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Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip[1]

This standard is issued under the fixed designation B 127; 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 Department of Defense.

1. Scope

1.1 This specification[2] covers rolled nickel-copper alloy (UNS N04400)* plate, sheet, and strip.

1.2 The values stated in inch-pound units are to be regarded as the standard. The other values given are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

B 164 Specification for Nickel-Copper Alloy Rod, Bar, and Wire[3]

E 8 Test Methods for Tension Testing of Metallic Materials[4]

E 10 Test Method for Brinell Hardness of Metallic Materials[4]

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials[4]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[5]

E 76 Test Methods for Chemical Analysis of Nickel-Copper Alloys[6]

E 112 Test Methods for Determining the Average Grain Size[4]

E 140 Hardness Conversion Tables for Metals[4]

F 155 Test Method for Temper of Strip and Sheet Metals for Electronic Devices (Spring-Back Method)[7]

2.2 *Military Standards:*[8]

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-271 Nondestructive Testing Requirements for Metals

3. Terminology

3.1 *Descriptions of Terms Specific to This Standard*—The terms given in Table 1 shall apply.

TABLE 1 Product Description

Product	Thickness, in. (mm)	Width, in. (mm)
Hot-rolled plate[A]	3/16 and over (Table 5 and Table 6)	(Table 8)[B]
Hot-rolled sheet[A]	0.018 to 0.250 (0.46 to 6.4), incl (Table 7)	(Table 10)
Cold-rolled sheet[C]	0.018 to 0.250 (0.46 to 6.4), incl (Table 7)	(Table 10)
Cold-rolled strip[C]	0.005 to 0.250 (0.13 to 6.4), incl (Table 7)	(Table 10)

[A] Material 3/16 to 1/4 in. (4.8 to 6.4 mm), incl, in thickness may be furnished as sheet or plate provided the material meets the specification requirements for the condition ordered.

[B] Hot-rolled plate, in widths 10 in. (254 mm) and under, may be furnished as hot-finished rectangles with sheared or cut edges in accordance with Specification B 164, provided the mechanical property requirements of this specification are met.

[C] Material under 48 in. (1219 mm) in width may be furnished as sheet or strip provided the material meets the specification requirements for the condition ordered.

4. Ordering Information

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

4.1.1 *Alloy*—Name or UNS number (see Table 2).

TABLE 2 Chemical Requirements

Element	Composition,%	Product (Check) Analysis Variations, under min or over max, of the Specified Limit of Element
	Alloy N04400	
Nickel, min[A]	63.0	0.45
Copper	28.0 to 34.0	0.15 under min-0.20 over max
Iron, max	2.5	0.05
Manganese, max	2.0	0.04
Carbon, max	0.3	0.02
Silicon, max	0.5	0.03
Sulfur, max	0.024	0.005

[A] Element shall be determined arithmetically by difference.

[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 Their Alloys.

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[2] For ASME Boiler and Pressure Vessel Code applications, see related Specification SB-127 in Section II of that code.

* New designation established in accordance with ASTM E527 and SAE J1086, Practice for Numbering Metals and Alloys (UNS).

[3] *Annual Book of ASTM Standards*, Vol 02.04.

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

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

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

[7] Discontinued—See *1983 Annual Book of ASTM Standards*, Vol 10.04.

[8] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

4.1.2 ASTM designation, including year of issue.
4.1.3 *Condition*—See 6.1, 6.2, and Appendix X1.
4.1.4 *Finish*—See Appendix X1.
4.1.5 *Dimensions*—Thickness, width, and length.
4.1.6 *Quantity*.
4.1.7 *Optional Requirements*:
4.1.7.1 *Sheet and Strip*—Whether to be furnished in coil, in cut straight lengths, or in random straight lengths.
4.1.7.2 *Strip*—Whether to be furnished with commercial slit edge, square edge, or round edge.
4.1.7.3 *Plate*—Whether to be furnished specially flattened (7.7.2); also how plate is to be cut (see 7.2.1 and 7.3.2).
4.1.8 *Fabrication Details*—Not mandatory but helpful to the manufacturer.
4.1.8.1 *Welding or Brazing*—Process to be employed.
4.1.8.2 *Plate*—Whether material is to be hot-formed.
4.1.9 *Certification*—State if certification or a report of test results is required (see Section 15).
4.1.10 *Samples for Product (Check) Analysis*—Whether samples for product (check) analysis should be furnished (see 5.2).
4.1.11 *Purchaser Inspection*—If the purchaser wishes to witness the tests or inspection of material at the place of manufacture, the purchase order must so state indicating which tests or inspections are to be witnessed (see Section 13).

5. Chemical Composition

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

5.2 If a product (check) analysis is performed by the purchaser, the material shall conform to the product (check) analysis variations prescribed in Table 2.

6. Mechanical and Other Requirements

6.1 *Mechanical Properties*—The material shall conform to the requirements for mechanical properties prescribed in Table 3.
6.2 *Deep-Drawing and Spinning Quality Sheet and Strip*—The material shall conform to the requirements for grain size and hardness properties prescribed in Table 4.
6.2.1 The mechanical properties of Table 3 do not apply to deep-drawing and spinning quality sheet and strip.

7. Dimensions and Permissible Variations

7.1 *Thickness and Weight*:
7.1.1 *Plate*—For plate up to 2 in. (50.8 mm), inclusive, in thickness, the permissible variation under the specified thickness and permissible excess in overweight shall not exceed the amounts prescribed in Table 5.
7.1.1.1 For use with Table 5, plate shall be assumed to weigh 0.319 lb/in.^{3}(8.83 g/cm^3).
7.1.2 *Plate*—For plate over 2 in. (50.8 mm) in thickness, the permissible variations over the specified thickness shall not exceed the amounts prescribed in Table 6.
7.1.3 *Sheet and Strip*—The permissible variations in thickness of sheet and strip shall be as prescribed in Table 7. The thickness of strip and sheet shall be measured with the micrometer spindle ⅜in. (9.5 mm) or more from either edge

TABLE 3 Mechanical Properties for Plate, Sheet, and Strip (All Thicknesses and Sizes Unless Otherwise Indicated)

Condition (Temper)	Tensile Strength, min, psi (MPa)	Yield Strength[A] (0.2 % offset), min, psi (MPa)	Elongation in 2 in. or 50 mm, or 4*D*, min, %	Rockwell Hardness (B Scale)[B,C]
Hot-Rolled Plate				
Annealed	70 000 (485)	28 000 (195)	35	...
As-rolled[D,E]	75 000 (515)	40 000 (275)	25	...
Hot-Rolled Sheet				
Annealed	70 000 (485)	28 000 (195)	35	...
Cold-Rolled Sheet				
Annealed	70 000 to 85 000 (485 to 585)	28 000 (195)	35	...
Quarter-hard	...	...	...	73 to 83
Half-hard	...	...	...	82 to 90
Hard	100 000 (690)	90 000 (620)	2	...
Cold-Rolled Strip				
Annealed	70 000 to 85 000 (485 to 585)[F]	28 000 (195)	35[F]	...
Skin hard	...	...	...	68 to 73
Quarter-hard	...	...	...	73 to 83
Half-hard	...	...	...	82 to 90
Three-quarter-hard	...	...	...	89 to 94
Hard	100 000 (690)[F]	90 000 (620)	2[F]	...
Spring temper	...	...	...	98 min

[A] Yield strength requirements do not apply to material under 0.020 in. (0.51 mm) in thickness.
[B] For Rockwell or equivalent hardness conversions see Hardness Conversion Tables E140.
[C] Caution should be observed in using the Rockwell test on thin material, as the results may be affected by specimen thickness. For thicknesses under 0.050 in. (1.3 mm), the use of the Rockwell superficial or the Vickers hardness test is suggested.
[D] As-rolled plate may be given a stress-relieving heat treatment subsequent to final rolling.
[E] As-rolled plate specified "suitable for hot forming" shall be furnished from heats of known good hot-malleability characteristics (see X1.2.2). There are no applicable tensile or hardness requirements for such material.
[F] Not applicable for thickness under 0.010 in. (0.25 mm).

TABLE 4 Grain Size and Hardness for Cold-Rolled, Deep-Drawing, and Spinning Quality Sheet and Strip

Thickness, in. (mm)	Calculated Diameter of Average Grain Section, max		Corresponding ASTM Micro-Grain Size No.	Rockwell B[A,B] Hardness, max
	mm	in.		
Sheet (56 in. (1420 mm) Wide and Under)				
0.050 (1.3) and under	0.075	0.0030	4.5	76
Over 0.050 to 0.250 (1.3 to 6.4), incl	0.110	0.0043	3.5	76
Strip (12 in. (305 mm) Wide and Under)[C]				
0.005[D] to 0.015 (0.13 to 0.38), incl	0.022	0.0009	8[E]	76[E]
Over 0.015 to 0.024 (0.38 to 0.61), incl	0.060	0.0024	5.5	76
Over 0.024 to 0.125 (0.61 to 3.2), incl	0.075	0.0030	4.5	76

[A] For Rockwell or equivalent hardness conversions see Hardness Conversion Tables E140.
[B] Caution should be observed in using the Rockwell test on thin material as the results may be affected by specimen thickness. For thicknesses under 0.050 in. (1.3 mm), the use of the Rockwell superficial or the Vickers hardness test is suggested.
[C] Sheet requirements in Table 4 apply to strip thicknesses over 0.125 in. (3.2 mm), and for all thicknesses of strip over 12 in. (305 mm) in width.
[D] For ductility evaluations for strip under 0.005 in. (0.13 mm) in thickness, the spring-back test such as described in Test Method F 155 is often used and the manufacturer should be consulted.
[E] Accurate grain size and hardness determinations are difficult to make on strip under 0.005 in. (0.13 mm) in thickness and are not recommended.

TABLE 5 Permissible Variations in Thickness and Overweight of Rectangular Plates

NOTE 1—All plates shall be ordered to thickness and not to weight per square foot. No plates shall vary more than 0.01 in. (0.3 mm) under the thickness ordered, and the overweight of each lot[A] in each shipment shall not exceed the amount given in the table. Spot grinding is permitted to remove surface imperfections, such spots not to exceed 0.01 in. (0.3 mm) under the specified thickness.

Specified Thickness, in. (mm)	Permissible Excess in Average Weight,[B,C] per Square Foot of Plates for Widths Given in Inches (Millimetres) Expressed in Percentage of Nominal Weights									
	Under 48 (1220)	48 to 60 (1220 to 1520), excl	60 to 72 (1520 to 1830), excl	72 to 84 (1830 to 2130), excl	84 to 96 (2130 to 2440), excl	96 to 108 (2440 to 2740), excl	108 to 120 (2740 to 3050), excl	120 to 132 (3050 to 3350), excl	132 to 144 (3350 to 3660), excl	144 to 160 (3660 to 4070), incl
3/16 to 5/16 (4.8 to 7.9), excl	9.0	10.5	12.0	13.5	15.0	16.5	18.0	...	...	...
5/16 to 3/8 (7.9 to 9.5), excl	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	...	...
3/8 to 7/16 (9.5 to 11.1), excl	7.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5
7/16 to 1/2 (11.1 to 12.7), excl	6.0	7.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0
1/2 to 5/8 (12.7 to 15.9), excl	5.0	6.0	7.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5
5/8 to 3/4 (15.9 to 19.0), excl	4.5	5.5	6.0	7.0	7.5	9.0	10.5	12.0	13.5	15.0
3/4 to 1 (19.0 to 25.4), excl	4.0	4.5	5.5	6.0	7.0	7.5	9.0	10.5	12.0	13.5
1 to 2 (25.4 to 50.8), incl	4.0	4.0	4.5	5.5	6.0	7.0	7.5	9.0	10.5	12.0

[A] The term "lot" applied to this table means all of the plates of each group width and each group thickness.
[B] The permissible overweight for lots of circular and sketch plates shall be 25 % greater than the amounts given in this table.
[C] The weight of individual plates shall not exceed the nominal weight by more than 1¼ times the amount given in the table and Footnote *B*.

TABLE 6 Permissible Variations in Thickness for Rectangular Plates Over 2 in. (51.0 mm) in Thickness

NOTE 1—Permissible variation under specified thickness, 0.01 in. (0.3 mm).

Specified Thickness, in. (mm)	Permissible Variations, in. (mm), over Specified Thickness for Widths Given, in. (mm)					
	To 36 (915), excl	36 to 60 (915 to 1520), excl	60 to 84 (1520 to 2130), excl	84 to 120 (2130 to 3050), excl	120 to 132 (3050 to 3350), excl	132 (3350) and over
Over 2 to 3 (51.0 to 76.0), excl	1/16 (1.6)	3/32 (2.4)	7/64 (2.8)	1/8 (3.2)	1/8 (3.2)	9/64 (3.6)
3 to 4 (76.0 to 102.0), incl	5/64 (2.0)	3/32 (2.4)	7/64 (2.8)	1/8 (3.2)	1/8 (3.2)	9/64 (3.6)

for material 1 in. (25.4 mm) or over in width and at any place on the strip under 1 in. in width.

7.2 *Width or Diameter* :

7.2.1 *Plate*—The permissible variations in width of rectangular plates and diameter of circular plates shall be as prescribed in Table 8 and Table 9.

7.2.2 *Sheet and Strip*—The permissible variations in width for sheet and strip shall be as prescribed in Table 10.

7.3 *Length*:

7.3.1 Sheet and strip of all sizes may be ordered to cut lengths in which case, a variation of 1/8 in. (3.2 mm) over the specified length shall be permitted.

7.3.2 Permissible variations in length of rectangular plate shall be as prescribed in Table 11.

7.4 *Straightness*:

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

7.4.2 Straightness for coiled material is subject to agreement between the manufacturer and the purchaser.

7.5 *Edges*:

7.5.1 When finished edges of strip are specified in the contract or purchase order, the following descriptions shall apply:

7.5.1.1 Square-edge strip shall be supplied with finished edges, with sharp, square corners, and without bevel or rounding.

TABLE 7 Permissible Variations in Thickness of Sheet and Strip (Permissible Variations, Plus and Minus, in Thickness, in. (mm), for Widths Given, in. (mm)

Specified Thickness, in. (mm)	Sheet[A]			
	Hot-Rolled		Cold-Rolled	
	48 (1220) and Under	Over 48 to 60 (1220 to 1520), incl	48 (1220) and Under	Over 48 to 60 (1220 to 1520), incl
0.018 to 0.025 (0.5 to 0.6), incl	0.003 (0.08)	0.004 (0.10)	0.002 (0.05)	0.003 (0.08)
Over 0.025 to 0.034 (0.6 to 0.9), incl	0.004 (0.10)	0.005 (0.13)	0.003 (0.08)	0.004 (0.10)
Over 0.034 to 0.043 (0.9 to 1.1), incl	0.005 (0.13)	0.006 (0.15)	0.004 (0.10)	0.005 (0.13)
Over 0.043 to 0.056 (1.1 to 1.4), incl	0.005 (0.13)	0.006 (0.15)	0.004 (0.10)	0.005 (0.13)
Over 0.056 to 0.070 (1.4 to 1.8), incl	0.006 (0.15)	0.007 (0.18)	0.005 (0.13)	0.006 (0.15)
Over 0.070 to 0.078 (1.8 to 2.0), incl	0.007 (0.18)	0.008 (0.20)	0.006 (0.15)	0.007 (0.18)
Over 0.078 to 0.093 (2.0 to 2.4), incl	0.008 (0.20)	0.009 (0.23)	0.007 (0.18)	0.008 (0.20)
Over 0.093 to 0.109 (2.4 to 2.8), incl	0.009 (0.23)	0.010 (0.25)	0.007 (0.18)	0.009 (0.23)
Over 0.109 to 0.125 (2.8 to 3.2), incl	0.010 (0.25)	0.012 (0.31)	0.008 (0.20)	0.010 (0.25)
Over 0.125 to 0.140 (3.2 to 3.6), incl	0.012 (0.31)	0.014 (0.36)	0.008 (0.20)	0.010 (0.25)
Over 0.140 to 0.171 (3.6 to 4.3), incl	0.014 (0.36)	0.016 (0.41)	0.009 (0.23)	0.012 (0.31)
Over 0.171 to 0.187 (4.3 to 4.8), incl	0.015 (0.38)	0.017 (0.43)	0.010 (0.25)	0.013 (0.33)
Over 0.187 to 0.218 (4.8 to 5.5), incl	0.017 (0.43)	0.019 (0.48)	0.011 (0.28)	0.015 (0.38)
Over 0.218 to 0.234 (5.5 to 5.9), incl	0.018 (0.46)	0.020 (0.51)	0.012 (0.31)	0.016 (0.41)
Over 0.234 to 0.250 (5.9 to 6.4), incl	0.020 (0.51)	0.022 (0.56)	0.013 (0.33)	0.018 (0.46)

Cold-Rolled Strip[A,B]	
Specified Thickness, in. (mm)	Widths 12 in. (305 mm) and under, plus and minus
Up to 0.050 (1.3), incl	0.0015 (0.04)
Over 0.050 to 0.093 (1.3 to 2.4), incl	0.0025 (0.06)
Over 0.093 to 0.125 (2.4 to 3.2), incl	0.004 (0.10)

[A] Measured ⅜ in. (9.5 mm) or more from either edge except for strip under 1 in. (25.4 mm) in width which is measured at any place.
[B] Standard sheet tolerances apply for thicknesses over 0.125 in. (3.2 mm) and for all thicknesses of strip over 12 in. (305 mm) wide.

7.5.1.2 Round-edge strip shall be supplied with finished edges, semicircular in form, and the diameter of the circle forming the edge being equal to the strip thickness.

7.5.1.3 When no description of any required form of strip edge is given, it shall be understood that edges such as those resulting from slitting or shearing will be acceptable.

7.5.1.4 Sheet shall have sheared or slit edges.

7.5.1.5 Plate shall have sheared or cut (machined, abrasive-cut, powder-cut, or inert-arc-cut) edges, as specified.

7.6 *Squareness (Sheet)*—For sheets of all thicknesses, the angle between adjacent sides shall be 90± 0.15° (1/16 in. in 24 in.) (1.6 mm in 610 mm).

7.7 *Flatness*:

7.7.1 There shall be no flatness requirements for "deep drawing quality," "spinning quality," or "as-rolled," sheet and strip (see X1.4)

7.7.2 Standard flatness tolerances for plate shall conform to the requirements prescribed in Table 12. "Specially flattened" plate when so specified, shall have permissible variations in flatness as agreed upon between the manufacturer and the purchaser.

8. Workmanship, Finish, and Appearance

8.1 The material shall be uniform in quality and temper, smooth, commercially straight or flat, and free of injurious imperfections.

8.2 *Sheet, Strip, and Plate*—Sheet, strip, and plate supplied in the conditions and finishes as listed in the appendix may be ground or machined to remove surface imperfections, provided such removal does not reduce the material below the minimum specified dimensions. Surface eliminated depressions shall be faired smoothly into the surrounding material. The removal of a surface imperfection shall be verified by the method originally used to detect the imperfection.

9. Sampling

9.1 *Lot*—Definition:

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

9.1.2 A lot for mechanical properties, hardness, and grain size testing shall consist of all material from the same heat, nominal thickness, and condition.

9.1.2.1 Where material cannot be identified by heat, a lot shall consist of not more than 500 lb (227 kg) of material in the same thickness and condition, except for plates weighing over 500 lb, in which case only one specimen shall be taken.

9.2 *Test Material Selection*:

9.2.1 *Chemical Analysis*—Representative samples shall be taken during pouring or subsequent processing.

9.2.1.1 *Product (Check) Analysis* shall be wholly the responsibility of the purchaser.

9.2.2 *Mechanical Properties, Hardness, and Grain Size*—Samples of the material to provide test specimens for mechanical properties, hardness, and grain size shall be taken from such locations in each lot as to be representative of that lot. (Hardness and grain size required only on the products as specified in Table 3 and Table 4.)

10. Number of Tests

10.1 *Chemical Analysis*—One test per lot.

10.2 *Mechanical Properties*—One test per lot.

10.3 *Hardness*—One test per lot. (Required only as specified in Table 3 and Table 4.)

10.4 *Grain Size*—One test per lot. (Required only as specified in Table 4.)

TABLE 8 Permissible Variations in Width[A] of Sheared, Plasma-Torch-Cut, and Abrasive-Cut Rectangular Plate[B,C]

Specified Thickness	Permissible Variations in Widths for Widths Given, in. (mm)									
	Up to 30 (760), incl		Over 30 to 72 (760 to 1830), incl		Over 72 to 108 (1830 to 2740), incl		Over 108 to 144 (2740 to 3660), incl		Over 144 to 160 (3660 to 4070), incl	
	+	−	+	−	+	−	+	−	+	−
Inches										
Sheared:[D]										
3/16 to 5/16, excl	3/16	1/8	1/4	1/8	3/8	1/8	1/2	1/8	...	...
5/16 to 1/2, excl	1/4	1/8	3/8	1/8	3/8	1/8	1/2	1/8	5/8	1/8
1/2 to 3/4, excl	3/8	1/8	3/8	1/8	1/2	1/8	5/8	1/8	3/4	1/8
3/4 to 1, excl	1/2	1/8	1/2	1/8	5/8	1/8	3/4	1/8	7/8	1/8
1 to 1 1/4, incl	5/8	1/8	5/8	1/8	3/4	1/8	7/8	1/8	1	1/8
Abrasive-cut:[E,F]										
3/16 to 1 1/4, incl	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
Over 1 1/4 to 2 3/4, incl	3/16	1/8	3/16	1/8	3/16	1/8	3/16	1/8	3/16	1/8
Plasma-torch-cut:[G]										
3/16 to 2, excl	1/2	0	1/2	0	1/2	0	1/2	0	1/2	0
2 to 3, incl	5/8	0	5/8	0	5/8	0	5/8	0	5/8	0
Millimetres										
Sheared:[D]										
4.8 to 7.9, excl	4.8	3.2	6.4	3.2	9.5	3.2	12.7	3.2	...	...
7.9 to 12.7, excl	6.4	3.2	9.5	3.2	9.5	3.2	12.7	3.2	15.9	3.2
12.7 to 19.0, excl	9.5	3.2	9.5	3.2	12.7	3.2	15.9	3.2	19.0	3.2
19.0 to 25.4, excl	12.7	3.2	12.7	3.2	15.9	3.2	19.0	3.2	22.2	3.2
25.4 to 31.8, incl	15.9	3.2	15.9	3.2	19.0	3.2	22.2	3.2	25.4	3.2
Abrasive-cut:[E,F]										
4.8 to 31.8, incl	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Over 31.8 to 69.8, incl	4.8	3.2	4.8	3.2	4.8	3.2	4.8	3.2	4.8	3.2
Plasma-torch-cut:[G]										
4.8 to 50.8, excl	12.7	0	12.7	0	12.7	0	12.7	0	12.7	0
50.8 to 76.2, incl	15.9	0	15.9	0	15.9	0	15.9	0	15.9	0

[A] Permissible variations in width for powder-cut or inert-arc-cut plate shall be as agreed upon between the manufacturer and the purchaser.
[B] Permissible variations in machined, powder-cut, or inert-arc-cut circular plate shall be as agreed upon between the manufacturer and the purchaser.
[C] Permissible variations in plasma-torch-cut sketch plates shall be as agreed upon between the manufacturer and the purchaser.
[D] The minimum sheared width is 10 in. (254 mm) for material 3/4 in. (19.0 mm) and under in thickness and 20 in. (508 mm) for material over 3/4 in. (19.0 mm) in thickness.
[E] The minimum abrasive-cut width is 2 in. (50.8 mm) and increases to 4 in. (101.6 mm) for thicker plates.
[F] These tolerances are applicable to lengths of 240 in. (6100 mm), max. For lengths over 240 in (6100 mm), an additional 1/16 in. (1.6 mm) is permitted, both plus and minus.
[G] The tolerance spread shown for plasma-torch cutting may be obtained all on the minus side, or divided between the plus and minus side if so specified by the purchaser.

11. Specimen Preparation

11.1 Tension test specimens shall be taken from material in the final condition (temper) and tested transverse to the direction of rolling when width will permit.

11.2 Tension test specimens shall be any of the standard or subsize specimens shown in Test Methods E 8.

11.3 In the event of disagreement, referee specimens shall be as follows:

11.3.1 Full thickness of the material machined to the form and dimensions shown for the sheet-type specimen in Test Methods E 8 for material under 1/2 in. (12.7 mm) in thickness.

11.3.2 The largest possible round specimen shown in Test Methods E 8 for material 1/2 in. (12.7 mm) and over.

12. Test Methods

12.1 Determine the chemical composition, mechanical, and other properties of the material as enumerated in this specification, in case of disagreement, in accordance with the following methods:

Test	ASTM Designation
Chemical analysis	E 76
Tension	E 8
Brinell hardness	E 10
Rockwell hardness	E 18
Grain size	E 112
Rounding	E 29
Rounding procedure	E 29
Spring-back	F 155

12.2 The measurement of the average grain size may be carried out by the planimetric method, the comparison method, or the intercept method described in Test Methods E 112. In case of dispute, the "referee" method for determining the average grain size shall be the planimetric method.

12.3 For purposes of determining compliance with the specified limits for requirements of the properties listed in the following table, an observed value or a calculated value shall be rounded as indicated, in accordance with the rounding method of Practice E 29.

TABLE 9 Permissible Variations in Diameter for Circular Plates

Specified Diameter, in. (mm)	Permissible Variations Over Specified Diameter for Thickness Given, in. (mm)[A]
	To 3/8 (9.5), incl
Sheared Plate	
20 to 32 (508 to 813), excl	1/4 (6.4)
32 to 84 (813 to 2130), excl	5/16 (7.9)
84 to 108 (2130 to 2740), excl	3/8 (9.5)
108 to 140 (2740 to 3580), incl	7/16 (11.1)

Specified Diameter, in. (mm)	Thickness, max, in. (mm)	Permissible Variations in Specified Diameter for Thickness Given, in. (mm)[C]			
		3/16 to 2 (4.8 to 50.8), excl		2 to 3 (50.8 to 76.2), incl	
		+	–	+	–
Plasma-Torch-Cut Plate[B]					
19 to 20 (483 to 508), excl	3 (76.2)	1/2 (12.7)	0	5/8 (15.9)	0
20 to 22 (508 to 559), excl	2 3/4 (69.8)	1/2 (12.7)	0	5/8 (15.9)	0
22 to 24 (559 to 610), excl	2 1/2 (63.5)	1/2 (12.7)	0	5/8 (15.9)	0
24 to 28 (610 to 711), excl	2 1/4 (57.3)	1/2 (12.7)	0	5/8 (15.9)	0
28 to 32 (711 to 812), excl	2 (50.8)	1/2 (12.7)	0	5/8 (15.9)	0
32 to 34 (812 to 864), excl	1 3/4 (44.5)	1/2 (12.7)	0	...	...
34 to 38 (864 to 965), excl	1 1/2 (38.1)	1/2 (12.7)	0	...	...
38 to 40 (965 to 1020), excl	1 1/4 (31.8)	1/2 (12.7)	0	...	...
40 to 140 (1020 to 3560), incl	3 (76.2)	1/2 (12.7)	0	5/8 (15.9)	0

[A] No permissible variations under.
[B] Permissible variations in plasma-torch-cut sketch plates shall be as agreed upon between the manufacturer and the purchaser.
[C] The tolerance spread shown may also be obtained all on the minus side or divided between the plus and minus sides if so specified by the purchaser.

TABLE 10 Permissible Variations in Width of Sheet and Strip

Specified Thickness, in. (mm)	Specified Width, in. (mm)	Permissible Variations in Specified Width, in. (mm)	
		+	–
Sheet			
Up to 0.250 (6.4)	all	0.125 (3.2)	0
Strip[A]			
Under 0.075 (1.9)	up to 12 (305), incl	0.007 (0.18)	0.007 (0.18)
	over 12 to 48 (305 to 1219), incl	0.062 (1.6)	0
0.075 to 0.100 (1.9 to 2.5), incl	up to 12 (305), incl	0.009 (0.23)	0.009 (0.23)
	over 12 to 48 (305 to 1219), incl	0.062 (1.6)	0
Over 0.100 to 0.125 (2.5 to 3.2), incl	up to 12 (305), incl	0.012 (0.30)	0.012 (0.30)
	over 12 to 48 (305 to 1219), incl	0.062 (1.6)	0
Over 0.125 to 0.160 (3.2 to 4.1), incl	up to 12 (305), incl	0.016 (0.41)	0.016 (0.41)
	over 12 to 48 (305 to 1219), incl	0.062 (1.6)	0
Over 0.160 to 0.187 (4.1 to 4.7), incl	up to 12 (305), incl	0.020 (0.51)	0.020 (0.51)
	over 12 to 48 (305 to 1219), incl	0.062 (1.6)	0
Over 0.187 to 0.250 (4.7 to 6.4), incl	up to 12 (305), incl	0.062 (1.6)	0.062 (1.6)
	over 12 to 48 (305 to 1219), incl	0.062 (1.6)	0.062 (1.6)

[A] Rolled-round or square-edge strip in thicknesses of 0.071 to 0.125 in. (1.8 to 3.2 mm), inclusive, in widths 3 in. (76.2 mm) and under, shall have permissible width variations of ±0.005 in. (±0.130 mm). Permissible variations for other sizes shall be as agreed upon between the manufacturer and the purchaser.