

American National Standard Dimensional Tolerances for Aluminum Mill Products

American National Standard

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American National Standard Dimensional Tolerances for Aluminum Mill Products

Secretariat

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American National Standards Institute

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Foreword

This Standard is a revision of “American National Standard Dimensional Tolerances for Aluminum Mill Products” issued in 2017 (ANSI H35.2-2017).

The tolerances included in this Standard were developed by the Technical Committee of The Aluminum Association. They are broadly accepted both within the aluminum industry itself and by users of the metal. They are the basis of the dimensional tolerances specified in U.S. government, technical society, and other specifications for aluminum products. They represent the maximum deviation from specified dimensions that may be expected in any individual piece. For most pieces the deviation from specified dimensions will be less than the tolerance shown.

Work on the tolerances began in the Aluminum Association in 1949, five years before its Technical Committee was established. In that year a special committee was appointed by the Association’s Extruded Products Division to develop drafting standards for these products. One of the committee’s assignments was to develop standard tolerances for aluminum extrusions. The committee completed its work later in 1949, and the Association issued the first edition of its *Drafting Standards for Extruded and Tubular Products*, including the tolerances, in October of that year.

By 1954, the Association’s technical activities had grown to the point that a standing Technical Committee was needed. One of the first jobs undertaken by this committee was the compilation of mechanical property data for commonly used aluminum alloys and dimensional tolerances for other aluminum mill products. This work was completed later in 1954, and the resulting data were published in the first edition of the Association’s “Standards for Aluminum Mill Products” in June 1955. Successive editions of the “Standards for Aluminum Mill Products” have been revised to include new data and to keep the manual abreast of industry advances. In 1968 the title was changed to “Aluminum Standards and Data” to reflect the adoption of a revised format.

Many refinements have been made in the tolerances as experience was gained in their use. In addition, tolerances have been developed for products not covered initially, and the data have been extended to embrace the larger sizes now being produced. All of these additions and refinements have been incorporated into this Standard. Included also are definitions of the various products as given in “Aluminum Standards and Data” published by the Aluminum Association, and standard limits for expressing the tolerances.

This Standard was originally developed and subsequently revised using the “canvass” method and published under the proprietary sponsorship of the Aluminum Association. At the request of the Aluminum Association, the establishment of Standards Committee H35 on Aluminum and Aluminum Alloys was authorized by the American National Standards Institute on 17 February 1970, with the Association serving as Secretariat.

The 1971 revision of ANSI H35.2 was the first revision developed by Standards Committee H35, under the “Standards Committee” procedures, and the 1972, 1975, 1978, and 1982 revisions were developed under the auspices of that Committee.

Standards Committee H35 was transferred to an Accredited Standards Committee on December 28, 1983, and this revision was developed under the Accredited Standards Committee method.

This latest (2023) revision consists of numerous updates to the previous (2017) edition which are highlighted throughout the document.

Dimensional Tolerances for Aluminum Mill Products

1. Definitions

Bar—A solid wrought product that is long in relation to its cross section which is square or rectangular (excluding plate and flattened wire) with sharp or rounded corners or edges, or is a regular hexagon or octagon, that is typically supplied in straight lengths and in which at least one perpendicular distance between parallel faces is 0.375 inch or greater. In North America, below this limit the product is called “Wire.” In Europe, bar is supplied in straight lengths; if supplied in coiled form, the product is called “Wire.”

Fin Stock—Coiled sheet or foil suitable and intended for manufacture of fins for heat-exchanger applications.

Foil—Generally, a rolled product rectangular in cross section of thickness equal to or less than 0.0079 inch (Formerly 0.006 inch, changed to 0.0079 inch for international harmonization). There is an overlap in the thickness range 0.006-0.0079 inch defined for foil and sheet. Foil products in this thickness range are supplied to foil product specifications.

Forging Stock—A solid product, typically ingot, rod, bar for profile, intended and suitable for forging. Forging stock is typically a cast product or an extruded product.

Pipe—Tube in standardized combinations of outside diameter and wall thickness. Pipe is commonly designated by “Nominal Pipe Sizes” and “ANSI Schedule Numbers.”

Plate—A rolled product that is rectangular in cross section and with thickness not less than 0.250 inch with sheared or sawed edges.

Tread Plate—Plate (or sheet) upon which a pattern has been impressed on one side, by rolling using a specially prepared roll with an appropriate pattern, to provide improved traction.

Profile—A wrought product that is long in relation to its cross-sectional dimensions which is of a form other than that of sheet, plate, rod, bar, tube, wire or foil. For profiles sometimes the term “Shape” or “Section” is used; however, the term “Shape” is no longer recommended.

Structural Profile—A profile, rolled or extruded, commonly used for structural purposes such as angles, channels, H-beams, I-beams, tees, and zeos.

Rod—A solid wrought product of circular cross section that is long in relation to its diameter, typically supplied in straight lengths. In North America, the minimum diameter of a rod is 0.375 inch; below this limit “Wire.” In Europe, rod is supplied in straight lengths and is often called “Round Bar”; if supplied in coiled form, the product is called “Wire.”

Shape—This term is no longer recommended. The term “Profile” is preferred. See “Profile.”

Sheet—Generally, a rolled product that is rectangular in cross section with thickness greater than 0.006 inch and less than 0.250 inch with slit, sheared or sawed edges. There is an overlap in the thickness range of 0.006-0.0079 inch defined for foil and sheet. Sheet products in this thickness range are supplied to sheet product specifications.

Alclad Sheet—A composite aluminum sheet having an aluminum core and a metallurgically bonded aluminum layer or layers anodic to the core, on one or both sides, thus electrolytically protecting the core against corrosion. If only one side is clad, the product is often named “Alclad One Side Sheet.”

Brazing Sheet—Sheet of a low melting temperature alloy used for brazing or a clad sheet product having a bonded layer or layers of a low melting temperature alloy used for brazing.

Duct Sheet—Coiled or flat sheet suitable for duct applications.

Tube—A hollow wrought product of uniform cross-section with only one enclosed void and with a uniform wall thickness, supplied in straight lengths or in coiled form. Cross-sections are in the shape of circles, ovals, squares, rectangles, equilateral triangles or regular polygons and can have corners rounded, provided the inner and outer cross-sections are concentric and have the same form and orientation. Tube can be formed by extrusion or by forming and joining of sheet.

Heat-Exchanger Tube—A tube used in an apparatus in which fluid inside the tube will be heated or cooled by fluid outside the tube, but the term is typically not applied to coiled tube or to tube for use in refrigerators or radiators.

Welded Tube—A tube produced by longitudinal seam-welding, typically of formed sheet. Welded tube can be fabricated by arc-welding with or without welding wire, high frequency seam welding, or any other type of welding.

Wire—A solid wrought product that is long in relation to its cross section, which is square or rectangular with sharp or rounded corners or edges, or is round, hexagonal, or octagonal. In North America, the maximum diameter or perpendicular distance between parallel faces of a wire is 0.375 inches; above this limit the product is called “Rod” or “Bar”. In Europe, wire is supplied in coiled form; if supplied in straight lengths, the product is called “Rod” or “Bar.”

2. Standard Limits for Expressing Tolerances

2.1 Standard limits for expressing the tolerances depend on the type of instrument ordinarily used in measuring the particular dimension. Where instruments permitting the required degree of accuracy generally are used, the tolerances are expressed in decimals as follows (except for foil):

Tolerance less than 0.005 in. . Multiple of 0.0005
 Tolerance of 0.005 in. and greater 0.XXX

For measurements commonly made with instruments not permitting such accuracy, the tolerances are expressed in fractions.

2.2 Rounding For purposes of determining conformance to the dimensional tolerances, a measured value is not rounded off. To determine applicable limits when a dimension is specified to more decimal places than are used in these standards, it shall be rounded off to the same number of places in conformance with ASTM E29, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications.

3. Applicable Limits

The applicable limits for mechanical properties, physical properties, cladding thickness, and ultrasonic discontinuity limits are those that apply to the specified (ordered) dimension.

Tolerances other than equal bilateral may be specified but shall be within the standard plus and minus limits for the specified (ordered) dimension.

When a specified (ordered) dimension is expressed to more decimal places than are used in these standards, applicable limits are determined by rounding off the specified dimension to the same number of places in conformance with the rounding-off method of ASTM recommended Practice E29.

4. *Section intentionally blank*

5. *Section intentionally blank*

6. *Section intentionally blank*

7. Sheet and Plate

Tables 7.1 – 7.6 intentionally blank

TABLE 7.7a Sheet and Plate Thickness Tolerances (Applicable to All Alloys Not Included in the Aerospace Alloys Table 7.7b or Not Specified for Aerospace Applications)

NOTE: ALSO APPLICABLE TO ALLOYS WHEN SUPPLIED AS ALCLAD.

SPECIFIED THICKNESS, in.		SPECIFIED WIDTH—in.							
		Up thru 39.37	Over 39.37 Thru 59.06	Over 59.06 Thru 78.74	Over 78.74 Thru 98.43	Over 98.43 Thru 118.11	Over 118.11 Thru 137.80	Over 137.80 Thru 157.48	Over 157.48 Thru 177.17
Over	Thru	TOLERANCES—in. plus and minus							
0.0059	0.010	0.0010	0.0015	..	..	..	..	..	..
0.010	0.016	0.0010	0.0015	..	..	..	..	..	..
0.016	0.025	0.0015	0.0020	0.0030	0.0035	..	..	..	..
0.025	0.032	0.0020	0.0025	0.0035	0.0040	..	..	..	..
0.032	0.039	0.0020	0.0030	0.0035	0.0045	0.006	..	..	..
0.039	0.047	0.0025	0.0035	0.0045	0.006	0.007	0.008	..	..
0.047	0.063	0.0030	0.0035	0.0050	0.006	0.007	0.009	..	..
0.063	0.079	0.0035	0.0040	0.006	0.007	0.008	0.010	..	..
0.079	0.098	0.0035	0.0045	0.006	0.007	0.009	0.011	..	..
0.098	0.126	0.0045	0.006	0.007	0.009	0.011	0.013	..	..
0.126	0.158	0.006	0.007	0.009	0.011	0.013	0.015	..	..
0.158	0.197	0.007	0.009	0.011	0.013	0.015	0.018	..	..
0.197	0.248	0.009	0.011	0.013	0.015	0.018	0.022	0.027	..
0.248	0.315	0.012	0.014	0.015	0.018	0.022	0.027	0.035	0.043
0.315	0.394	0.015	0.017	0.020	0.023	0.027	0.033	0.041	0.051
0.394	0.630	0.023	0.023	0.027	0.032	0.035	0.043	0.053	0.065
0.630	0.984	0.031	0.031	0.037	0.043	0.047	0.058	0.070	0.085
0.984	1.575	0.039	0.039	0.047	0.055	0.065	0.075	0.090	0.105
1.575	2.362	0.055	0.055	0.060	0.070	0.085	0.100	0.115	..
2.362	3.150	0.075	0.075	0.085	0.100	0.105	0.125	..	..
3.150	3.937	0.100	0.100	0.115	0.125	0.130	0.160	..	..
3.937	6.299	0.130	0.130	0.145	0.165	..	..	..	..
6.300	8.000	0.160	0.160	0.160	0.165	..	..	..	..
8.001	12.000	0.190	0.190	0.190	0.190	..	..	..	..

TABLE 7.7b Sheet and Plate Thickness Tolerances (Applicable to All Alloys Specified for Aerospace Applications)

(INCLUDES AEROSPACE ALLOYS 2014, 2024, 2124, 2219, 2324, 2419, 7050, 7075, 7150 and 7475)

NOTE: ALSO APPLICABLE TO ALLOYS WHEN SUPPLIED AS ALCLAD.

SPECIFIED THICKNESS		SPECIFIED WIDTH—in.											
		Up thru 39.37	Over 39.37 thru 47.24	Over 47.24 thru 55.12	Over 55.12 thru 59.06	Over 59.06 thru 70.87	Over 70.87 thru 78.74	Over 78.74 thru 86.61	Over 86.61 thru 98.43	Over 98.43 thru 118.11	Over 118.11 thru 137.80	Over 137.80 thru 157.48	Over 157.48 thru 177.17
Over	Thru	TOLERANCES—in. plus and minus											
0.0059	0.010	0.0010	0.0020	0.0020	0.0020	..	..	..	..	..	..	..	..
0.010	0.016	0.0015	0.0025	0.0025	0.0025	..	..	..	..	..	..	..	..
0.016	0.025	0.0015	0.0025	0.0025	0.0025	..	..	..	..	..	..	..	..
0.025	0.032	0.0015	0.0015	0.0020	0.0030	0.0030	..	..	..	..	..	..	..
0.032	0.039	0.0015	0.0015	0.0020	0.0030	0.0030	0.0035	0.0035	0.007	..	..	..	..
0.039	0.047	0.0020	0.0020	0.0020	0.0030	0.0030	0.0035	0.0035	0.008	0.010	0.011	..	..
0.047	0.063	0.0020	0.0020	0.0030	0.0030	0.0030	0.0035	0.0035	0.009	0.011	0.013	..	..
0.063	0.079	0.0020	0.0020	0.0030	0.0035	0.0035	0.0035	0.0035	0.010	0.013	0.015	..	..
0.079	0.098	0.0025	0.0025	0.0035	0.0040	0.0040	0.0045	0.0045	0.011	0.015	0.018	..	..
0.098	0.126	0.0035	0.0035	0.0035	0.0045	0.0045	0.0045	0.0045	0.013	0.016	0.020	..	..
0.126	0.158	0.0040	0.0040	0.0045	0.007	0.007	0.009	0.009	0.015	0.018	0.022	..	..
0.158	0.197	0.006	0.007	0.007	0.009	0.009	0.011	0.011	0.018	0.022	0.026	..	..
0.197	0.248	0.009	0.012	0.012	0.012	0.017	0.017	0.021	0.021	0.025	0.029	..	..
0.248	0.315	0.012	0.015	0.015	0.015	0.019	0.019	0.024	0.024	0.029	0.033	0.041	0.051
0.315	0.394	0.017	0.018	0.018	0.018	0.022	0.022	0.028	0.028	0.033	0.039	0.047	0.059
0.394	0.630	0.023	0.023	0.023	0.023	0.028	0.028	0.033	0.033	0.039	0.047	0.059	0.070
0.630	0.984	0.031	0.031	0.031	0.031	0.037	0.037	0.043	0.043	0.051	0.060	0.070	0.085
0.984	1.575	0.039	0.039	0.039	0.039	0.047	0.047	0.055	0.055	0.065	0.075	0.090	0.105
1.575	2.362	0.055	0.055	0.055	0.055	0.060	0.060	0.070	0.070	0.090	0.100	0.115	..
2.362	3.150	0.075	0.075	0.075	0.075	0.085	0.085	0.100	0.100	0.110	0.125	..	..
3.150	3.937	0.100	0.100	0.100	0.100	0.115	0.115	0.130	0.130	0.150	0.160	..	..
3.937	6.299	0.130	0.130	0.130	0.130	0.145	0.145	0.165	0.165	..	..	..	..
6.300	8.000	0.160	0.160	0.160	0.160	0.160	0.160	0.165	0.165	..	..	..	..
8.001	10.000	0.190	0.190	0.190	0.190	0.190	0.190	0.190	0.190	..	..	..	..

Note: Capability to provide tighter tolerances may vary with supplier.

① Footnote is inactive.

Aluminum Mill Products

TABLE 7.8 Width Tolerances—Sheared Flat Sheet and Plate

SPECIFIED THICKNESS in.	SPECIFIED WIDTH—in.					
	Up thru 6	Over 6 thru 24	Over 24 thru 60	Over 60 thru 96	Over 96 thru 132	Over 132 thru 168
	TOLERANCES ②—in.					
0.006–0.124	$\pm 1/16$	$\pm 3/32$	$\pm 1/8$	$\pm 1/8$	$\pm 5/32$	..
0.125–0.249	$\pm 3/32$	$\pm 3/32$	$\pm 1/8$	$\pm 5/32$	$\pm 3/16$	..
0.250–0.499	$\pm 1/4$	$\pm 5/16$	$\pm 3/8$	$\pm 3/8$	$\pm 7/16$	$\pm 1/2$

TABLE 7.9 Length Tolerances—Sheared Flat Sheet and Plate

SPECIFIED THICKNESS in.	SPECIFIED LENGTH—in.							
	Up thru 30	Over 30 thru 60	Over 60 thru 120	Over 120 thru 240	Over 240 thru 360	Over 360 thru 480	Over 480 thru 600	Over 600 thru 720
	TOLERANCES ②—in.							
0.006–0.124	$\pm 1/16$	$\pm 3/32$	$\pm 1/8$	$\pm 5/32$	$\pm 3/16$	$\pm 7/32$	$\pm 9/32$	..
0.125–0.249	$\pm 3/32$	$\pm 3/32$	$\pm 1/8$	$\pm 5/32$	$\pm 7/32$	$\pm 1/4$	$\pm 5/16$	..
0.250–0.499	$\pm 1/4$	$\pm 3/8$	$\pm 7/16$	$\pm 1/2$	$\pm 9/16$	$\pm 5/8$	$\pm 11/16$	$\pm 3/4$

TABLE 7.10 Width and Length Tolerances—Sawed Flat Sheet and Plate

SPECIFIED THICKNESS in.	SPECIFIED WIDTH AND LENGTH—in.							
	Up thru 30	Over 30 thru 60	Over 60 thru 120	Over 120 thru 240	Over 240 thru 360	Over 360 thru 480	Over 480 thru 600	Over 600 thru 720
	TOLERANCES ②—in.							
0.080–0.249	$\pm 1/8$	$\pm 1/8$	$\pm 3/16$	$\pm 1/4$	$\pm 1/4$	$\pm 5/16$	$\pm 3/8$	$\pm 7/16$
0.250–12.000	$\pm 1/4$	$\pm 5/16$	$\pm 3/8$	$\pm 1/2$	$\pm 9/16$	$\pm 5/8$	$\pm 3/4$	$\pm 7/8$

TABLE 7.11 Width Tolerances—Slit Coiled Sheet

SPECIFIED THICKNESS in.	SPECIFIED WIDTH—in.					
	Up thru 6	Over 6 thru 12	Over 12 thru 24	Over 24 thru 48	Over 48 thru 60	Over 60 thru 96
	TOLERANCES ②—in. plus and minus					
0.006–0.125	0.010	$1/64$	$1/32$	$3/64$	$1/16$	$1/8$
0.126–0.186	0.012	$1/32$	$1/32$	$1/16$	$3/32$	..
0.187–0.249	0.016	$1/32$	$3/64$	$3/32$	$1/8$	..

For all numbered footnotes, see page 12.

TABLE 7.12 Lateral Bow Tolerances—Coiled Sheet

SPECIFIED THICKNESS in.	SPECIFIED WIDTH—in.				
	$1/2$ thru 1	Over 1 thru 2	Over 2 thru 4	Over 4 thru 10	Over 10
	TOLERANCE—in. in 6 ft. Allowable Deviation of a Side Edge from a Straight Line				
0.006–0.064	$3/4$	$9/16$	$3/8$	$1/4$	$3/16$
0.065–0.125	..	..	$3/8$	$1/4$	$3/16$

TABLE 7.13 Lateral Bow Tolerances—Flat Sheet and Plate

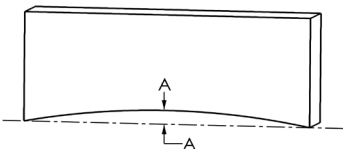
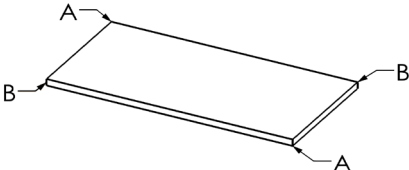
SPECIFIED THICKNESS in.	SPECIFIED WIDTH in.	ALLOWABLE DEVIATION OF A SIDE EDGE FROM A STRAIGHT LINE						
								
		Maximum allowable value of AA						
		SPECIFIED LENGTH—in.						
		Up thru 60	Over 60 thru 90	Over 90 thru 120	Over 120 thru 150	Over 150 thru 180	Over 180 thru 210	Over 210 thru 240
TOLERANCE—in.								
0.006–0.125	Up thru 4	0.250	0.563	1.000	1.563	2.250	3.000	4.000 ⑤
	Over 4 thru 10	0.094	0.219	0.375	0.563	0.875	1.156	1.500 ⑤
	Over 10 thru 35	0.063	0.125	0.188	0.250	0.375	0.500	0.750 ⑤
	Over 35	0.032	0.063	0.125	0.188	0.250	0.375	0.500 ⑤
0.126–0.249	Over 4 thru 15	0.063	0.125	0.250	0.375	0.563	0.750	1.000 ⑤
	Over 15	0.032	0.063	0.125	0.188	0.250	0.375	0.500 ⑤
0.250–12.000	Up thru 10	0.250	0.563	1.000	1.563	2.250	3.000	4.000 ⑤
	Over 10 thru 18	0.063	0.125	0.250	0.406	0.594	0.781	1.000 ⑤
	Over 18	0.032	0.094	0.125	0.219	0.312	0.438	0.562 ⑤

TABLE 7.14 Squareness Tolerances—Flat Sheet and Plate

SPECIFIED LENGTH ft.	SPECIFIED WIDTH—ft.	
	Up thru 3	Over 3
	ALLOWABLE DIFFERENCE IN LENGTH OF DIAGONALS ④ —Inches	
		
	Maximum difference between AA and BB	
Up thru 12	$\frac{3}{32} \times \text{width, ft } ③$	$\frac{5}{64} \times \text{width, ft } ③$
Over 12	$\frac{9}{64} \times \text{width, ft } ③$	$\frac{7}{64} \times \text{width, ft } ③$

① Footnote is inactive.

② Tolerances applicable at ambient mill temperatures. A change in dimension of 0.013 in. per 100 in. per 10°F must be recognized.

③ If specified width is other than an exact multiple of 12 in., tolerance is determined by using the next largest exact multiple. For example, if speci-

fied width is 53 in. and specified length is 72 in., the tolerance is $\frac{5}{64}$ in. $\times 5 = \frac{25}{64}$ in. This result is then rounded to $\frac{7}{16}$ in. in accordance with footnote ④.④ Use values for calculating only. Round result upward to nearest $\frac{1}{16}$ in.

⑤ Also applicable to any 240-inch increment of longer sheet or plate.

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TABLE 7.15 Diameter Tolerances—Sheared or Blanked Sheet and Plate Circles

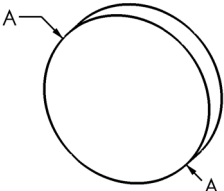
SPECIFIED THICKNESS in.	SPECIFIED DIAMETER				
	Up thru 18	Over 18 thru 36	Over 36 thru 96	Over 96 thru 132	Over 132 thru 168
	ALLOWABLE DEVIATION FROM SPECIFIED DIAMETER in. plus and minus				
					
	Difference between AA and specified diameter				
0.006–0.249	1/32	3/64	1/16	1/8	3/16
0.250–0.375	..	1/16	1/8	3/16	1/4
0.376–0.625	..	1/8	3/16	1/4	3/8
0.626–0.875	..	3/16	1/4	3/8	1/2
0.876–1.250	..	1/4	3/8	1/2	5/8

TABLE 7.16 Diameter Tolerances—Sawed Sheet and Plate Circles

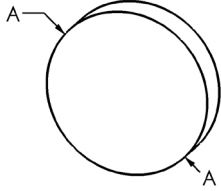
SPECIFIED THICKNESS in.	SPECIFIED DIAMETER			
	Up thru 18	Over 18 thru 60	Over 60 thru 132	Over 132 thru 168
	ALLOWABLE DEVIATION FROM SPECIFIED DIAMETER in. plus and minus			
				
	Difference between AA and specified diameter			
0.080–1.000	1/8	3/16	1/4	1/2
1.001–3.000	1/4	3/8	1/2	3/4

TABLE 7.17 Flatness Tolerances—Flat Sheet ③ and Coiled Cut-to-Length Flat Sheet ③ ④

ALLOY (Includes Alclads)	SPECIFIED THICKNESS in.	Longitudinal or Transverse Distance (ft.) Center to Center of Buckles or Edge Waves ⑤				
		Up thru 2	Over 2 thru 3	Over 3 thru 4	Over 4 thru 6	Over 6
		TOLERANCES, in. ⑥ ⑦ ⑧				
1060, 1100, 1350, 3003, 3005, 3105, 5005, 5050, 5X57	0.020 thru 0.064 0.065 thru 0.249	1/8 1/8	3/16 3/16	3/16 5/16	5/16 3/8	3/8 1/2
3004, 5052, 5083, 5086, 5252, 5X54, 5456, brazing sheet, and all heat treatable alloys	0.020 thru 0.064 0.065 thru 0.249	3/16 3/16	3/16 5/16	5/16 3/8	3/8 1/2	1/2 9/16

① Footnote is inactive.

② Footnote is inactive.

③ Not applicable to flat sheet over 60 in. wide.

④ It is the responsibility of the entity processing coiled sheet to cut flat lengths to meet these tolerances.

⑤ Also applicable to overall length or width of sheet if only one longitudinal and/or transverse buckle or edge wave is present.

⑥ Allowable deviation from flat with the sheet positioned on flat horizontal surface to minimize deviation.

⑦ Not applicable to O, F and HX8 and harder tempers.

⑧ Not applicable to end or corner turnup.

TABLE 7.18 Flatness Tolerances—Sawed or Sheared Plate**LONGITUDINAL FLATNESS**

SPECIFIED THICKNESS, in.	TOLERANCE ① in.—Allowable Deviation from Flat	
	TX51 tempers ②	Other than TX51 tempers ② ⑦
0.250–3.000 3.001– 12.000	$\frac{3}{16}$ in any 6 ft ③ $\frac{1}{8}$ in any 6 ft or less	$\frac{1}{4}$ in any 6 ft or less $\frac{1}{4}$ in any 6 ft or less

TRANSVERSE FLATNESS

SPECIFIED THICKNESS, in.	TOLERANCE ① in.—Allowable Deviation from Flat				
	Widths over 4 ft thru 6 ft ④		Widths over 2 ft thru 4 ft		Widths 2 ft and less
	TX51 tempers ②	Other than TX51 tempers ② ⑦	TX51 tempers ②	Other than TX51 tempers ② ⑦	All tempers ⑦
0.250–0.624	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{16}$	$\frac{3}{8}$	Only short-span flatness tolerance applies
0.625–1.500	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	
1.501–3.000	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	
3.001– 12.000	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{3}{16}$	

SHORT-SPAN FLATNESS ⑤

SPECIFIED THICKNESS, in.	TOLERANCE ⑥ in.—Allowable Deviation from Flat	
	TX51 tempers ②	Other than TX51 tempers ② ⑦
0.250–0.624 0.625– 12.000	0.100 0.075	0.125 0.090

① As measured with plate resting on a flat surface concave side upward, using a straightedge and a feeler gauge, dial gauge or scale.

② TX51 is a general designation for the following stress-relieved tempers: T351, T451, T651, T851, T7351, T7451 and T7651.

③ For pieces ordered to less than 6 ft in length, the tolerance is $\frac{1}{8}$ in. for the total length.

④ For widths over 6 ft, these tolerances apply for any 6 ft of total width.

⑤ Short-span flatness is the deviation from flat over full span for spans 2 ft and less.

⑥ As measured with the plate resting on a flat surface.

⑦ Not applicable to O, F, and HX8 and harder tempers.

Tables 7.19 – 7.25 intentionally blank

TABLE 7.26 Thickness Tolerances①—Commercial Roofing and Siding

NOMINAL THICKNESS in.	NOMINAL WIDTH—in.	
	Up thru 36	Over 36 thru 54
	TOLERANCE—in. plus and minus	
0.024	0.0025	0.004
0.032	0.0025	0.005
0.036	0.0025	0.005
0.040	0.003	0.005
0.050	0.004	0.006

TABLE 7.27 Depth of Corrugation Tolerances—Commercial Roofing and Siding

Allowable deviation from nominal depth of corrugation: $\pm \frac{1}{32}$ in.

TABLE 7.28 Length Tolerances②—Commercial Roofing and Siding

Allowable deviation from specified length: $\pm \frac{1}{2}$ in.
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TABLE 7.29 Parallelness of Corrugations—Commercial Roofing and Siding

PRODUCT	PARALLELNESS OF CORRUGATIONS
Corrugated roofing and siding	Capable of being lapped at either end.
V-beam roofing and siding	Capable of being lapped at either end.
Ribbed roofing	Capable of being lapped at either end and ribs are parallel to each other and to edges of sheet within $\pm \frac{1}{8}$ in.
Ribbed siding	Capable of being lapped at either end.

TABLE 7.30 Squareness Tolerance—Commercial Roofing and Siding

Allowable difference in length of diagonals: $\pm \frac{1}{2}$ in.
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① Applicable to flat sheet prior to painting, corrugating or embossing.

② Applicable to lengths of 3 feet through 30 feet for all products except ribbed siding. For ribbed siding, tolerances are applicable to lengths of 3 feet through 36 $\frac{1}{2}$ feet.

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TABLE 7.31 Thickness Tolerances—Duct Sheet

STANDARD THICKNESS in.	TOLERANCE—in. plus and minus	
	STANDARD WIDTHS—in.	
	24, 30, 36	48
0.016	0.0015	0.002
0.018, 0.020, 0.022, 0.025	0.002	0.0025
0.032	0.002	0.0025
0.040	0.0025	0.003
0.050, 0.063	0.003	0.004

TABLE 7.32 Width Tolerances—Flat Duct Sheet

STANDARD THICKNESS	TOLERANCE—in. plus and minus	
	STANDARD WIDTHS—in.	
	24, 30, 36	48
All	$\frac{3}{32}$	$\frac{1}{8}$

TABLE 7.33 Width Tolerances—Coiled Duct Sheet and Coiled Duct Sheet Cut to Length

STANDARD THICKNESS in.	TOLERANCE—in. plus and minus	
	STANDARD WIDTHS—in.	
	24	30, 36, 48
All	$\frac{1}{32}$	$\frac{3}{64}$

TABLE 7.34 Length Tolerances—Coiled Duct Sheet Cut to Length and Flat Duct Sheet

STANDARD LENGTH	STANDARD WIDTH	TOLERANCE, in.
All	All	$\pm \frac{1}{4}$

Table 7.35 intentionally blank

TABLE 7.36 Weights per Square Foot—Tread Plate

The following nominal weights per square foot are based on alloy 6061, which has a density of 0.098 pounds per cubic inch:

THICKNESS in.	NOMINAL WEIGHT lb/sq. ft
0.100	1.55
0.125	1.90
0.156	2.34
0.188	2.79
0.250	3.67
0.375	5.43
0.500	7.20
0.625	8.96

TABLE 7.37 Thickness Tolerances—Tread Plate

SPECIFIED ① THICKNESS—in.	TOLERANCES—in.	
	Plus ②	Minus
0.100	0.008	0.012
0.125	0.010	0.015
0.156	0.011	0.019
0.188	0.013	0.023
0.250	0.018	0.030
0.375	0.025	0.045
0.500	0.035	0.060
0.625	0.044	0.075

① Specified thickness does not include height of pattern.

② In case of dispute, allowed plus tolerance shall be determined by weight. The allowed deviation from nominal weight shall not exceed plus 8 percent.

TABLE 7.38 Width Tolerances—Tread Plate

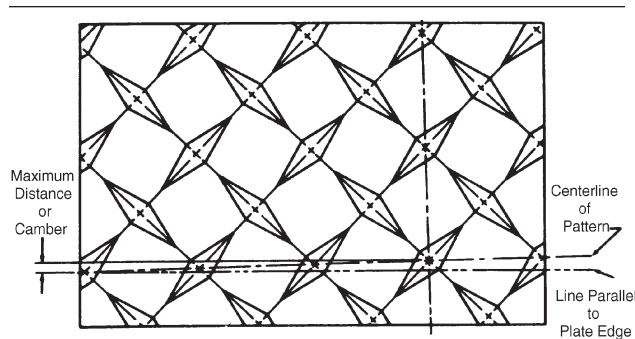
Allowable deviation from specified width: $\pm \frac{3}{8}$ in.

TABLE 7.39 Length Tolerances—Tread Plate

SPECIFIED LENGTH in.	TOLERANCE in.—plus
Up thru 144	$\frac{3}{8}$
Over 144 thru 240	$\frac{7}{16}$
Over 240	$\frac{1}{2}$

TABLE 7.40 Height of Pattern Tolerance—Tread Plate

Minimum height of raised pattern: 0.040 inch.
(Maximum height is controlled by weight tolerance.)

**TABLE 7.41 Camber of Pattern Line ④
Tolerances—Tread Plate**

SPECIFIED LENGTH in.	TOLERANCE—in.	
	SPECIFIED WIDTH—in.	
	Up thru 48	Over 48 thru 72
Up thru 24	$\frac{1}{8}$	$\frac{1}{8}$
Over 24 thru 72	$\frac{1}{2}$	$\frac{1}{2}$
Over 72 thru 144	$\frac{3}{4}$	1
Over 144	1	$1\frac{1}{2}$

**TABLE 7.42 Lateral Bow ③ Tolerances—
Tread Plate**

SPECIFIED WIDTH in.	TOLERANCE—in.
	ALLOWABLE DEVIATION OF A SIDE EDGE FROM A STRAIGHT LINE
	SPECIFIED THICKNESS—in.
	0.100–0.625
Up thru 4	1 in any 10 ft.
Over 4 thru 72	$\frac{1}{8}$ in any 10 ft.

**TABLE 7.43 Squareness Tolerances ⑤—
Tread Plate**

SPECIFIED LENGTH in.	TOLERANCE—in.
	ALLOWABLE DIFFERENCE IN LENGTH OF DIAGONALS
Up thru 144	$\frac{3}{8}$
Over 144 thru 240	$\frac{7}{16}$
Over 240	$\frac{1}{2}$

③ Applicable only to lengths up through 240 inches.

④ The camber of a pattern line is the maximum distance between the center of any figure in a pattern line and a line parallel with the edge of the plate that passes through the center of the figure in the same pattern line nearest to the edge of the floor plate.

⑤ Not resquared.