



Designation: A265 – 12 (Reapproved 2019)

Standard Specification for Nickel and Nickel-Base Alloy-Clad Steel Plate¹

This standard is issued under the fixed designation A265; 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 plate of a carbon steel or low-alloy steel base to which is integrally and continuously bonded on one or both sides a layer of nickel or nickel-base alloy. The material is generally intended for pressure vessel use but may be used in other structural applications where corrosion resistance of the alloy is of prime importance.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *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

- A6/A6M Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
- A20/A20M Specification for General Requirements for Steel Plates for Pressure Vessels
- A370 Test Methods and Definitions for Mechanical Testing of Steel Products
- A578/A578M Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications

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.

Current edition approved March 1, 2019. Published April 2019. Originally approved in 1943. Last previous edition approved in 2012 as A265 – 12. DOI: 10.1520/A0265-12R19.

² For ASME Boiler and Pressure Vessel Code applications see related Specification SA-265 in Section II of that Code.

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.

- A751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
- B127 Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
- B162 Specification for Nickel Plate, Sheet, and Strip
- B168 Specification for Nickel-Chromium-Aluminum Alloys (UNS N06699), Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, N06045, and N06696), Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617), Nickel-Iron-Chromium-Tungsten Alloy (UNS N06674), Plate
- B333 Specification for Nickel-Molybdenum Alloy Plate, Sheet, and Strip
- B409 Specification for Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip
- B424 Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825, UNS N08221, and UNS N06845) Plate, Sheet, and Strip
- B443 Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Plate, Sheet, and Strip
- B463 Specification for UNS N08020 Alloy Plate, Sheet, and Strip
- B575 Specification for Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, Low-Carbon Nickel-Chromium-Molybdenum-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Tungsten, and Low-Carbon Nickel-Molybdenum-Chromium Alloy Plate, Sheet, and Strip
- B582 Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip
- B625 Specification for UNS N08925, UNS N08031, UNS N08034, UNS N08932, UNS N08926, UNS N08354, UNS N08830, and UNS R20033 Plate, Sheet, and Strip

2.2 Other Standards:

- ASME Boiler and Pressure Vessel Code, Section IX⁴

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

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 This material is considered as single-clad or double-clad nickel or nickel-base alloy clad steel plate, depending on whether one or both sides are covered.

3.1.2 The term plate as used in this specification applies to material $\frac{3}{16}$ in. (2.73 mm) and over in thickness, and over 10 in. (254 mm) in width.

3.1.3 *alloy cladding, n*—the nickel or nickel-base alloy component of the composite plate.

3.1.4 *base metal (backing steel), n*—component to which the alloy cladding is applied, usually the greater percentage of the composite plate and usually consisting of carbon or low-alloy steel.

3.1.5 *integrally and continuously bonded, n*—the process by which the alloy cladding and base metal are brought together to form a metallurgical bond at essentially the entire interface of the two metals by means other than those processes that do not produce a homogeneous composite plate.

4. Ordering Information

4.1 It is the responsibility of the purchaser to specify all requirements that are necessary for material ordered under this specification. Such requirements may include, but are not limited to the following:

4.1.1 Quantity (weight or number of pieces).

4.1.2 Heat treatment, if required (see Section 5).

4.1.3 Dimensions, including the thickness of the cladding alloy and the backing steel, or of the total composite plate and if more or less restrictive thickness tolerances apply.

4.1.4 Cladding alloy specification (see Section 6).

4.1.5 Base metal specification (see Section 6).

4.1.6 Product analysis, if required. Specify whether applicable to the cladding alloy, backing steel, or both (see Section 10).

4.1.7 Mechanical Properties (see Sections 7, 13, and 14).

4.1.8 Restrictions, if required, on repair by welding (see Section 14).

4.1.9 Additions to the specification or special requirements such as applicable construction code rules.

4.1.10 Corrosions tests, if required.

4.1.11 Notification when the cladding alloy is to be used for inclusion in the design strength calculations for an applicable construction code.

NOTE 1—Construction codes may dictate certain fabrication requirements when the cladding is used in the design calculations that may be different than if the cladding is used for corrosion resistance only. This may be particularly important when the alloy cladding involves the use of welded components in the explosion bonded clad manufacturing process. It is incumbent on the purchaser to make the clad manufacturer aware of any such restrictions or applications at time of order.

4.2 In addition to the basic requirements of this specification and the backing steel specification, certain supplementary requirements are available when additional control, testing, or examination is required to meet end use requirements. The purchaser is referred to the listed supplementary requirements in this specification and to the detailed requirements in Specification A20/A20M.

4.2.1 Nondestructive examination,

4.2.2 Impact testing, and

4.2.3 Simulated Post-Weld Heat Treatment of Mechanical Test Coupons (SPWHT).

4.3 If the requirements of this specification are in conflict with the requirements of Specification A20/A20M, the requirements of this specification shall prevail.

4.4 Special tests.

5. Materials and Manufacture

5.1 Process:

5.1.1 The steel shall be made by the open-hearth, electric-furnace (with separate degassing and refining optional), or basic-oxygen processes, or by secondary processes whereby steel made from these primary processes is remelted using, but not limited to electroslag remelting or vacuum arc remelting processes.

5.1.2 The cladding metal may be metallurgically bonded to the base metal by any method that will produce a clad steel that will conform to the requirements of this specification.

5.1.3 For explosively bonded products, the alloy cladding metal may be comprised of two or more separate alloy plates or sheets completely welded together to form a single fabricated component.

5.2 *Heat Treatment*—Unless a specific heat treatment is required by the cladding material or base steel specification, or unless otherwise agreed upon by the purchaser and manufacturer, the clad plate shall be furnished in a condition that is appropriate for the cladding alloy, base metal, or both.

6. Chemical Composition

6.1 The composite plate may conform to any desired combination cladding metal and base metal as described in 6.2 and 6.3, and as agreed upon between the purchaser and the manufacturer.

6.2 *Cladding Metal*—The nickel or nickel-base alloy cladding metal specified shall conform to the requirements as to chemical composition prescribed for the respective metal in Specifications B127, B162, B168, B333, B409, B424, B443, B463, B575, B582, and B625, or other nickel-base alloy as agreed upon by the purchaser and manufacturer.

6.3 *Base Metal*—The base metal shall be carbon steel or low-alloy steel conforming to the ASTM specifications for steels for either pressure vessels or general structural applications, or other, as agreed upon by the purchaser and manufacturer. The base metal shall conform to the chemical requirements of the specification to which it is ordered.

TABLE 1 Weights for Component Materials

	Density		Weight per Square Foot for Material 1 in. (25.4 mm) in Thickness, lb
	lb/in. ³	g/cm ³	
Steel	0.283	7.83	40.80
Nickel	0.321	8.88	46.22
Nickel-copper alloy	0.319	8.83	45.94
Nickel-chromium-iron alloy	0.307	8.49	44.21