering steel and nonferrous fasteners are published in Volume 15.08 of the *Annual Book of ASTM Standards*

GENERAL METHODS OF TESTING, PRACTICES, AND DEFINITIONS

Test Methods for:

A	751 – 94	Chemical Analysis of Steel Products, Test Methods, Practices, and Terminology for
§†A	370 – 95	Mechanical Testing of Steel Products
E	*10 – 93*	*Brinell Hardness of Metallic Materials (see Vol 03.01)*
E	*142 – 92*	*Controlling Quality of Radiographic Testing (see Vol 03.03)*
E	*112 – 95*	*Determining the Average Grain Size (see Vol 03.01)*
A	*255 – 95*	*End-Quench Test for Hardenability of Steel (see Vol 01.05)*
E	*140 – 95*	*Hardness Conversion Tables for Metals (Relationship Between Brinell Hardness, Vickers Hardness, Rockwell Hardness, Rockwell Superficial Hardness, and Knoop Hardness) (see Vol 03.01)*
E	*23 – 94b*	*Notched Bar Impact Testing of Metallic Materials (see Vol 03.01)*
E	*3 – 95*	*Preparation of Metallographic Specimens (see Vol 03.01)*
E	*59 – 93*	*Sampling Steel and Iron for Determination of Chemical Composition (see Vol 03.05)*

Practices for:

A	*380 – 94a*	*Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems (see Vol 01.03)*
E	*178 – 94*	*Dealing with Outlying Observations (see Vol 14.02)*
A	*262 – 93a*	*Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels (see Vol 01.03)*
G	*31 – 72 (1995)$^{\epsilon 1}$*	*Laboratory Immersion Corrosion Testing of Metals (see Vol 03.02)*
E	*709 – 95*	*Magnetic Particle Examination (see Vol 03.03)*
E	*177 – 90a*	*Use of the Terms Precision and Bias in ASTM Test Methods (see Vol 14.02)*

Definitions of Terms Relating to:

E	*44 – 84 (1993)*	*Heat Treatment of Metals (see Vol 01.02)*
E	*6 – 89 (1994)$^{\epsilon 1}$*	*Methods of Mechanical Testing (see Vol 03.01)*

METRIC PRACTICE

Practice for:

§*E*	*380 – 93*	*Use of the International System of Units (SI) (the Modernized Metric System) (Excerpts) (See Related Material Section)*

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STRUCTURAL STEEL; CONCRETE REINFORCING STEEL; PRESSURE VESSEL PLATE AND FORGINGS; STEEL RAILS, WHEELS, AND TIRES

A complete Subject Index begins on p. 531

This contents includes only those standards included in this book and those standards that appeared previously that have been superseded or discontinued within the past three 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 1996 have as their final number 96. A letter following this number indicates more than one revision during that year, that is 96a indicates the second revision in 1996, 96b 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, (1996). A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval—$\epsilon 1$ for the first change, $\epsilon 2$ for the second change, etc.

§ 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.

† 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.

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

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RELATED MATERIAL

Designation: A 1 – 92

Standard Specification for Carbon Steel Tee Rails[1]

This standard is issued under the fixed designation A 1; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This specification covers carbon steel tee rails of nominal weights of 60 lb/yd (29.8 kg/m) and over for use in railway track, including export and industrial applications.

1.2 Supplementary requirements S1 through S3 shall apply only when specified by the purchaser in the order.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

A 29/A 29M Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished, General Requirements for[2]

E 10 Test Method for Brinell Hardness of Metallic Materials[3]

E 127 Practice for Fabricating and Checking Aluminum Alloy Ultrasonic Standard Reference Blocks[4]

E 428 Practice for Fabrication and Control of Steel Reference Blocks Used in Ultrasonic Inspection[4]

2.2 *Military Standards:*

MIL-STD-129 Marking for Shipment and Storage[5]

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage[5]

2.3 *Federal Standard:*

Fed. Std. No. 123 Marking for Shipments (Civil Agencies)[5]

2.4 *American Railway Engineering Association (AREA) Manual for Railway Engineering:*

Specifications for Steel Rails, Chapter 4, Part 2[6]

3. Ordering Information

3.1 Orders for rails under this specification shall include the following information:

3.1.1 ASTM designation and year of issue.

3.1.2 Quantity (tons or pieces as appropriate).

3.1.3 Full identification of section with dimensional drawing, if required.

3.1.4 Arrangement of drilled bolt holes, if any, with dimensional drawing, if required.

3.1.5 Quantity of right-hand and left-hand (Note 1) drilled rails, drilled both-end rails, and undrilled (blank) rails desired.

3.1.6 Supplementary requirements that shall apply (see S1 through S3).

3.1.7 Disposition of various classifications of rails (see 8.4.6 and 8.4.7).

NOTE 1—The right-hand or left-hand end of the rail is determined by facing the side of the rail on which the brand (raised characters) appears.

4. Materials and Manufacture

4.1 *Melting Practice*—The steel shall be made by any of the following processes: open-hearth, basic-oxygen, or electric-furnace.

4.1.1 The steel shall be cast by a continuous process, in hot-topped ingots, or by other methods agreed upon by the purchaser and the manufacturer.

4.2 *Discard*—Sufficient discard shall be taken from the bloom or ingot to ensure freedom from injurious segregation and pipe.

4.3 *Hydrogen Elimination:*

4.3.1 *Applicability:*

4.3.1.1 Rails 60 through 70 lb/yd (29.8 through 34.8 kg/m) are not subject to treatment for hydrogen elimination.

4.3.1.2 Rails over 70 through 84 lb/yd (over 34.8 through 41.7 kg/m) may be subjected to treatment for hydrogen elimination at the option of the manufacturer.

4.3.1.3 Rails over 84 lb/yd (41.7 kg/m) shall be processed by methods that prevent the formation of shatter cracks as agreed upon by the purchaser and the manufacturer. Acceptable methods include control cooling of the rails or blooms, or vacuum treatment of the molten steel.

4.3.2 *Rail Control-Cooling Procedure* (AREA Specifications for Steel Rails)[7]—Rails shall be control-cooled in accordance with the following procedure, except when produced from vacuumdegassed steel or control-cooled blooms, in which case the rails may be air-cooled, and 4.3.2.1 through 4.3.2.7 are not applicable.

4.3.2.1 All rails shall be cooled on the hot beds or runways until full transformation is accomplished and then charged immediately into the containers. In no case should the rail be charged at a temperature below 725°F (385°C).

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[1] This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.01 on Steel Rails and Accessories.

Current edition approved Dec. 15, 1992. Published April 1993. Originally published as A 1 – 01. Last previous edition A 1 – 84.

[2] *Annual Book of ASTM Standards*, Vol 01.05.

[3] *Annual Book of ASTM Standards*, Vol 03.01.

[4] *Annual Book of ASTM Standards*, Vol 03.03.

[5] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

[6] Available from American Railway Engineering Assn., 50 F St. NW, Washington, DC 20001.

[7] Adapted from AREA Specifications for Steel Rails (see 2.4).