



Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube¹

This standard is issued under the fixed designation B241/B241M; 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 U.S. Department of Defense.

1. Scope*

1.1 This specification² covers aluminum and aluminum–alloy seamless pipe and seamless extruded round tube in the alloys and tempers shown in Table 1 [Table 2] intended for pressure applications. The standard sizes for seamless pipe are listed in Table 16.7 of ANSI H35.2 and H35.2(M). Nonstandard alloys, tempers, and sizes of pipe are produced as seamless extruded tube. Also included in this standard are seamless extruded pipe and seamless extruded tube for Oil & Gas Transmission previously covered under Specification B345/B345M.

NOTE 1—Throughout this specification, use of the term *alloy*, in the general sense, includes aluminum as well as aluminum alloy.

NOTE 2—For drawn seamless tubes, see Specification B210/B210M; for extruded tubes, Specifications B221 and B221M; for drawn seamless tubes for condensers and heat exchangers, Specifications B234 and B234M; for seamless condenser and heat exchanger tubes with integral fins, Specification B429/B429M; and for drawn tube for general purpose applications, Specification B483/B483M.

1.2 Alloy and temper designations are in accordance with ANSI H35.1/H35.1(M). The equivalent Unified Numbering System alloy designations are those of Table 4 preceded by A9, for example, A91100 for aluminum 1100 in accordance with Practice E527.

1.3 For acceptance criteria for inclusion of new aluminum and aluminum alloys in this specification, see Annex A2.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

¹ This specification is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.03 on Aluminum Alloy Wrought Products.

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² For ASME Boiler and Pressure Vessel Code applications see related specifications 241/SB241-241M/SB241M in Section II of that code.

1.4.1 The SI units are shown either in brackets or in separate tables.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:³

B210/B210M Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes

B221 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

B221M Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)

B234 Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes for Surface Condensers, Evaporators, and Heat Exchangers

B234M Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes for Surface Condensers, Evaporators, and Heat Exchangers (Metric)

B429/B429M Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

B483/B483M Specification for Aluminum and Aluminum-Alloy Drawn Tube and Drawn Pipe for General Purpose Applications

B557 Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products

B557M Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products (Metric)

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard



- [B594 Practice for Ultrasonic Inspection of Aluminum-Alloy Wrought Products](#)
- [B647 Test Method for Indentation Hardness of Aluminum Alloys by Means of a Webster Hardness Gage](#)
- [B648 Test Method for Indentation Hardness of Aluminum Alloys by Means of a Barcol Impressor](#)
- [B660 Practices for Packaging/Packing of Aluminum and Magnesium Products](#)
- [B666/B666M Practice for Identification Marking of Aluminum and Magnesium Products](#)
- [B807/B807M Practice for Extrusion Press Solution Heat Treatment for Aluminum Alloys](#)
- [B881 Terminology Relating to Aluminum- and Magnesium-Alloy Products](#)
- [B918/B918M Practice for Heat Treatment of Wrought Aluminum Alloys](#)
- [B945 Practice for Aluminum Alloy Extrusions Press Cooled from an Elevated Temperature Shaping Process for Production of T1, T2, T5 and T10-Type Tempers](#)
- [B985 Practice for Sampling Aluminum Ingots, Billets, Castings and Finished or Semi-Finished Wrought Aluminum Products for Compositional Analysis](#)
- [E18 Test Methods for Rockwell Hardness of Metallic Materials](#)
- [E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)
- [E527 Practice for Numbering Metals and Alloys in the Unified Numbering System \(UNS\)](#)
- [E716 Practices for Sampling and Sample Preparation of Aluminum and Aluminum Alloys for Determination of Chemical Composition by Spark Atomic Emission Spectrometry](#)
- [E1004 Test Method for Determining Electrical Conductivity Using the Electromagnetic \(Eddy Current\) Method](#)
- [E1251 Test Method for Analysis of Aluminum and Aluminum Alloys by Spark Atomic Emission Spectrometry](#)
- [E3061 Test Method for Analysis of Aluminum and Aluminum Alloys by Inductively Coupled Plasma Atomic Emission Spectrometry \(Performance Based Method\)](#)
- [G47 Test Method for Determining Susceptibility to Stress-Corrosion Cracking of 2XXX and 7XXX Aluminum Alloy Products](#)
- 2.3 *ANSI Standards:*
 - [B2.1 Pipe Threads \(except Dryseal\)⁴](#)
 - [B36.10 Wrought Steel and Wrought Iron Pipe⁴](#)
 - [H35.1/H35.1\(M\) Alloy and Temper Designation Systems for Aluminum⁵](#)
 - [H35.2 Dimensional Tolerances for Aluminum Mill Products⁵](#)
 - [H35.2\(M\) Dimensional Tolerances for Aluminum Mill Products \[Metric\]⁵](#)

- 2.4 *American Welding Society Standard*
 - [D10.7 Recommended Practices for Gas Shielded Arc Welding of Aluminum and Aluminum-Alloy Pipe⁶](#)
- 2.5 *Federal Standard:*
 - [Fed. Std. No. 123 Marking for Shipment \(Civil Agencies\)⁷](#)
- 2.6 *Military Standard:*
 - [MIL-STD-129 Marking for Shipment and Storage⁷](#)
- 2.7 *AMS Specification:*
 - [AMS 2772 Heat Treatment of Aluminum Alloy Raw Materials⁸](#)
- 2.8 *CEN EN Standards*
 - [CEN EN 14242 Aluminum and Aluminum Alloys—Chemical Analysis—Inductively Coupled Plasma Optical Emission Spectral Analysis⁹](#)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *alclad seamless pipe or alclad seamless round tube, n*—a composite pipe or tube product composed of a seamless aluminum alloy core having on either the inside or the outside surface a metallurgically bonded aluminum or aluminum-alloy coating that is anodic to the core, thus electrolytically protecting the core against corrosion.

3.1.2 *capable of, adj*—the test need not be performed by the producer of the material. However, should subsequent testing by the purchaser establish that the material does not meet these requirements, the material shall be subject to rejection.

3.1.3 *extruded seamless alclad tube, n*—a composite round tube product composed of an aluminum alloy core having on either the inside or outside surface a metallurgically bonded aluminum or aluminum alloy coating that is anodic to the core, thus electrolytically protecting the core against corrosion.

3.1.4 *extruded seamless pipe, n*—extruded seamless round tube with standardized sizes of outside diameter and wall thickness commonly designated by “Nominal Pipe Sizes” and American National Standards Institute (ANSI) “Schedule Numbers.”

3.1.5 *extruded seamless round tube, n*—a hollow product having a round cross section and a uniform wall thickness, brought to final dimensions by extruding from a hollow cast ingot or mandrel pierced ingot.

3.1.6 *producer, n*—the primary manufacturer of the material.

3.1.7 *seamless pipe, n*—extruded or drawn seamless tube having certain standardized sizes of outside diameter and wall thickness commonly designated by “Nominal Pipe Sizes” and American National Standards Institute (ANSI) “Schedule Numbers.”

⁶ Available from the American Welding Society, 8669 NW 36th St, Miami, FL 33166.

⁷ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://dodssp.daps.dla.mil>.

⁸ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

⁹ Available from European Committee for Standardization (CEN), 36 Rue de Stassart, B-1050, Brussels, Belgium, <http://www.cenorm.be>.

⁴ Available from American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

⁵ Available from Aluminum Association, Inc., 1400 Crystal Dr., Suite 430, Arlington, VA 22202 <http://www.aluminum.org>.

3.1.8 *supplier, n*—jobber or distributor as distinct from producer.

3.2 *Other Definitions*—For all other definitions of product terms, refer to Terminology **B881**.

4. Ordering Information

4.1 Orders for material to this specification shall include the following information:

4.1.1 This specification designation (which includes the number, the year, and the revision letter, if applicable),

NOTE 3—For inch-pound orders specify Specification B241; for metric orders specify Specification B241M. Do not mix units.

4.1.2 Quantity in pieces or pounds [kilograms],

4.1.3 Alloy (Section 7),

4.1.4 Temper (Section 9),

4.1.5 Pipe size and schedule number (Table 12.55 of ANSI H35.2 and H35.2(M)), or outside diameter and wall thickness (tube). Dimensional tolerances for 14, 16, 18, and 20-in. pipe sizes (see Table 3) shall be agreed upon between the producer and purchaser and shall be specified by contract or purchase order.

4.1.6 For alloy Alclad 3003, state clad inside or outside (Section 13).

4.1.7 End configuration (Sections 15.4 and 15.5).

4.1.8 Length (Section 14).

4.2 Additionally, orders for material to this specification shall include the following information when required by the purchaser:

4.2.1 Whether solution treatment at the press is unacceptable (8.3),

4.2.2 Whether heat treatment in accordance with Practice **B918/B918M** is required (8.4),

4.2.3 Whether threaded ends are required (see 15.2),

4.2.4 Whether inspection or witness of inspection and tests by the purchaser's representative is required prior to material shipment (Section 16),

4.2.5 Whether Practices **B660** applies and, if so, the levels of preservation, packaging, and packing required (20.3),

4.2.6 Whether certification of the material is required (Section 21),

4.2.7 Requirements for tensile property and dimensional tolerance for sizes not specifically covered (9.1.2 and 14.2),

4.2.8 Whether ultrasonic inspection is required (Section 16, Table 5 [Table 6]),

4.2.9 Whether Sections 10 and 11 apply to 6063 and 6061 alloys, and

4.2.10 Whether the term "Seamless" is required in product marking in accordance with Practice **B666/B666M**.

4.2.11 Whether hardness screening is required (10.3, Table 5 [Table 6]).

5. Materials and Manufacture

5.1 The pipe and tube shall be produced from hollow extrusion ingot (cast in hollow form, or drilled, or pierced from solid ingot) and shall be extruded by use of the die and mandrel method.

5.1.1 At the option of the producer, the pipe and tube may be drawn after extrusion, provided all the requirements of this specification are met.

6. Quality Assurance

6.1 *Responsibility for Inspection and Tests*—Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection and test requirements specified herein. The producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser in the order or at the time of contract signing. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections and tests are deemed necessary to ensure that material conforms to prescribed requirements.

6.2 *Lot Definition*—An inspection lot shall be defined as follows:

6.2.1 For heat-treated tempers, an inspection lot shall consist of an identifiable quantity of material of the same mill form, alloy, temper, and nominal dimensions traceable to a heat-treat lot or lots, and subjected to inspection at one time.

6.2.2 For non-heat treated tempers, an inspection lot shall consist of an identifiable quantity of material of the same mill form alloy, temper, and nominal dimensions subjected to inspection at one time.

7. Composition

7.1 *Limits*—The pipe or tube shall conform to the composition limits specified in Table 4. Conformance shall be determined by the producer, by taking samples in accordance with Practices **E716**, when the ingots are poured, and analyzing those samples in accordance with Test Methods **E1251**, **E3061**, or EN 14242. At least one sample shall be taken for each group of ingots poured simultaneously from the same source of molten metal. If the producer has determined the composition during pouring of the ingots, they shall not be required to sample and analyze the finished product.

7.2 If it becomes necessary to analyze the finished or semi-finished product for conformance to chemical composition limits, the methods of sampling and methods of analysis shall be as provided in the following:

7.2.1 *Methods of Sampling*—Samples for chemical analysis shall be taken in accordance with Practice **B985**.

7.2.2 *Methods of Analysis*—Analysis shall be performed in accordance with Test Methods **E1251**, **E3061**, or CEN EN 14242 (ICP method).

NOTE 4—It is standard practice in the United States aluminum industry to determine conformance to the composition limits prior to further processing of ingots into wrought products. Due to the continuous nature of the process, it is not practical to keep a specific ingot analysis identified with a specific quantity of finished material.