Designation: B 688 – 96 (Reapproved 2004)

Standard Specification for Chromium-Nickel-Molybdenum-Iron (UNS N08366 and UNS N08367) Plate, Sheet, and Strip[1]

This standard is issued under the fixed designation B 688; 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 covers chromium-nickel-molybdenum-iron UNS N08366 and UNS N08367* plate, sheet, and strip for use in corrosive service and heat-resisting applications.

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

1.3 *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 become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet for this product/material as provided by the manufacturer, to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

E 8 Test Methods for Tension Testing of Metallic Materials

E 10 Test Method for Brinell Hardness of Metallic Materials

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

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

E 38 Methods for Chemical Analysis of Nickel-Chromium and Nickel-Chromium-Iron Alloys[3]

E 140 Hardness Conversion Tables for Metals

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

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *sheet, n*—material under 3⁄16 in. (5 mm) in thickness and 24 in. (610 mm) and over in width.

3.1.2 *strip, n*—material under 3⁄16 in. (5 mm) in thickness and under 24 in. (610 mm) in width.

3.1.3 *plate, n*—material 3⁄16 in. (5 mm) and over in thickness and over 10 in. (254 mm) in width.

4. Ordering Information

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

4.1.1 Quantity (feet, metres, or number of pieces),

4.1.2 Alloy name or UNS number,

4.1.3 Finish (hot-rolled or cold-rolled),

4.1.4 Dimensions (thickness, width, and length if cut-length),

4.1.5 Certification, if required,

4.1.6 Purchaser's inspection, if required,

4.1.7 ASTM designation and year of issue, and

4.1.8 Samples for product analysis, if required.

5. Chemical Composition

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

5.2 If a product (check) analysis is made by the purchaser, the material shall conform to the permissible variations for product (check) analysis in Table 1.

6. Mechanical Properties and Other Requirements

6.1 The material shall conform to the mechanical property requirements specified in Table 2.

7. Dimensions and Permissible Variations

7.1 *Sheet*—Material shall conform to the variations specified in Tables 3-9, inclusive. There will be no flatness requirements for non-stretcher leveled sheet.

7.2 *Strip*—Material shall conform to the variations specified in Tables 10-13, inclusive. Note that strip of all sizes may be ordered to cut lengths in which case a variation of ½ in. (13

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

[2] 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.

[3] Withdrawn.

TABLE 1 Chemical Requirements

Element	Composition Limits, %		Product (Check) Analysis Variations, under min or over max, of the Specified Limit of Element, %
	N08366	N08367	
Carbon	0.035 max	0.030 max	0.005
Manganese	2.00 max	2.00 max	0.04
Silicon	1.00 max	1.00 max	0.05
Phosphorus	0.040 max	0.040 max	0.005
Sulfur	0.030 max	0.030 max	0.005
Chromium	20.00 to 22.00	20.00 to 22.00	0.25
Nickel	23.50 to 25.50	23.50 to 25.50	0.20
Molybdenum	6.00 to 7.00	6.00 to 7.00	0.15
Nitrogen	...	0.18 to 0.25	0.01
Iron[A]	remainder	remainder	...
Copper	...	0.75 max	0.04

[A]Iron shall be determined arithmetically by difference.

TABLE 2 Mechanical Properties for Plate, Sheet, and Strip

	N08366	N08367
Yield strength, 0.2 % offset, min, ksi (MPa)	35 (240)	45 (310)
Tensile strength, min, ksi (MPa)		
≤3⁄16 in. (4.8 mm) thick	75 (515)	100 (690)
>3⁄16	75 (515)	95 (655)
Elongation in 2 in. or 50 mm or 4*D*, min, %	30[A]	30[A]
Hardness,[B] max		
≤3⁄16 in. (4.8 mm) thick	95 HRB	100 HRB
>3⁄16	212 HBN	240 HBN

[A]Not applicable for thickness under 0.015 in. (0.40 mm).
[B]Hardness values (Brinell, Rockwell, or equivalent) are informative only and are not to be construed as the basis for acceptance or rejection.

TABLE 3 Permissible Variations in Thickness for Hot-Rolled Sheets in Cut Lengths, Cold-Rolled Sheets in Cut Lengths and Coils

Specified Thickness,[A] in. (mm)	Permissible Variations, Plus and Minus	
	in.	mm
Over 0.145 (3.68) to less than 3⁄16 (4.76)	0.014	0.36
Over 0.130 (3.30) to 0.145 (3.68), incl	0.012	0.30
Over 0.114 (2.90) to 0.130 (3.30), incl	0.010	0.25
Over 0.098 (2.49) to 0.114 (2.90), incl	0.009	0.23
Over 0.083 (2.11) to 0.098 (2.49), incl	0.008	0.20
Over 0.072 (1.83) to 0.083 (2.11), incl	0.007	0.18
Over 0.058 (1.47) to 0.072 (1.83), incl	0.006	0.15
Over 0.040 (1.02) to 0.058 (1.47), incl	0.005	0.13
Over 0.026 (0.66) to 0.040 (1.02), incl	0.004	0.10
Over 0.016 (0.41) to 0.026 (0.66), incl	0.003	0.08
Over 0.007 (0.18) to 0.016 (0.41), incl	0.002	0.05
Over 0.005 (0.13) to 0.007 (0.18), incl	0.0015	0.04
0.005 (0.13)	0.001	0.03

[A]Thickness measurements are taken at least 3⁄8 in. (9.52 mm) from the edge of the sheet.

mm) over the specified length shall be permitted. There shall be no flatness requirements for non-stretcher leveled strip.

7.3 *Plate*—Material shall conform to the variations specified in Tables 14-20, inclusive. Specially flattened plate, when so specified, shall have permissible variations in flatness as agreed upon between the manufacturer and purchaser.

TABLE 4 Permissible Variations in Width and Length for Hot-Rolled and Cold-Rolled Resquared Sheets (Stretcher Leveled Standard of Flatness)

Specified Dimensions, in. (mm)	Tolerances		
	Plus		Minus
	in.	mm	
For thickness under 0.131 (3.33):			
Widths up to 48 (1219) excl	1⁄16	2	0
Widths 48 (1219) and over	1⁄8	3	0
Lengths up to 120 (3048) excl	1⁄16	2	0
Lengths 120 (3048) and over	1⁄8	3	0
For thicknesses 0.131 (3.33) and over:			
All widths and lengths	1⁄4	6	0

TABLE 5 Permissible Variations in Width for Hot-Rolled and Cold-Rolled Sheets not Resquared and Cold-Rolled Coils

Specified Thickness, in. (mm)	Tolerances for Specified Width, in. (mm)	
	24 (610) to 48 (1219), excl	48 (1219) and Over
Less than 3⁄16 (4.76)	1⁄16 (2) plus 0 minus	1⁄8 (3) plus 0 minus

TABLE 6 Permissible Variations in Camber for Hot-Rolled and Cold-Rolled Sheets Not Required and Cold-Rolled Coils[A]

Specified Width, in. (mm)	Tolerance per Unit Length of Any 8 ft (2438 mm), in. (mm)
24 (610) to 36 (914), incl	1⁄8 (3)
Over 36 (914)	1⁄16 (2)

[A]Camber is the greatest deviation of a side edge from a straight line and measurement is taken by placing an 8-ft (2438-mm) straightedge on the concave side and measuring the greatest distance between the sheet edge and the straightedge.

TABLE 7 Permissible Variations in Length for Hot-Rolled and Cold-Rolled Sheets Not Resquared

Length, ft (mm)	Tolerances, in. (mm)
Up to 10 (3048), incl	1⁄4 (6) plus 0 minus
Over 10 (3048) to 20 (6096), incl	1⁄2 (13) plus 0 minus

8. Workmanship, Finish, and Appearance

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

9. Sampling

9.1 *Lot for Chemical Analysis and Mechanical Testing*:

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

9.1.2 Lots for mechanical testing shall consist of the material from one heat, in the same condition, and of the same nominal thickness.

9.2 *Test Material Selection*:

9.2.1 *Chemical Analysis*:

TABLE 8 Permissible Variations in Flatness for Hot-Rolled and Cold-Rolled Sheets Specified to Stretcher-Leveled Standard of Flatness

Specified Thickness, in. (mm)	Width, in. (mm)	Length, in. (mm)	Flatness Tolerance,[A] in. (mm)
Under 3/16 (4.76)	to 48 (1219), incl	to 96 (2438), incl	1/8 (3)
Under 3/16 (4.76)	to 48 (1219), incl	over 96 (2438)	1/4 (6)
Under 3/16 (4.76)	over 48 (1219)	to 96 (2438), incl	1/4 (6)
Under 3/16 (4.76)	over 48 (1219)	over 96 (2438)	1/4 (6)

TABLE 9 Permissible Variations in Diameter for Hot-Rolled and Cold-Rolled Sheets, Sheared Circles

Specified Thickness, in. (mm)	Tolerance Over Specified Diameter (No Tolerance Under), in. (mm)		
	Diameters Under 30 in. (762)	Diameters 30 (762) to 48 in. (1219)	Diameters Over 48 in. (1219)
0.0972 (2.46) and thicker	1/8 (3)	3/16 (5)	1/4 (6)
0.0971 (2.46) to 0.0568 (1.45), incl	3/32 (2)	5/32 (4)	7/32 (6)
0.0567 (1.45) and thinner	1/16 (2)	1/8 (3)	3/16 (5)

TABLE 10 Permissible Variations in Thickness for Cold-Rolled Strip in Coils and Cut Lengths

NOTE 1— Thickness measurements are taken at least 3/8 in. (9.52 mm) in from the edge of the strip, except that on widths less than 1 in. (25.4 mm), the tolerances are applicable for measurements at all locations. The tolerances in this table include crown tolerances.

Specified Thickness, in. (mm)	Thickness Tolerances, for the Thickness and Widths Given, Plus and Minus, in. (mm)		
	Width, in. (mm)		
	3/16 (4.76) to 6 (152), incl	Over 6 (152) to 12 (305), incl	Over 12 (305) to 24 (610), excl
	Thickness Tolerances[A]		
0.005 (0.13) to 0.010 (0.25), incl	10 %	10 %	10 %
Over 0.010 (0.25) to 0.011 (0.28), incl	0.0015 (0.04)	0.0015 (0.04)	0.0015 (0.04)
Over 0.011 (0.28) to 0.013 (0.33), incl	0.0015 (0.04)	0.0015 (0.04)	0.002 (0.05)
Over 0.013 (0.33) to 0.017 (0.43), incl	0.0015 (0.04)	0.002 (0.05)	0.002 (0.05)
Over 0.017 (0.43) to 0.020 (0.51), incl	0.0015 (0.04)	0.002 (0.05)	0.0025 (0.06)
Over 0.020 (0.51) to 0.029 (0.74), incl	0.002 (0.05)	0.0025 (0.06)	0.0025 (0.06)
Over 0.029 (0.74) to 0.035 (0.89), incl	0.002 (0.05)	0.003 (0.08)	0.003 (0.08)
Over 0.035 (0.89) to 0.050 (1.27), incl	0.0025 (0.06)	0.0035 (0.09)	0.0035 (0.09)
Over 0.050 (1.27) to 0.069 (1.75), incl	0.003 (0.08)	0.0035 (0.09)	0.0035 (0.09)
Over 0.069 (1.75) to 0.100 (2.54), incl	0.003 (0.08)	0.004 (0.10)	0.005 (0.13)
Over 0.100 (2.54) to 0.125 (2.98), incl	0.004 (0.10)	0.0045 (0.11)	0.005 (0.13)
Over 0.125 (2.98) to 0.161 (4.09), incl	0.0045 (0.11)	0.0045 (0.11)	0.005 (0.13)
Over 0.161 (4.09) to under 3/16 (4.76)	0.005 (0.13)	0.005 (0.13)	0.006 (0.15)

[A] Thickness tolerances given in in. (mm) unless otherwise indicated.

TABLE 11 Permissible Variations in Width for Cold-Rolled Strip in Coils and Cut Lengths for Edge Nos. 1 and 5

Specified Edge No.	Width, in. (mm)	Thickness, in. (mm)	Width Tolerance for Thickness and Width Given, in. (mm)	
			Plus	Minus
1 and 5	3/32 (7.14) and under	1/16 (1.59) and under	0.005 (0.13)	0.005 (0.13)
1 and 5	over 3/32 (7.14) to 3/4 (19.05), incl	3/32 (2.38) and under	0.005 (0.13)	0.005 (0.13)
1 and 5	over 3/4 (19.05) to 5 (127), incl	1/8 (3.18) and under	0.005 (0.13)	0.005 (0.13)
5	over 5 (127.00) to 9 (228.60), incl	1/8 (3.18) to 0.008 (0.20), incl	0.010 (0.25)	0.010 (0.25)
5	over 9 (228.60) to 20 (508.00), incl	0.105 (2.67) to 0.015 (0.38)	0.010 (0.25)	0.010 (0.25)
5	over 20 (508.00)	0.080 (2.03) to 0.023 (0.58)	0.015 (0.38)	0.015 (0.38)

9.2.1.1 An analysis of each lot shall be made by the manufacturer from a representative sample obtained during the pouring of the heat or subsequent processing.

9.2.1.2 If samples for product (check) analysis are specified, a representative sample shall be taken from each lot (see 9.1.1) of finished material.

9.2.2 *Sampling for Mechanical Properties*—Samples of the material to provide test specimens for mechanical testing shall be taken from such locations in each lot (see 9.1.2) as to be representative of that lot.

10. Number of Tests

10.1 *Chemical Analysis*—One test per lot.

10.2 *Mechanical Tests*—One test per lot.

10.3 *Retests*—If the specimen used in the mechanical test of any lot fails to meet the specified requirements, two additional

TABLE 12 Permissible Variations in Width for Cold-Rolled Strip in Coils and Cut Lengths for Edge No. 3

Specified Thickness, in. (mm)	Width Tolerance, Plus and Minus for Thickness and Width Given, in. (mm)					
	Under ½ (12.70) to 3/16 (4.76), incl	½ (12.70) to 6 (152.40), incl	Over 6 (152.40) to 9 (228.60), incl	Over 9 (228.60) to 12 (304.80), incl	Over 12 (304.80) to 20 (508.00), incl	Over 20 (508.00) to 24 (609.60), incl
Under 3/16 (4.76) to 0.161 (4.09), incl	...	0.016 (0.41)	0.020 (0.51)	0.020 (0.51)	0.031 (0.79)	0.031 (0.79)
0.160 (4.06) to 0.100 (2.54), incl	0.010 (0.25)	0.010 (0.25)	0.016 (0.41)	0.016 (0.41)	0.020 (0.51)	0.020 (0.51)
0.099 (2.51) to 0.069 (1.75), incl	0.008 (0.20)	0.008 (0.20)	0.010 (0.25)	0.010 (0.25)	0.016 (0.41)	0.020 (0.51)
0.068 (1.73) and under	0.005 (0.13)	0.005 (0.13)	0.005 (0.13)	0.010 (0.25)	0.016 (0.41)	0.020 (0.51)

TABLE 13 Permissible Variations in Camber for Cold-Rolled Strip in Coils and Cut Lengths[A]

Specified Width, in. (mm)	Tolerance per Unit Length of Any 8 ft (2438 mm), in. (mm)
To 1½ (38.10), incl	½ (13)
Over 1½ (38.10) to 24 (609.60), excl	¼ (6)

[A]Camber is the deviation of a side edge from a straight line and measurement is taken by placing an 8-ft (2438-mm) straightedge on the concave side and measuring the greatest distance between the strip edge and the straightedge.

specimens shall be taken from different sample pieces and tested. The results of the tests on both of these specimens shall meet the specified requirements.

11. Specimen Preparation

11.1 Tension test specimens shall be taken from material in the final condition and tested transverse to the direction of rolling when width permits.

11.2 Tension test specimens shall be any of the standard or sub-size specimens shown in Test Methods E 8. The largest possible size specimen of Test Methods E 8 shall be used.

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 ½ in. (13 mm) in thickness.

11.3.2 The largest possible round specimen shown in Test Methods E 8 for material ½ in. (13 mm) and over in thickness.

12. Test Methods

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

12.1.1 *Chemical Analysis*—Methods E 38 and Test Methods E 354.

12.1.1.1 Methods E 38 shall be used only for elements not covered by Test Methods E 354.

12.2 *Tension Test*—Test Methods E 8.

12.3 *Hardness Test*—Test Method E 10 or Test Methods E 18, as applicable.

12.4 *Hardness Conversion*—Hardness Conversion Tables E 140.

12.5 *Determination of Significant Places*—For purposes of determining compliance with the specified limits for the requirements of the properties listed in the following table, round an observed or a calculated value as indicated, in accordance with the rounding methods of Practice E 29.

Requirements	rounded unit for observed or calculated value
Chemical composition	nearest unit in the last right-hand place of figures of the specified limit
Tensile strength and yield strength	nearest 1000 psi (7 MPa)
Elongation	nearest 1 %
Brinell hardness	tabular value[A]
Rockwell hardness	1 Rockwell number

[A]Round the mean diameter of the Brinell impression to the nearest 0.05 mm and report the corresponding hardness number read from the table without further rounding.

13. Inspection

13.1 Inspection of the material shall be agreed upon between the purchaser and the supplier as part of the purchase contract.

14. Rejection and Rehearing

14.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

15. Certification

15.1 Upon request of the purchaser in the contract or purchase order, a manufacturer's certification that the material was manufactured and tested in accordance with this specification together with a report of the test results shall be furnished at the time of the shipment.

16. Product Marking

16.1 Each bundle or shipping container shall be marked with the name of the material, heat number, condition (temper), the specification number, the size, gross, tare and net weights, consignor and consignee address, contract or order number, or such other information as may be defined in the contract or purchase order.

16.2 When agreed upon between purchaser and manufacturer, material shall be marked individually with the name of

TABLE 14 Permissible Variations in Thickness for Plates[A,B]

Specified Thickness, in. (mm)	Width, in. (mm)			
	To 84 (2134), incl	Over 84 (2134) to 120 (3048), incl	Over 120 (3048) to 144 (3658), incl	Over 144 (3658)
	Tolerance Over Specified Thickness,[C] in. (mm)			
3/16 (4.76) to 3/8 (9.52), excl	0.045 (1.14)	0.050 (1.27)	...	...
3/8 (9.52) to 3/4 (19.05), excl	0.055 (1.40)	0.060 (1.52)	0.075 (1.90)	0.090 (2.29)
3/4 (19.05) to 1 (25.40), excl	0.060 (1.52)	0.065 (1.65)	0.085 (2.16)	0.100 (2.54)

[A] The tolerance under specified thickness is 0.01 in. (0.25 mm).
[B] Thickness is measured along the longitudinal edges of the plate at least 3/8 in. (9.52 mm), but not more than 3 in. (76.20 mm), from the edge.
[C] For circles, the over thickness tolerances in this table apply to the diameter of the circle corresponding to the width ranges shown. For plates of irregular shape, the over thickness tolerances apply to the greatest width corresponding to the width ranges shown.

TABLE 15 Permissible Variations in Width and Length for Rectangular Sheared Mill Plates and Universal Mill Plates

Width, in. (mm)	Length, in. (mm)	Tolerances Over Specified Width and Length for Given Width, Length, and Thickness,[A] in. (mm)					
		Under 3/8 in. (9.52 mm) in Thickness		3/8 (9.52) to 1/2 (12.70 mm) in., incl, in Thickness		Over 1/2 (12.70 mm) to 1 in. (25.40 mm) in Thickness	
		Width	Length	Width	Length	Width	Length
48 (1219) and under	144 (3658) and under	1/8 (3)	3/16 (5)	3/16 (5)	1/4 (6)	5/16 (8)	3/8 (10)
Over 48 (1219) to 60 (1524), incl		3/16 (5)	1/4 (6)	1/4 (6)	5/16 (8)	3/8 (10)	7/16 (11)
Over 60 (1524) to 84 (2134), incl		1/4 (6)	5/16 (8)	5/16 (8)	3/8 (10)	7/16 (11)	1/2 (13)
Over 84 (2134) to 108 (2743), incl		5/16 (8)	3/8 (10)	3/8 (10)	7/16 (11)	1/2 (13)	9/16 (14)
Over 108 (2743)		3/8 (10)	7/16 (11)	7/16 (11)	1/2 (13)	5/8 (16)	11/16 (17)
48 (1219) and under	over 144 (3658) to 240 (6096)	3/16 (5)	3/8 (10)	1/4 (6)	1/2 (13)	5/16 (8)	5/8 (16)
Over 48 (1219) to 60 (1524), incl		1/4 (6)	7/16 (11)	5/16 (8)	5/8 (16)	3/8 (10)	3/4 (19)
Over 60 (1524) to 84 (2134), incl		3/8 (10)	1/2 (13)	7/16 (11)	11/16 (17)	1/2 (13)	3/4 (19)
Over 84 (2134) to 108 (2743), incl		7/16 (11)	9/16 (14)	1/2 (13)	3/4 (19)	5/8 (16)	7/8 (22)
Over 108 (2743)		1/2 (13)	5/8 (16)	5/8 (16)	7/8 (22)	11/16 (17)	1 (25)
48 (1219) and under	over 240 (6096) to 360 (9144)	1/4 (6)	1/2 (13)	5/16 (8)	5/8 (16)	3/8 (10)	3/4 (19)
Over 48 (1219) to 60 (1524), incl		5/16 (8)	5/8 (16)	3/8 (10)	3/4 (19)	1/2 (13)	3/4 (19)
Over 60 (1524) to 84 (2134), incl		7/16 (11)	11/16 (17)	1/2 (13)	3/4 (19)	5/8 (16)	7/8 (22)
Over 84 (2134) to 108 (2743), incl		9/16 (14)	3/4 (19)	5/8 (16)	7/8 (22)	3/4 (19)	1 (25)
Over 108 (2743)		5/8 (16)	7/8 (22)	11/16 (17)	1 (25)	7/8 (22)	1 (25)
60 (1524) and under	over 360 (9144) to 480 (12192)	7/16 (11)	1 1/8 (29)	1/2 (13)	1 1/4 (32)	5/8 (16)	1 3/8 (35)
Over 60 (1524) to 84 (2134), incl		1/2 (13)	1 1/4 (32)	5/8 (16)	1 3/8 (35)	3/4 (19)	1 1/2 (38)
Over 84 (2134) to 108 (2743), incl		9/16 (14)	1 1/4 (32)	3/4 (19)	1 3/8 (35)	7/8 (22)	1 1/2 (38)
Over 108 (2743)		3/4 (19)	1 3/8 (35)	7/8 (22)	1 1/2 (38)	1 (25)	1 5/8 (41)
60 (1524) and under	over 480 (12192) to 600 (15240)	7/16 (11)	1 1/4 (32)	1/2 (13)	1 1/2 (38)	5/8 (16)	1 5/8 (41)
Over 60 (1524) to 84 (2134), incl		1/2 (13)	1 3/8 (35)	5/8 (16)	1 1/2 (38)	3/4 (19)	1 5/8 (41)
Over 84 (2134) to 108 (2743), incl		5/8 (16)	1 3/8 (35)	3/4 (19)	1 1/2 (38)	7/8 (22)	1 5/8 (41)
Over 108 (2743)		3/4 (19)	1 1/2 (38)	7/8 (22)	1 5/8 (41)	1 (25)	1 3/4 (44)
60 (1524) and under	over 600 (15240)	1/2 (13)	1 3/4 (44)	5/8 (16)	1 7/8 (48)	3/4 (19)	1 7/8 (48)
Over 60 (1524) to 84 (2134), incl		5/8 (16)	1 3/4 (44)	3/4 (19)	1 7/8 (48)	7/8 (22)	1 7/8 (48)
Over 84 (2134) to 108 (2743), incl		5/8 (16)	1 3/4 (44)	3/4 (19)	1 7/8 (48)	7/8 (22)	1 7/8 (48)
Over 108 (2743)		7/8 (22)	1 3/4 (44)	1 (25)	2 (51)	1 1/8 (29)	2 1/4 (57)

[A] The tolerance under specified width and length is 1/4 in. (6.35 mm).

TABLE 16 Permissible Variations in Annealed Plates

NOTE 1—Tolerances in this table apply to plates up to 15 ft (4572 mm) in length, or to any 15 ft (4572 mm) of longer plates.
NOTE 2—If the longer dimension is under 36 in. (914 mm), the thickness tolerance is not greater than 1/4 in. (6.35 mm).

Specified Thickness, in. (mm)	Flatness Tolerance (Deviation from a Horizontal Flat Surface) for Thicknesses and Widths Given, in. (mm)								
	Width, in. (mm)								
	48 (1219) or Under	Over 48 (1219) to 60 (1524), excl	60 (1524) to 72 (1829), excl	72 (1829) to 84 (2134), excl	84 (2134) to 96 (2438), excl	96 (2438) to 108 (2743), excl	108 (2743) to 120 (3048), excl	120 (3048) to 144 (3658), excl	144 (3658) and Over
3/16 (4.76) to 1/4 (6.35), excl	3/4 (19)	1 1/16 (27)	1 1/4 (32)	1 3/8 (35)	1 5/8 (41)	1 5/8 (41)	1 7/8 (48)	2 (51)	...
1/4 (6.35) to 3/8 (9.52), excl	11/16 (17)	3/4 (19)	15/16 (24)	1 1/8 (29)	1 3/8 (35)	1 7/16 (37)	1 9/16 (40)	1 7/8 (48)	...
3/8 (9.52) to 1/2 (12.70), excl	1/2 (13)	9/16 (14)	11/16 (17)	3/4 (19)	15/16 (24)	1 1/8 (29)	1 1/4 (32)	1 7/16 (37)	1 3/4 (44)
1/2 (12.70) to 3/4 (19.05), excl	1/2 (13)	9/16 (14)	5/8 (16)	5/8 (16)	13/16 (21)	1 1/8 (29)	1 1/8 (29)	1 1/8 (29)	1 3/8 (35)
3/4 (19.05) to 1 (25.40), excl	1/2 (13)	9/16 (14)	5/8 (16)	5/8 (16)	3/4 (19)	13/16 (21)	15/16 (24)	1 (25)	1 1/8 (29)

the material, heat number, condition (temper), the specification number, size, and producer's name or mark.

17. Keywords

17.1 plate; sheet; strip; UNS N08367

TABLE 17 Permissible Variations in Camber for Sheared Mill and Universal Mill Plates[A]

Maximum camber	−⅛ in. in any 5 ft −3 mm in any 1.524 m

[A]Camber is the deviation of a side edge from a straight line, and measurement is taken by placing a 5-ft straightedge on the concave side and measuring the greatest distance between the plate and the straightedge.

TABLE 18 Permissible Variations in Diameter for Circular Plates

Specified Diameter, in. (mm)	Tolerance Over Specified Diameter for Given Diameter and Thickness,[A] in. (mm)		
	To ⅜ (9.52) in., excl, in Thickness	⅜ (9.52) to ⅝ (15.88) in., excl, in Thickness	⅝ in. (15.88) to 1 (25.4) in Thickness[B]
To 60 (1524), excl	¼ (6)	⅜ (10)	½ (13)
60 (1524 mm) to 84 (2134 mm), excl	5⁄16 (8)	7⁄16 (11)	9⁄16 (14)
84 (2134 mm) to 108 (2743 mm), excl	⅜ (10)	½ (13)	⅝ (16)
108 (2743 mm) to 180 (4572 mm), excl	7⁄16 (11)	9⁄16 (14)	11⁄16 (17)

[A]No tolerance under.
[B]Circular and sketch plates over ⅝ in. (15.88 mm) in thickness are not commonly sheared but are machined or flame cut.

TABLE 19 Recommended Flame Cutting Allowances to Clean Up in Machining Plates, Circles, Rings, and Sketches[A]

Specified Thickness, in. (mm)	Machining Allowance per Edge, in. (mm)
1 (25.4) and under	¼ (6)

[A]Supplier assumes the appropriate clean-up allowances have been included in ordered dimension.

TABLE 20 Permissible Variations in Abrasive Cutting Width and Length for Plates

Specified Thickness, in. (mm)	Tolerance Over Specified Width and Length[A]	
	Width	Length
Up to 1 (25.4), incl	⅛ (3)	⅛ (3)

[A]The tolerance under specified width and length is ⅛ in. (3.18 mm).