Designation: B 575 – 99a

Standard Specification for Low-Carbon Nickel-Molybdenum-Chromium, Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, Low-Carbon Nickel-Chromium-Molybdenum-Tantalum, and Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Plate, Sheet, and Strip[1]

This standard is issued under the fixed designation B 575; 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.

1. Scope

1.1 This specification[2] covers plate, sheet, and strip of low-carbon nickel-molybdenum-chromium alloys (UNS N10276, N06022, and N06455), low-carbon nickel-chromium-molybdenum alloy (UNS N06058, UNS N06059)*, low-carbon nickel-chromium-molybdenum-copper alloy (UNS N06200), 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 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 Materials[3]

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials[3]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[4]

E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition[5]

E 112 Test Methods for Determining the Average Grain Size[3]

E 140 Hardness Conversion Tables for Metals (Relationship Between Brinell Hardness, Vickers Hardness, Rockwell Hardness, Rockwell Superficial Hardness, and Knoop Hardness)[3]

E 1473 Test Methods for Chemical Analysis of Nickel, Cobalt, and High-Temperature Alloys[6]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *cold-rolled plate*—material 3⁄16 to 3⁄8in. (4.76 to 9.52 mm), inclusive, in thickness.

3.1.2 *hot-rolled plate*—material 3⁄16 in. (4.76 mm) and over in thickness.

3.1.3 *plate*—material 3⁄16 in. (4.76 mm) and over in thickness.

3.1.4 *sheet and strip*—material under 3⁄16 in. (4.76 mm) in thickness.

4. Ordering Information

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

4.1.1 *Alloy*—Table 1,

[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.

* New designation established in accordance with ASTM E 527 and SAE J1086, Practice for Numbering Metals and Alloys (UNS).

[3] *Annual Book of ASTM Standards,* Vol 03.01.

[4] *Annual Book of ASTM Standards,* Vol 14.02.

[5] *Annual Book of ASTM Standards,* Vol 03.05.

[6] *Annual Book of ASTM Standards,* Vol 03.06.

TABLE 1 Chemical Requirements

Element	Composition Limits, %							
	Alloy N10276	Alloy N06022	Alloy N06455	Alloy N06059	Alloy N06058	Alloy N06200	Alloy N06210	Alloy N06686
Molybdenum	15.0–17.0	12.5–14.5	14.0–17.0	15.0–16.5	19.0 - 21.0	15.0–17.0	18.0–20.0	15.0-17.0
Chromium	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	19.0-23.0
Iron	4.0–7.0	2.0–6.0	3.0 max	1.5, max	1.5, max	3.0 max	1.0 max	5.0 max
Tungsten	3.0–4.5	2.5–3.5	...	...	0.3 max	...	...	3.0-4.4
Cobalt, max	2.5	2.5	2.0	0.3	0.3	2.0 max	1.0	...
Carbon, max	0.010	0.015	0.015	0.010	0.010	0.010	0.015	0.010
Silicon, max	0.08	0.08	0.08	0.10	0.10	0.08	0.08	0.08
Manganese, max	1.0	0.50	1.0	0.5	0.5	0.50	0.5	0.75
Vanadium, max	0.35	0.35	...	...	...	...	0.35	...
Phosphorus, max	0.04	0.02	0.04	0.015	0.015	0.025	0.02	0.04
Sulfur, max	0.03	0.02	0.03	0.010	0.010	0.010	0.02	0.02
Titanium	...	...	0.7 max	...	...	...	...	0.02-0.25
Nickel	remainder[A]	remainder[A]	remainder[A]	Bal	Bal	remainder[A]	remainder[A]	remainder[A]
Aluminum	...	...	...	0.1–0.4	0.40 max	0.50 max	...	...
Copper	...	...	...	0.50 max	0.50 max	1.3–1.9	...	...
Tantalum	...	...	...	...	...	...	1.5–2.2	...

[A] See 9.2.2.

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

4.1.3 *Optional Requirement*—Plate; state how plate is to be cut (see 7.8.1 and Table 2),

4.1.4 *Certification*— State if certification or a report of test results is required (Section 15),

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

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

5. Chemical Composition

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

TABLE 2 Permissible Variations in Width and Length of Sheared, 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				
Sheared:				
3/16 to 5/16, excl	3/16	1/8	1/4	1/8
5/16 to 1/2, incl	1/4	1/8	3/8	1/8
Abrasive-cut:				
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
Torch-cut: [A]				
3/16 to 2 excl	1/2	0	1/2	0
2 to 3 incl	5/8	0	5/8	0
Millimetres				
Sheared:				
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
Abrasive-cut:				
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
Torch-cut: [A]				
4.8 to 50.8 excl	12.7	0	12.7	0
50.8 to 76.2 incl	15.9	0	15.9	0

[A] The tolerance spread shown for 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.

5.2 If a product (check) analysis is made by the purchaser, the material shall conform to the requirements specified in Table 1 subject to the permissible tolerances 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.

6.2 *Hardness*—The hardness values given in Table 4 are informative only.

6.3 *Grain Size for Sheet and Strip*— Sheet and strip shall conform to the grain sizes as illustrated in Plate 1 of Test Methods E 112. The requirements shall be as indicated in Table 5.

7. Dimensions, Mass, and Permissible Variations

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

Alloy	Density lb/in.^{3}	Density g/cm^3
N10276	0.321	(8.87)
N06022	0.314	(8.69)
N06455	0.312	(8.64)
N06058	0.318	(8.80)
N06059	0.311	(8.60)
N06200	0.307	(8.50)
N06210	0.316	(8.76)
N06686	0.315	(8.73)

7.2 *Thickness*:

7.2.1 *Plate*—The permissible variations in thickness of plate shall be as prescribed in 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 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 2.

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*: