



Designation: B575 – 17 (Reapproved 2023)

Standard 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 Strip¹

This standard is issued under the fixed designation B575; 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, sheet, and strip of low-carbon nickel-chromium-molybdenum alloys (UNS N10276, N06022, N06455, N06035, N06044, UNS N06058, UNS N06059),³ low-carbon nickel-chromium-molybdenum-copper alloy (UNS N06200), low-carbon nickel-molybdenum-chromium (UNS N10362), low-carbon nickel-chromium-molybdenum-tantalum alloy (UNS N06210), and low-carbon nickel-chromium-molybdenum-tungsten alloy (UNS N06686) as shown in **Table 1**, for use in general corrosive service.

1.2 The following products are covered under this specification:

1.2.1 *Sheet and Strip*—Hot or cold rolled, solution annealed, and descaled unless solution anneal is performed in an atmosphere yielding a bright finish.

1.2.2 *Plate*—Hot or cold rolled, solution annealed, and descaled.

1.3 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.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

¹ This specification is under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.07 on Refined Nickel and Cobalt and Their Alloys.

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² For ASME Boiler and Pressure Vessel Code applications, see related Specification SB-575 in Section II of that Code.

³ Designation established in accordance with Practice E527 and SAE J1086, Practice for Numbering Metals and Alloys (UNS).

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 ASTM Standards:⁴

- B906 Specification for General Requirements for Flat-Rolled Nickel and Nickel Alloys Plate, Sheet, and Strip
- E112 Test Methods for Determining Average Grain Size
- E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness
- E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

- 3.1.1 *cold-rolled plate, n*—material $\frac{3}{16}$ in. to $\frac{3}{8}$ in. (4.76 mm to 9.52 mm), inclusive, in thickness.
- 3.1.2 *hot-rolled plate, n*—material $\frac{3}{16}$ in. (4.76 mm) and over in thickness.
- 3.1.3 *plate, n*—material $\frac{3}{16}$ in. (4.76 mm) and over in thickness.
- 3.1.4 *sheet and strip, n*—material under $\frac{3}{16}$ in. (4.76 mm) in thickness.

⁴ 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



TABLE 1 Chemical Requirements

| Element | Composition Limits, % | | | | | | | | | | | |
|-----------------|------------------------|--------------|------------------------|------------------------|------------------------|--------------|--------------|------------------------|------------------------|------------------------|------------------------|--|
| | Alloy N06035 | Alloy N06044 | Alloy N10276 | Alloy N06022 | Alloy N06455 | Alloy N06059 | Alloy N06058 | Alloy N06200 | Alloy N06210 | Alloy N10362 | Alloy N06686 | |
| Molybdenum | 7.60-9.00 | 0.80-1.20 | 15.0-17.0 | 12.5-14.5 | 14.0-17.0 | 15.0-16.5 | 18.5-21.0 | 15.0-17.0 | 18.0-20.0 | 21.5-23.0 | 15.0-17.0 | |
| Chromium | 32.25-34.25 | 43.5-45.3 | 14.5-16.5 | 20.0-22.5 | 14.0-18.0 | 22.0-24.0 | 20.0-23.0 | 22.0-24.0 | 18.0-20.0 | 13.8-15.6 | 19.0-23.0 | |
| Iron | 2.00 max | 0.3 max | 4.0-7.0 | 2.0-6.0 | 3.0 max | 1.5, max | 1.5, max | 3.0 max | 1.0 max | 1.25 max | 5.0 max | |
| Tungsten | 0.60 max | ... | 3.0-4.5 | 2.5-3.5 | ... | ... | 0.3 max | ... | ... | ... | 3.0-4.4 | |
| Cobalt, max | 1.00 | ... | 2.5 | 2.5 | 2.0 | 0.3 | 0.3 | 2.0 max | 1.0 | ... | ... | |
| Carbon, max | 0.050 | 0.02 | 0.010 | 0.015 | 0.015 | 0.010 | 0.010 | 0.010 | 0.015 | 0.010 | 0.010 | |
| Silicon, max | 0.60 | 0.20 | 0.08 | 0.08 | 0.08 | 0.10 | 0.10 | 0.08 | 0.08 | 0.08 | 0.08 | |
| Manganese, max | 0.50 | 0.07-0.30 | 1.0 | 0.50 | 1.0 | 0.5 | 0.5 | 0.50 | 0.5 | 0.60 | 0.75 | |
| Vanadium, max | 0.20 | ... | 0.35 | 0.35 | ... | ... | ... | ... | 0.35 | ... | ... | |
| Phosphorus, max | 0.030 | 0.020 | 0.04 | 0.02 | 0.04 | 0.015 | 0.015 | 0.025 | 0.02 | 0.025 | 0.04 | |
| Sulfur, max | 0.015 | 0.020 | 0.03 | 0.02 | 0.03 | 0.010 | 0.010 | 0.010 | 0.02 | 0.010 | 0.02 | |
| Titanium | ... | 0.10-0.30 | ... | ... | 0.7 max | ... | ... | ... | ... | ... | 0.02-0.25 | |
| Nickel | remainder ^A | Bal | remainder ^A | remainder ^A | remainder ^A | Bal | Bal | remainder ^A | remainder ^A | remainder ^A | remainder ^A | |
| Aluminum | 0.40 max | 0.30 max | ... | ... | ... | 0.1-0.4 | 0.40 max | 0.50 max | ... | 0.50 max | ... | |
| Copper | 0.30 max | ... | ... | ... | ... | 0.50 max | 0.50 max | 1.3-1.9 | ... | ... | ... | |
| Tantalum | ... | ... | ... | ... | ... | ... | ... | ... | 1.5-2.2 | ... | ... | |
| Nitrogen | ... | ... | ... | ... | ... | 0.02-0.15 | 0.02-0.15 | ... | ... | ... | ... | |

^A Shall be determined arithmetically by difference.

TABLE 2 Mechanical Property Requirements

| Alloy | Tensile Strength, min, psi (MPa) | Yield Strength (0.2 % Offset), min, psi (MPa) | Elongation in 2 in. (50.8 mm) or 4D ^A min, % | Rockwell Hardness, ^B max |
|--------|----------------------------------|-----------------------------------------------|---------------------------------------------------------|-------------------------------------|
| N10276 | 100 000 (690) | 41 000 (283) | 40 | 100 HRB |
| N06022 | 100 000 (690) | 45 000 (310) | 45 | 100 HRB |
| N06455 | 100 000 (690) | 40 000 (276) | 40 | 100 HRB |
| N06035 | 85 000 (586) | 35 000 (241) | 30 | 100 HRB |
| N06044 | 100 000 (690) | 45 000 (310) | 30 | 100 HRB |
| N06058 | 110 000 (760) | 52 000 (360) | 40 | 100 HRB |
| N06059 | 100 000 (690) | 45 000 (310) | 45 | 100 HRB |
| N06200 | 100 000 (690) | 45 000 (310) | 45 | 100 HRB |
| N10362 | 105 000 (725) | 45 000 (310) | 40 | 100 HRB |
| N06686 | 100 000 (690) | 45 000 (310) | 45 | 100 HRB |
| N06210 | 100 000 (690) | 45 000 (310) | 45 | 100 HRB |

^A D refers to the diameter of the tension specimen.

^B Hardness values are shown for information purposes only and are not to be used as a basis of acceptance or rejection. For approximate hardness conversions, see Hardness Conversion Tables E140.

4. General Requirements

4.1 Material furnished to this specification shall conform to the applicable requirements of Specification B906 unless otherwise provided herein.

5. Ordering Information

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

5.1.1 Alloy—Table 1,

5.1.2 Dimensions—Thickness (in decimals of an inch), width, and length (inch or fractions of an inch),

5.1.3 Optional Requirement—Plate; state how plate is to be cut (Specification B906, table titled Permissible Variations in Width and Length of Sheared, Torch-Cut, or Abrasive-Cut Rectangular Plate),

5.1.4 Certification—State if certification or a report of test results is required (Specification B906, section on Material Test Report and Certification),

5.1.5 Purchase Inspection—State which tests or inspections are to be witnessed (Specification B906, section on Inspection), and

5.1.6 Samples for Product (Check) Analysis—State whether samples should be furnished (Specification B906, section on Sampling).

6. Chemical Composition

6.1 The material shall conform to the composition limits specified in Table 1.

6.2 If a product (check) analysis is made by the purchaser, the material shall conform to the requirements specified in Table 1 and Specification B906.

7. Mechanical Properties and Other Requirements

7.1 Tensile Properties—The material shall conform to the room temperature tensile properties prescribed in Table 2.

7.2 Hardness—The hardness values given in Table 2 are informative only.

7.3 Grain Size for Sheet and Strip—Sheet and strip shall conform to the grain sizes as illustrated in Plate 1 of Test Methods E112. The requirements shall be as indicated in Table 3.

8. Dimensions, Mass, and Permissible Variations

8.1 Weight—For calculations of mass or weight, the following densities shall be used:

| Alloy | lb/in. ³ | Density g/cm ³ |
|--------|---------------------|---------------------------|
| N10276 | 0.321 | (8.87) |
| N06022 | 0.314 | (8.69) |
| N06455 | 0.312 | (8.64) |
| N06035 | 0.296 | (8.18) |
| N06044 | 0.287 | (7.97) |
| N06058 | 0.318 | (8.80) |
| N06059 | 0.311 | (8.60) |
| N06200 | 0.307 | (8.50) |
| N06210 | 0.316 | (8.76) |
| N10362 | 0.319 | (8.83) |
| N06686 | 0.315 | (8.73) |

8.2 Thickness:

8.2.1 Plate—The permissible variations in thickness of plate shall be as prescribed in Specification B906, table titled Permissible Variations in Thickness of Plate.

8.2.2 Sheet and Strip—The permissible variations in thickness of sheet and strip shall be as prescribed in Specification B906, table titled Permissible Variations in thickness of Sheet and Strip. The thickness shall be measured with the micrometer spindle 3/8 in. (9.525 mm) or more from any edge for material 1 in. (25.4 mm) or over in width and at any place on material under 1 in. (25.4 mm) in width.

8.3 Width:

8.3.1 Plate—The permissible variations in width of rectangular plates shall be as prescribed in Specification B906, table

TABLE 3 Grain Size for Annealed Sheet

| Thickness, in. (mm) | ASTM Micrograin Size Number | Average Grain Diameter, mm (in.) |
|-------------------------|-----------------------------|----------------------------------|
| 0.125 (3.175) and under | 3.0 or finer | 0.127 (0.0050) |
| Over 0.125 (3.175) | 1.5 or finer | 0.214 (0.0084) |