



Designation: A20/A20M – 20

Standard Specification for General Requirements for Steel Plates for Pressure Vessels¹

This standard is issued under the fixed designation A20/A20M; 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 general requirements specification² covers a group of common requirements that, unless otherwise specified in the applicable product specification, apply to rolled steel plates for pressure vessels covered by each of the following product specifications issued by ASTM:

Title of Specification	ASTM Designation ⁴
Pressure Vessel Plates, Alloy Steel, Nickel	A203/A203M
Pressure Vessel Plates, Alloy Steel, Molybdenum	A204/A204M
Pressure Vessel Plates, Alloy Steel, Manganese-Vanadium-Nickel	A225/A225M
Stainless Chromium Steel-Clad Plate	A263
Stainless Chromium-Nickel Steel-Clad Plate	A264
Nickel and Nickel-Base Alloy-Clad Steel Plate	A265
Pressure Vessel Plates, Carbon Steel, Low- and Intermediate-Tensile Strength	A285/A285M
Pressure Vessel Plates, Carbon Steel, Manganese-Silicon	A299/A299M
Pressure Vessel Plates, Alloy Steel, Manganese-Molybdenum and Manganese-Molybdenum-Nickel	A302/A302M
Pressure Vessel Plates, Alloy Steel, Double-Normalized and Tempered 9 % Nickel	A353/A353M
Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum	A387/A387M
Pressure Vessel Plates, Carbon Steel, High Strength Manganese	A455/A455M
Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service	A515/A515M
Pressure Vessel Plates, Carbon Steel, Moderate- and Lower-Temperature Service	A516/A516M
Pressure Vessel Plates, Alloy Steel, High-Strength, Quenched and Tempered	A517/A517M
Pressure Vessel Plates, Alloy Steel, Quenched and Tempered, Manganese-Molybdenum and Manganese-Molybdenum-Nickel	A533/A533M

¹ This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.11 on Steel Plates for Boilers and Pressure Vessels.

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² For ASME Boiler and Pressure Vessel Code applications, see related Specification SA-20/SA-20M in Section II of that Code.

Title of Specification	ASTM Designation ⁴
Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel	A537/A537M
Pressure Vessel Plates, Alloy Steel, Quenched-and-Tempered, Chromium-Molybdenum, and Chromium-Molybdenum-Vanadium	A542/A542M
Pressure Vessel Plates, Alloy Steel, Quenched and Tempered Nickel-Chromium-Molybdenum	A543/A543M
Pressure Vessel Plates, Alloy Steel, Quenched and Tempered 7, 8, and 9 % Nickel	A553/A553M
Pressure Vessel Plates, Carbon Steel, Manganese-Titanium for Glass or Diffused Metallic Coatings	A562/A562M
Pressure Vessel Plates, Carbon Steel, High Strength, for Moderate and Lower Temperature Service	A612/A612M
Pressure Vessel Plates, 5 % and 5½ % Nickel Alloy Steels, Specially Heat Treated	A645/A645M
Pressure Vessel Plates, Carbon-Manganese-Silicon Steel, for Moderate and Lower Temperature Service	A662/A662M
Pressure Vessel Plates, Carbon-Manganese-Silicon Steel, Quenched and Tempered, for Welded Pressure Vessels	A724/A724M
Pressure Vessel Plates, Low-Carbon Age-Hardening Nickel-Copper-Chromium-Molybdenum-Columbium (Niobium) Alloy Steel	A736/A736M
Pressure Vessel Plates, High-Strength Low-Alloy Steel	A737/A737M
Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel, for Moderate and Lower Temperature Service	A738/A738M
Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum-Vanadium	A832/A832M
Steel Plates for Pressure Vessels, Produced by Thermo-Mechanical Control Process (TMCP)	A841/A841M
Steel Plates, 9 % Nickel Alloy, for Pressure Vessels, Produced by the Direct-Quenching Process	A844/A844M
Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum-Tungsten	A1017/A1017M

⁴ These designations refer to the latest issue of the respective specification which appears in the *Annual Book of ASTM Standards*, Vol 01.04.

1.1.1 This general requirements specification also covers a group of supplementary requirements that are applicable to several of the above product specifications as indicated therein. Such requirements are provided for use if additional testing or additional restrictions are required by the purchaser, and apply only if specified individually in the purchase order.

1.2 **Appendix X1** provides information on coil as a source of plates for pressure vessels.

1.3 **Appendix X2** provides information on the variability of tensile properties in plates for pressure vessels.

1.4 **Appendix X3** provides information on the variability of Charpy-V-Notch impact test properties in plates for pressure vessels.

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

1.5 **Appendix X4** provides information on cold bending of plates, including suggested minimum inside radii for cold bending.

1.6 These materials are intended to be suitable for fusion welding. When the steel is to be welded, it is presupposed that a welding procedure suitable for the grade of steel and intended use or service will be utilized.

1.7 In case of any conflict in requirements, the requirements of the applicable product specification prevail over those of this general requirements specification.

1.8 Additional requirements that are specified in the purchase order and accepted by the supplier are permitted, provided that such requirements do not negate any of the requirements of this general requirements specification or the applicable product specification.

1.9 For purposes of determining conformance with this general requirements specification and the applicable product specification, values are to be rounded to the nearest unit in the right-hand place of figures used in expressing the limiting values in accordance with the rounding method of Practice **E29**.

1.10 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.

1.11 This general requirements specification and the applicable product specification are expressed in both inch-pound units and SI units; unless the order specifies the applicable “M” specification designation (SI units), the plates are to be furnished to inch-pound units.

1.12 *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 *ASTM Standards:*³

A203/A203M Specification for Pressure Vessel Plates, Alloy Steel, Nickel

A204/A204M Specification for Pressure Vessel Plates, Alloy Steel, Molybdenum

A225/A225M Specification for Pressure Vessel Plates, Alloy Steel, Manganese-Vanadium-Nickel

A263 Specification for Stainless Chromium Steel-Clad Plate

A264 Specification for Stainless Chromium-Nickel Steel-Clad Plate

A265 Specification for Nickel and Nickel-Base Alloy-Clad Steel Plate

A285/A285M Specification for Pressure Vessel Plates, Carbon Steel, Low- and Intermediate-Tensile Strength

A299/A299M Specification for Pressure Vessel Plates, Carbon Steel, Manganese-Silicon

A302/A302M Specification for Pressure Vessel Plates, Alloy Steel, Manganese-Molybdenum and Manganese-Molybdenum-Nickel

A353/A353M Specification for Pressure Vessel Plates, Alloy Steel, Double-Normalized and Tempered 9 % Nickel

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A387/A387M Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum

A435/A435M Specification for Straight-Beam Ultrasonic Examination of Steel Plates

A455/A455M Specification for Pressure Vessel Plates, Carbon Steel, High-Strength Manganese

A515/A515M Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service

A516/A516M Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service

A517/A517M Specification for Pressure Vessel Plates, Alloy Steel, High-Strength, Quenched and Tempered

A533/A533M Specification for Pressure Vessel Plates, Alloy Steel, Quenched and Tempered, Manganese-Molybdenum and Manganese-Molybdenum-Nickel

A537/A537M Specification for Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel

A542/A542M Specification for Pressure Vessel Plates, Alloy Steel, Quenched-and-Tempered, Chromium-Molybdenum, and Chromium-Molybdenum-Vanadium

A543/A543M Specification for Pressure Vessel Plates, Alloy Steel, Quenched and Tempered Nickel-Chromium-Molybdenum

A553/A553M Specification for Pressure Vessel Plates, Alloy Steel, Quenched and Tempered 7, 8, and 9 % Nickel

A562/A562M Specification for Pressure Vessel Plates, Carbon Steel, Manganese-Titanium for Glass or Diffused Metallic Coatings

A577/A577M Specification for Ultrasonic Angle-Beam Examination of Steel Plates

A578/A578M Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications

A612/A612M Specification for Pressure Vessel Plates, Carbon Steel, High Strength, for Moderate and Lower Temperature Service

A645/A645M Specification for Pressure Vessel Plates, 5 % and 5½ % Nickel Alloy Steels, Specially Heat Treated

A662/A662M Specification for Pressure Vessel Plates, Carbon-Manganese-Silicon Steel, for Moderate and Lower Temperature Service

A700 Guide for Packaging, Marking, and Loading Methods for Steel Products for Shipment

A724/A724M Specification for Pressure Vessel Plates, Carbon-Manganese-Silicon Steel, Quenched and Tempered, for Welded Pressure Vessels

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.

- [A736/A736M](#) Specification for Pressure Vessel Plates, Low-Carbon Age-Hardening Nickel-Copper-Chromium-Molybdenum-Columbium (Niobium) Alloy Steel
- [A737/A737M](#) Specification for Pressure Vessel Plates, High-Strength, Low-Alloy Steel
- [A738/A738M](#) Specification for Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel, for Moderate and Lower Temperature Service
- [A751](#) Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
- [A770/A770M](#) Specification for Through-Thickness Tension Testing of Steel Plates for Special Applications
- [A832/A832M](#) Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum-Vanadium
- [A841/A841M](#) Specification for Steel Plates for Pressure Vessels, Produced by Thermo-Mechanical Control Process (TMCP)
- [A844/A844M](#) Specification for Steel Plates, 9% Nickel Alloy, for Pressure Vessels, Produced by the Direct-Quenching Process
- [A941](#) Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys
- [A1017/A1017M](#) Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum-Tungsten
- [E21](#) Test Methods for Elevated Temperature Tension Tests of Metallic Materials
- [E29](#) Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- [E112](#) Test Methods for Determining Average Grain Size
- [E208](#) Test Method for Conducting Drop-Weight Test to Determine Nil-Ductility Transition Temperature of Ferritic Steels
- [E709](#) Guide for Magnetic Particle Testing
- 2.2 *American Society of Mechanical Engineers Code:*⁴
- [ASME Boiler and Pressure Vessel Code, Section IX](#)
- 2.3 *U.S. Federal Standard:*⁵
- [Fed. Std. No. 123 Marking for Shipment \(Civil Agencies\)](#)
- 2.4 *Automotive Industry Action Group Standard:*⁶
- [B 1 Bar Code Symbology Standard](#)

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

- 3.1.1 *as-rolled*—for plates, the condition of a plate that has been hot-rolled and will not be or has not yet been heat treated.
 - 3.1.1.1 *Discussion*—The term *as-rolled* by itself is not meant to refer to plates that have been hot-rolled using control-rolling (CR), direct quench (DQT), thermo-mechanical control rolling (TMCP), recrystallization control rolling (RCR), or any similar methods that are intended to produce a set of properties that are not normally achievable were they not employed. The term *as-rolled* is to be distinguished from the established term

plate-as-rolled that does not define the actual condition of a plate, but defines the singular product of a slab or ingot that has been hot-rolled

3.1.2 *coil*—hot-rolled steel in coil form for processing into finished plates.

3.1.3 *exclusive*—when used in relation to ranges, as for ranges of thicknesses in the tables of permissible variations in dimensions, the term is intended to exclude only the greater value of the range. Thus, a range from 60 to 72 in. [1500 to 1800 mm] *exclusive* includes 60 in. [1500 mm], but does not include 72 in. [1800 mm].

3.1.4 *heat treatment terms*—see 3.1.11, and Terminology A941.

3.1.5 *hot forming*—a forming operation producing permanent deformation, performed after the plate has been heated to the temperature required to produce grain refinement.

3.1.6 *hot-rolled (hot rolling)*—for plates, the process described for a plate that has been rolled from a slab or ingot whose starting temperature is suitably above the recrystallization temperature of the metal to be rolled.

3.1.6.1 *Discussion*—Hot-rolled may be used in conjunction with any rolling process to more effectively describe a specific condition, for example; hot-rolled as-rolled; hot-rolled control-rolled, etc.

3.1.7 *manufacturer*—the organization that directly controls the conversion of steel ingots or slabs, by hot rolling, into plate-as-rolled or into coil; and for plates produced from plate-as-rolled, the organization that directly controls, or is responsible for, one or more of the operations involved in finishing the plates. Such finishing operations include leveling, cutting to length, testing, inspection, conditioning, heat treatment (if applicable), packaging, marking, loading for shipment, and certification.

3.1.7.1 *Discussion*—The finishing operations need not be done by the organization that did the hot rolling of the plate. For plates produced from coil, see also 3.1.2.

3.1.8 *mill edge*—the normal edge produced by rolling between horizontal finishing rolls. A mill edge does not conform to any definite contour. Mill edge plates have two mill edges and two trimmed edges.

3.1.8.1 *Discussion*—Mill edge plates may at times be side-trimmed on one or both sides at the discretion of the manufacturer.

3.1.9 *plate identifier*—the alpha, numeric, or alphanumeric designation used to identify the plate.

3.1.10 *plates*—flat hot-rolled steel, ordered to thickness or weight and typically to width and length, commonly available by size as follows:

Width, in. [mm]	Thickness, in. [mm]
Over 8 [200]	over 0.229 [6.0 mm and over]
Over 48 [1200]	over 0.179 [4.6 mm and over]

3.1.10.1 *Discussion*—Steel plates are available in various thickness, width, and length combinations dependent upon equipment and processing capabilities of various manufacturers and processors. Historic limitations of a plate based upon dimensions (thickness, width, and length) do not take into

⁴ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁵ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

⁶ Available from Automotive Industry Action Group (AIAG), 26200 Lahser Rd., Suite 200, Southfield, MI 48033, <http://www.aiag.org>.