



Standard Specification for Nickel-Chromium-Iron-Molybdenum-Tungsten Alloy (UNS N06920) Plate, Sheet, and Strip¹

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1. Scope

1.1 This specification covers nickel-chromium-iron-molybdenum-tungsten alloy UNS N06920 in the form of rolled plate, sheet, and strip for general corrosion service.

1.2 The following products are covered under this specification:

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

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

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:*

E 8 Test Methods for Tension Testing of Metallic Materials²

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications³

E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition⁴

E 354 Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel and Cobalt Alloys⁴

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *plate*—material $\frac{3}{16}$ in. (4.76 mm) and over in thickness.

3.1.2 *sheet and strip*—material under $\frac{3}{16}$ in. (4.76 mm) in thickness.

4. Ordering Information

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

¹ This specification is under the jurisdiction of ASTM Committee B-2 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.07 on Refined Nickel and Cobalt, and Alloys Containing Nickel or Cobalt or both as Principal Constituents.

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² *Annual Book of ASTM Standards*, Vol 03.01.

³ *Annual Book of ASTM Standards*, Vol 14.02.

⁴ *Annual Book of ASTM Standards*, Vol 03.05.

4.1.1 *Alloy*.

4.1.2 *Dimensions*—Thickness (in decimals of an inch), width, and length (inch or fraction of an inch).

4.1.3 *Certification*—State whether a report of test results is required (Section 15).

4.1.4 *Optional Requirement*—Plate; state how the plate is to be cut (see 7.8.1 and Table 1).

4.1.5 *Purchase Inspection*—State which tests or inspections are to be witnessed (Section 13).

4.1.6 *Samples for Product (Check) Analysis*—State whether samples shall be furnished (9.2.2).

5. Chemical Composition

5.1 The material shall conform to the chemical composition requirements prescribed in Table 2.

5.2 If a product (check) analysis is made by the purchaser, the material shall conform to the requirements specified in Table 2 subject to the permissible tolerances given in Table 3.

6. Mechanical Properties and Other Requirements

6.1 *Tensile Properties*—The material shall conform to the room temperature tensile properties prescribed in Table 4.

7. Dimensions, Mass, and Permissible Variations

7.1 For the purposes of calculating the weight of the material covered by this specification, a density of 0.303 lb/in.³ (8.39 g/cm³) shall be used.

7.2 *Thickness:*

7.2.1 *Plate*—The permissible variations in thickness of plate shall be as prescribed in Table 5 and Table 6.

7.2.2 *Sheet and Strip*—The permissible variations in thickness of sheet and strip shall be as prescribed in Table 7. The thickness shall be measured with the micrometer spindle $\frac{3}{8}$ 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.

7.3 *Width:*

7.3.1 *Plate*—The permissible variations in width of rectangular plates shall be as prescribed in Table 1.

7.3.2 *Sheet and Strip*—The permissible variations in width for sheet and strip shall be as prescribed in Table 8.

7.4 *Length:*

7.4.1 *Plate*—Permissible variations in the length of rectangular plate shall be as prescribed in Table 1.

7.4.2 *Sheet and Strip*—Sheet and strip may be ordered to cut

TABLE 1 Permissible Variations in Width and Length of Sheared, Plasma-Torch-Cut, or Abrasive Cut Rectangular Plate

Specified Thickness	Permissible Variations in Widths and Lengths for Dimensions Given, in. (mm)			
	Up to 30 (760), incl		Over 30 (760)	
	+	-	+	-
	Inches			
<i>Sheared:</i>				
3/16 to 5/16	3/16	1/8	1/4	1/8
5/16 to 1/2, incl	1/4	1/8	3/8	1/8
<i>Abrasive Cut:</i>				
3/16 to 1 1/2, incl	1/16	1/16	1/16	1/16
Over 1 1/2 to 2 1/2, incl	1/8	1/8	1/8	1/8
<i>Plasma-Torch-Cut:^A</i>				
3/16 to 2, excl	1/2	0	1/2	0
2 to 3, incl	3/8	0	3/8	0
	Millimetres			
<i>Sheared:</i>				
4.76 to 7.94, excl	4.76	3.18	6.35	3.18
7.94 to 12.70, incl	6.35	3.18	9.52	3.18
<i>Abrasive Cut:</i>				
4.76 to 38.1, incl	1.59	1.59	1.59	1.59
Over 38.1 to 63.5, incl	3.18	3.18	3.18	3.18
<i>Plasma-Torch-Cut:^A</i>				
4.8 to 50.8, excl	12.7	0	12.7	0
50.8 to 76.2, incl	15.9	0	15.9	0

^AThe tolerance spread shown for plasma-torch-cutting may be obtained all on the minus side, or divided between the plus and the minus side if so specified by the purchaser.

TABLE 2 Chemical Requirements

Element	Composition Limits, %
Chromium	20.5–23.0
Iron	17.0–20.0
Molybdenum	8.0–10.0
Tungsten	1.0–3.0
Carbon, max	0.03
Cobalt, max	5.0
Manganese, max	1.0
Phosphorus, max	0.040
Sulfur, max	0.030
Silicon, max	1.0
Nickel	Remainder ^A

^ASee 12.1.1.

lengths, in which case a variation of 1/8 in. (3.175 mm) over the specified length shall be permitted, with a 0 minus tolerance.

7.5 Straightness:

7.5.1 The edgewise curvature (depth of chord) of flat sheet, strip, and plate shall not exceed the product of 0.05 in. multiplied by the length in feet (0.04 mm multiplied by the length in centimetres).

7.5.2 Straightness for coiled strip is subject to agreement between the manufacturer and the purchaser.

7.6 *Squareness (Sheet)*—For sheets of all thicknesses and widths of 6 in. (152.4 mm) or more, the angle between adjacent sides shall be 90 ± 0.15° (1/16 in. in 24 in. or 2.6 mm/m).

7.7 *Flatness*—Plate, sheet, and strip shall be commercially flat.

7.8 Edges:

TABLE 3 Product (Check) Analysis Tolerances

Element	Tolerance Over the Max or Under the Min Limit, %
Chromium	0.25
Iron	0.30
Molybdenum	0.15
Tungsten: Under min	0.04
Over max	0.10
Carbon, max	0.01
Cobalt, max	0.05
Manganese, max	0.03
Phosphorus, max	0.005
Sulfur, max	0.005
Silicon, max	0.05

TABLE 4 Mechanical Property Requirements

Tensile Strength, min, ksi (MPa)	95 (655)
Yield Strength, min, ksi (MPa)	35 (240)
Elongation in 2 in. (50.8 mm) or 4D ^A , min, %	35

^AD refers to the diameter of the tension specimen.

TABLE 5 Permissible Variations in Thickness of Plate^A

Specific Thickness, in. (mm)	Permissible Variations in Thickness, in. (mm) ^{B,C}	
	+	-
3/16 to 7/32 (4.762 to 5.556), incl	0.021 (0.53)	0.010 (0.25)
Over 7/32 to 1/4 (5.556 to 6.350), incl	0.024 (0.61)	0.010 (0.25)
Over 1/4 to 3/8 (6.350 to 9.525), incl	0.027 (0.69)	0.010 (0.25)
Over 3/8 to 1/2 (9.525 to 12.70), incl	0.030 (0.76)	0.010 (0.25)
Over 1/2 to 5/8 (12.70 to 15.88), incl	0.035 (0.89)	0.010 (0.25)
Over 5/8 to 3/4 (15.88 to 19.05), incl	0.040 (1.02)	0.010 (0.25)
Over 3/4 to 7/8 (19.05 to 22.25), incl	0.045 (1.14)	0.010 (0.25)
Over 7/8 to 1 (22.22 to 25.4), incl	0.050 (1.27)	0.010 (0.25)
Over 1 to 2 1/2 (25.4 to 63.5), incl	5 ^D	0.010 (0.25)

^AApplicable to plate 48 in. (1219 mm) and under in width.

^BMeasured 3/8 in. (9.525 mm) or more from any edge.

^CBuffing or grinding for removal of light surface imperfections shall be permitted. The depth of such buffed or ground areas shall not exceed the minimum tolerance thickness.

^DExpressed as percent of thickness.

7.8.1 Plates shall have sheared, abrasive cut, or plasma-torch-cut edges as specified.

7.8.2 Sheet and strip shall have sheared or slit edges.

8. Workmanship, Finish, and Appearance

8.1 The material shall be uniform in quality and condition, smooth, and free of injurious defects.

9. Sampling

9.1 *Lots for Chemical Analysis and Mechanical Testing:*

9.1.1 A lot for chemical analysis shall consist of one heat.

9.1.2 A lot of plate, sheet, or strip for mechanical testing shall be defined as the material from one heat in the same condition and specified thickness.

9.2 *Sampling for Chemical Analysis:*

9.2.1 A representative sample shall be obtained from each heat during pouring or subsequent processing.

9.2.2 Product (check) analysis shall be wholly the responsibility of the purchaser.

9.3 *Sampling for Mechanical Testing*—Representative samples shall be taken from each lot of finished material.