TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ① ⑩ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
3105 (Continued)						
3105-H18	0.013–0.031	28.0	..	24.0	..	1
	0.032–0.050	28.0	..	24.0	..	1
	0.051–0.080	28.0	..	24.0	..	2
3105-H22	0.013–0.019	19.0	..	15.0	..	3
	0.020–0.031	19.0	..	15.0	..	4
	0.032–0.050	19.0	..	15.0	..	5
	0.051–0.080	19.0	..	15.0	..	6
3105-H24	0.013–0.019	22.0	..	18.0	..	2
	0.020–0.031	22.0	..	18.0	..	3
	0.032–0.050	22.0	..	18.0	..	4
	0.051–0.080	22.0	..	18.0	..	6
3105-H25	0.013–0.019	23.0	..	19.0	..	2
	0.020–0.031	23.0	..	19.0	..	3
	0.032–0.050	23.0	..	19.0	..	4
	0.051–0.080	23.0	..	19.0	..	6
3105-H26	0.013–0.031	25.0	..	21.0	..	3
	0.032–0.050	25.0	..	21.0	..	4
	0.051–0.080	25.0	..	21.0	..	5
3105-H28	0.013–0.031	28.0	..	24.0	..	2
	0.032–0.050	28.0	..	24.0	..	3
	0.051–0.080	28.0	..	24.0	..	4
5005						
5005-O	0.006–0.007	15.0	21.0	5.0	..	12
	0.008–0.012	15.0	21.0	5.0	..	14
	0.013–0.019	15.0	21.0	5.0	..	16
	0.020–0.031	15.0	21.0	5.0	..	18
	0.032–0.050	15.0	21.0	5.0	..	20
	0.051–0.113	15.0	21.0	5.0	..	21
	0.114–0.249	15.0	21.0	5.0	..	22
	0.250–3.000	15.0	21.0	5.0	..	22
5005-H12	0.017–0.019	18.0	24.0	14.0	..	2
	0.020–0.031	18.0	24.0	14.0	..	3
	0.032–0.050	18.0	24.0	14.0	..	4
	0.051–0.113	18.0	24.0	14.0	..	6
	0.114–0.161	18.0	24.0	14.0	..	7
	0.162-.0249	18.0	24.0	14.0	..	8
	0.250–0.499	18.0	24.0	14.0	..	9
	0.500–2.000	18.0	24.0	14.0	..	10
5005-H14	0.009–0.031	21.0	27.0	17.0	..	1
	0.032–0.050	21.0	27.0	17.0	..	2
	0.051–0.113	21.0	27.0	17.0	..	3
	0.114–0.161	21.0	27.0	17.0	..	5
	0.162–0.249	21.0	27.0	17.0	..	6
	0.250–0.499	21.0	27.0	17.0	..	8
	0.500–1.000	21.0	27.0	17.0	..	10
5005-H16	0.006–0.031	24.0	30.0	20.0	..	1
	0.032–0.050	24.0	30.0	20.0	..	2
	0.051–0.162	24.0	30.0	20.0	..	3
5005-H18	0.006–0.031	27.0	..	..	..	1
	0.032–0.050	27.0	..	..	..	2
	0.051–0.128	27.0	..	..	..	3
5005-H32 ③	0.017–0.019	17.0	23.0	12.0	..	3
	0.020–0.031	17.0	23.0	12.0	..	4
	0.032–0.050	17.0	23.0	12.0	..	5
	0.051–0.113	17.0	23.0	12.0	..	7
	0.114–0.161	17.0	23.0	12.0	..	8
	0.162–0.249	17.0	23.0	12.0	..	9
	0.250–2.000	17.0	23.0	12.0	..	10
5005-H34 ③	0.009–0.012	20.0	26.0	15.0	..	2
	0.013–0.031	20.0	26.0	15.0	..	3
	0.032–0.050	20.0	26.0	15.0	..	4
	0.051–0.113	20.0	26.0	15.0	..	5
	0.114–0.161	20.0	26.0	15.0	..	6
	0.162–0.249	20.0	26.0	15.0	..	7
	0.250–0.499	20.0	26.0	15.0	..	8
	0.500–1.000	20.0	26.0	15.0	..	10
5005-H36 ③	0.006–0.007	23.0	29.0	18.0	..	1
	0.008–0.019	23.0	29.0	18.0	..	2
	0.020–0.031	23.0	29.0	18.0	..	3
	0.032–0.162	23.0	29.0	18.0	..	4

For all numbered footnotes, see page 7-11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ① ⑩ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
5005-H38	0.006–0.012	26.0	..	..	..	1
	0.013–0.019	26.0	..	..	..	2
	0.020–0.031	26.0	..	..	..	3
	0.032–0.128	26.0	..	..	..	4
5005-H39	0.006–0.063	28.0	..	..	..	1
5005-H112	0.250–0.499	17.0	..	..	..	8
	0.500–2.000	15.0	..	..	..	12
	2.001–3.000	14.5	..	..	..	18
5050						
5050-O	0.006–0.007	18.0	24.0	6.0	..	..
	0.008–0.019	18.0	24.0	6.0	..	16
	0.020–0.031	18.0	24.0	6.0	..	18
	0.032–0.113	18.0	24.0	6.0	..	20
	0.114–0.249	18.0	24.0	6.0	..	22
	0.250–3.000	18.0	24.0	6.0	..	20
5050-H32 ③	0.017–0.050	22.0	28.0	16.0	..	4
	0.051–0.249	22.0	28.0	16.0	..	6
5050-H34 ③	0.009–0.031	25.0	31.0	20.0	..	3
	0.032–0.050	25.0	31.0	20.0	..	4
	0.051–0.249	25.0	31.0	20.0	..	5
5050-H36 ③	0.006–0.019	27.0	33.0	22.0	..	2
	0.020–0.050	27.0	33.0	22.0	..	3
	0.051–0.162	27.0	33.0	22.0	..	4
5050-H38	0.006–0.007	29.0	..	..	..	..
	0.008–0.031	29.0	..	..	..	2
	0.032–0.050	29.0	..	..	..	3
	0.051–0.128	29.0	..	..	..	4
5050-H39	0.006–0.063	31.0	..	..	..	1
5050-H112	0.250–3.000	20.0	..	8.0	..	12
5052						
5052-O	0.006–0.007	25.0	31.0	9.5	..	..
	0.008–0.012	25.0	31.0	9.5	..	14
	0.013–0.019	25.0	31.0	9.5	..	15
	0.020–0.031	25.0	31.0	9.5	..	16
	0.032–0.050	25.0	31.0	9.5	..	18
	0.051–0.113	25.0	31.0	9.5	..	19
	0.114–0.249	25.0	31.0	9.5	..	20
	0.250–3.000	25.0	31.0	9.5	..	18
5052-H32 ③	0.017–0.019	31.0	38.0	23.0	..	4
	0.020–0.050	31.0	38.0	23.0	..	5
	0.051–0.113	31.0	38.0	23.0	..	7
	0.114–0.249	31.0	38.0	23.0	..	9
	0.250–0.499	31.0	38.0	23.0	..	11
	0.500–2.000	31.0	38.0	23.0	..	12
5052-H34 ③	0.009–0.019	34.0	41.0	26.0	..	3
	0.020–0.050	34.0	41.0	26.0	..	4
	0.051–0.113	34.0	41.0	26.0	..	6
	0.114–0.249	34.0	41.0	26.0	..	7
	0.250–1.000	34.0	41.0	26.0	..	10
5052-H36 ③	0.006–0.007	37.0	44.0	29.0	..	2
	0.008–0.031	37.0	44.0	29.0	..	3
	0.032–0.162	37.0	44.0	29.0	..	4
5052-H38 ③	0.006–0.007	39.0	..	32.0	..	2
	0.008–0.031	39.0	..	32.0	..	3
	0.032–0.128	39.0	..	32.0	..	4
5052-H39	0.006–0.063	41.0	..	..	..	1
5052-H112	0.250–0.499	28.0	..	16.0	..	7
	0.500–2.000	25.0	..	9.5	..	12
	2.001–3.000	25.0	..	9.5	..	16
5052-H391	0.008–0.125	42.0	..	35.0	..	3
5083						
5083-O	0.051–1.500	40.0	51.0	18.0	29.0	16
	1.501–3.000	39.0	50.0	17.0	29.0	16
	3.001–4.000	38.0	..	16.0	..	16
	4.001–5.000	38.0	..	16.0	..	14
	5.001–7.000	37.0	..	15.0	..	14
	7.001–8.000	36.0	..	14.0	..	12

For all numbered footnotes, see page 7-11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ① ⑩ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
5083 (Continued)						
5083-H112	0.250–1.500	40.0	..	18.0	..	12
	1.501–3.000	39.0	..	17.0	..	12
5083-H116 ⑥ ⑨	0.063–0.499	44.0	..	31.0	..	10
	0.500–1.250	44.0	..	31.0	..	12
	1.251–1.500	44.0	..	31.0	..	12
	1.501–3.000	41.0	..	29.0	..	12
5083-H321	0.125–0.187	44.0	56.0	31.0	43.0	10
	0.188–1.500	44.0	56.0	31.0	43.0	12
	1.501–3.000	41.0	56.0	29.0	43.0	12
5086						
5086-O	0.020–0.050	35.0	44.0	14.0	..	15
	0.051–0.249	35.0	44.0	14.0	..	18
	0.250–2.000	35.0	44.0	14.0	..	16
5086-H32 ③	0.020–0.050	40.0	47.0	28.0	..	6
	0.051–0.249	40.0	47.0	28.0	..	8
	0.250–2.000	40.0	47.0	28.0	..	12
5086-H34 ③	0.009–0.019	44.0	51.0	34.0	..	4
	0.020–0.050	44.0	51.0	34.0	..	5
	0.051–0.249	44.0	51.0	34.0	..	6
	0.250–1.000	44.0	51.0	34.0	..	10
5086-H36 ③	0.006–0.019	47.0	54.0	38.0	..	3
	0.020–0.050	47.0	54.0	38.0	..	4
	0.051–0.162	47.0	54.0	38.0	..	6
5086-H38 ③	0.006–0.020	50.0	..	41.0	..	3
5086-H112	0.188–0.499	36.0	..	18.0	..	8
	0.500–1.000	35.0	..	16.0	..	10
	1.001–2.000	35.0	..	14.0	..	14
	2.001–3.000	34.0	..	14.0	..	14
5086-H116 ⑥ ⑨	0.063–0.249	40.0	..	28.0	..	8
	0.250–0.499	40.0	..	28.0	..	10
	0.500–1.250	40.0	..	28.0	..	10
	1.251–2.000	40.0	..	28.0	..	10
5154						
5154-O	0.020–0.031	30.0	41.0	11.0	..	12
	0.032–0.050	30.0	41.0	11.0	..	14
	0.051–0.113	30.0	41.0	11.0	..	16
	0.114–3.000	30.0	41.0	11.0	..	18
5154-H32 ③	0.020–0.050	36.0	43.0	26.0	..	5
	0.051–0.249	36.0	43.0	26.0	..	8
	0.250–2.000	36.0	43.0	26.0	..	12
5154-H34 ③	0.009–0.050	39.0	46.0	29.0	..	4
	0.051–0.161	39.0	46.0	29.0	..	6
	0.162–0.249	39.0	46.0	29.0	..	7
	0.250–1.000	39.0	46.0	29.0	..	10
5154-H36 ③	0.006–0.050	42.0	49.0	32.0	..	3
	0.051–0.113	42.0	49.0	32.0	..	4
	0.114–0.162	42.0	49.0	32.0	..	5
5154-H38 ③	0.006–0.050	45.0	..	35.0	..	3
	0.051–0.113	45.0	..	35.0	..	4
	0.114–0.128	45.0	..	35.0	..	5
5154-H112	0.250–0.499	32.0	..	18.0	..	8
	0.500–2.000	30.0	..	11.0	..	11
	2.001–3.000	30.0	..	11.0	..	15
5252						
5252-H24	0.030–0.090	30.0	38.0	..	..	10
5252-H25	0.030–0.090	31.0	39.0	..	..	9
5252-H28	0.030–0.090	38.0	..	..	..	3
5254						
5254-O	0.020–0.031	30.0	41.0	11.0	..	12
	0.032–0.050	30.0	41.0	11.0	..	14
	0.051–0.113	30.0	41.0	11.0	..	16
	0.114–3.000	30.0	41.0	11.0	..	18
5254-H32 ③	0.020–0.050	36.0	43.0	26.0	..	5
	0.051–0.249	36.0	43.0	26.0	..	8
	0.250–2.000	36.0	43.0	26.0	..	12

For all numbered footnotes, see page 7-11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ① ⑩ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
5254 (Continued)						
5254-H34 ③	0.009–0.050	39.0	46.0	29.0	..	4
	0.051–0.161	39.0	46.0	29.0	..	6
	0.162–0.249	39.0	46.0	29.0	..	7
	0.250–1.000	39.0	46.0	29.0	..	10
5254-H36 ③	0.006–0.050	42.0	49.0	32.0	..	3
	0.051–0.113	42.0	49.0	32.0	..	4
	0.114–0.162	42.0	49.0	32.0	..	5
5254-H38 ③	0.006–0.050	45.0	..	35.0	..	3
	0.051–0.113	45.0	..	35.0	..	4
	0.114–0.128	45.0	..	35.0	..	5
5254-H112	0.250–0.499	32.0	..	18.0	..	8
	0.500–2.000	30.0	..	11.0	..	11
	2.001–3.000	30.0	..	11.0	..	15
5454						
5454-O	0.020–0.031	31.0	41.0	12.0	..	12
	0.032–0.050	31.0	41.0	12.0	..	14
	0.051–0.113	31.0	41.0	12.0	..	16
	0.114–3.000	31.0	41.0	12.0	..	18
5454-H32 ③	0.020–0.050	36.0	44.0	26.0	..	5
	0.051–0.249	36.0	44.0	26.0	..	8
	0.250–2.000	36.0	44.0	26.0	..	12
5454-H34 ③	0.020–0.050	39.0	47.0	29.0	..	4
	0.051–0.161	39.0	47.0	29.0	..	6
	0.162–0.249	39.0	47.0	29.0	..	7
	0.250–1.000	39.0	47.0	29.0	..	10
5454-H112	0.250–0.499	32.0	..	18.0	..	8
	0.500–2.000	31.0	..	12.0	..	11
	2.001–3.000	31.0	..	12.0	..	15
5456						
5456-O	0.051–1.500	42.0	53.0	19.0	30.0	16
	1.501–3.000	41.0	52.0	18.0	30.0	16
	3.001–5.000	40.0	..	17.0	..	14
	5.001–7.000	39.0	..	16.0	..	14
	7.001–8.000	38.0	..	15.0	..	12
5456-H112	0.250–1.500	42.0	..	19.0	..	12
	1.501–3.000	41.0	..	18.0	..	12
5456-H116 ⑥⑨	0.063–0.499	46.0	..	33.0	..	10
	0.500–1.250	46.0	..	33.0	..	12
	1.251–1.500	44.0	..	31.0	..	12
	1.501–3.000	41.0	..	29.0	..	12
	3.001–4.000	40.0	..	25.0	..	12
5456-H321	0.188–0.499	46.0	59.0	33.0	46.0	12
	0.500–1.500	44.0	56.0	31.0	44.0	12
	1.501–3.000	41.0	54.0	29.0	43.0	12
5457						
5457-O	0.030–0.090	16.0	22.0	..	..	20
5652						
5652-O	0.006–0.007	25.0	31.0	9.5	..	..
	0.008–0.012	25.0	31.0	9.5	..	14
	0.013–0.019	25.0	31.0	9.5	..	15
	0.020–0.031	25.0	31.0	9.5	..	16
	0.032–0.050	25.0	31.0	9.5	..	18
	0.051–0.113	25.0	31.0	9.5	..	19
	0.114–0.249	25.0	31.0	9.5	..	20
	0.250–3.000	25.0	31.0	9.5	..	18
5652-H32 ③	0.017–0.019	31.0	38.0	23.0	..	4
	0.020–0.050	31.0	38.0	23.0	..	5
	0.051–0.113	31.0	38.0	23.0	..	7
	0.114–0.249	31.0	38.0	23.0	..	9
	0.250–0.499	31.0	38.0	23.0	..	11
	0.500–2.000	31.0	38.0	23.0	..	12
5652-H34 ③	0.009–0.019	34.0	41.0	26.0	..	3
	0.020–0.050	34.0	41.0	26.0	..	4
	0.051–0.113	34.0	41.0	26.0	..	6
	0.114–0.249	34.0	41.0	26.0	..	7
	0.250–1.000	34.0	41.0	26.0	..	10

For all numbered footnotes, see page 7–11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ① ⑩ (concluded)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
5652 (Continued)						
5652-H36 ③	0.006–0.007	37.0	44.0	29.0	..	2
	0.008–0.031	37.0	44.0	29.0	..	3
	0.032–0.162	37.0	44.0	29.0	..	4
5652-H38 ③	0.006–0.007	39.0	..	32.0	..	2
	0.008–0.031	39.0	..	32.0	..	3
	0.032–0.128	39.0	..	32.0	..	4
5652-H112	0.250–0.499	28.0	..	16.0	..	7
	0.500–2.000	25.0	..	9.5	..	12
	2.001–3.000	25.0	..	9.5	..	16
5657						
5657-H241 ⑦	0.030–0.090	18.0	26.0	..	..	13
5657-H25	0.030–0.090	20.0	28.0	..	..	8
5657-H26	0.030–0.090	22.0	30.0	..	..	7
5657-H28	0.030–0.090	25.0	..	..	..	5

Footnotes for Pages 7-3 through 7-11

① The data base and criteria upon which these mechanical property limits are established are outlined on page 6-1 under "Mechanical Properties."
② Type of test specimen used depends on thickness of material; see "Sampling and Testing," pages 4-1 through 4-5.
③ For the corresponding H2 temper, limits for maximum ultimate tensile strength and minimum yield strength do not apply.
④ This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during the preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of the cladding.
⑤ D represents specimen diameter.
⑥ Also applies to material previously designated H117.
⑦ This material is subject to some recrystallization and the attendant loss of brightness.
⑧ See page 6-4 for specific cladding thicknesses.
⑨ Materials in this temper when tested upon receipt by the purchaser is required to pass the exfoliation corrosion resistance test (ASSET Method) indicated on page 4-1. The improved resistance to exfoliation corrosion of individual lots is determined by microscopic examination to assure a microstructure that is predominantly free of a continuous grain boundary network of aluminum-magnesium precipitate. The microstructure is compared to that in a previously established acceptable reference photomicrograph.
⑩ Processes such as flattening, leveling, or straightening coiled products subsequent to shipment by the producer may alter the mechanical properties of the metal (refer to Certification, Section 4).

TABLE 7.2 Mechanical Property Limits—Heat-Treatable Alloys ① ⑭

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTH—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ③
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
2014						
2014-O Sheet and plate	0.020–0.499 0.500–1.000	.. ..	32.0 32.0	.. ..	16.0 ..	16 10
2014-T3 Flat Sheet	0.020–0.039 0.040–0.249	59.0 59.0	.. ..	35.0 36.0	.. ..	14 14
2014-T4 Coiled Sheet	0.020–0.249	59.0	..	35.0	..	14
2014-T451 ⑦⑧ Plate	0.250–0.499 0.500–1.000 1.001–2.000 2.001–3.000	58.0 58.0 58.0 57.0	.. ..	36.0 36.0 36.0 36.0	.. ..	14 14 12 8
2014-T42 ④⑩ Sheet and plate	0.020–1.000	58.0	..	34.0	..	14
2014-T6 and T62 ④⑩ Sheet	0.020–0.039 0.040–0.249	64.0 66.0	.. ..	57.0 58.0	.. ..	6 7
2014-T62 ④⑩ and T651⑦ Plate	0.250-.0499 0.500–1.000 1.001–2.000 2.001–2.500 2.501–3.000 3.001–4.000	67.0 67.0 67.0 65.0 63.0 59.0	.. ..	59.0 59.0 59.0 58.0 57.0 55.0	.. ..	7 6 4 2 2 1
ALCLAD 2014⑥						
Alclad 2014-O Sheet and Plate	0.020–0.499 0.500–1.000	.. ..	30.0 32.0⑤	.. ..	14.0 ..	16 10
Alclad 2014-T3 Flat sheet	0.020–0.024 0.025–0.039 0.040–0.249	54.0 55.0 57.0	.. .. ..	33.0 34.0 35.0	.. .. ..	14 14 15
Alclad 2014-T4 Coiled sheet	0.020–0.024 0.025–0.039 0.040–0.128 0.129–0.249	54.0 55.0 57.0 57.0	.. ..	31.0 32.0 34.0 34.0	.. ..	14 14 15 15
Alclad 2014-T451⑦⑧ Plate	0.250–0.499 0.500–1.000 1.001–2.000 2.001–3.000	57.0 58.0⑤ 58.0⑤ 57.0⑤	.. ..	36.0 36.0⑤ 36.0⑤ 36.0⑤	.. ..	15 14 12 8
Alclad 2014-T42④⑩ Sheet and plate	0.020–0.024 0.025–0.039 0.040–0.128 0.129–0.249 0.250–0.499 0.500–1.000	54.0 55.0 57.0 57.0 57.0 58.0⑤	.. ..	31.0 32.0 34.0 34.0 34.0 34.0⑤	.. ..	14 14 15 15 15 14
Alclad 2014-T6 and T62④⑩ Sheet	0.020–0.024 0.025–0.039 0.040–0.249	62.0 63.0 64.0	.. .. ..	54.0 55.0 57.0	.. .. ..	7 7 8
Alclad 2014-T62④⑩ and T651⑦ Plate	0.250–0.499 0.500–1.000 1.001–2.000 2.001–2.500 2.501–3.000 3.001–4.000	64.0 67.0⑤ 67.0⑤ 65.0⑤ 63.0⑤ 59.0⑤	.. ..	57.0 59.0⑤ 59.0⑤ 58.0⑤ 57.0⑤ 55.0⑤	.. ..	8 6 4 2 2 1
2024						
2024-O Sheet and plate	0.010–0.499 0.500–1.750	.. ..	32.0 32.0	.. ..	14.0	12 12
2024-T3⑧ Sheet	0.008–0.009 0.010–0.020 0.021–0.128 0.129–0.249	63.0 63.0 63.0 64.0	.. ..	42.0 42.0 42.0 42.0	.. ..	10 12 15 15
2024-T351⑦⑧ Plate	0.250–0.499 0.500–1.000 1.001–1.500 1.501–2.000 2.001–3.000 3.001–4.000	64.0 63.0 62.0 62.0 60.0 57.0	.. ..	42.0 42.0 42.0 42.0 42.0 41.0	.. ..	12 8 7 6 4 4
2024-T361⑧⑪ Flat sheet and plate	0.020–0.062 0.063–0.249 0.250–0.499 0.500	67.0 68.0 66.0 66.0	.. ..	50.0 51.0 49.0 49.0	.. ..	8 9 9 10

For all numbered footnotes, see page 7-21.

TABLE 7.2 Mechanical Property Limits—Heat-Treatable Alloys ① ⑭ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTH—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ③
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
2024 (Continued)						
2024-T4	0.010–0.020	62.0	..	40.0	..	12
Sheet	0.021–0.249	62.0	..	40.0	..	15
2024-T42④⑩	0.010–0.020	62.0	..	38.0	..	12
Sheet and plate	0.021–0.249	62.0	..	38.0	..	15
	0.250–0.499	62.0	..	38.0	..	12
	0.500–1.000	61.0	..	38.0	..	8
	1.001–1.500	60.0	..	38.0	..	7
	1.501–2.000	60.0	..	38.0	..	6
	2.001–3.000	58.0	..	38.0	..	4
2024-T62④⑩	0.010–0.499	64.0	..	50.0	..	5
Sheet and plate	0.500–3.000	63.0	..	50.0	..	5
2024-T72④⑩ Sheet	0.010–0.249	60.0	..	46.0	..	5
2024-T81 Flat sheet	0.010–0.249	67.0	..	58.0	..	5
2024-T851⑦	0.250–0.499	67.0	..	58.0	..	5
Plate	0.500–1.000	66.0	..	58.0	..	5
	1.001–1.499	66.0	..	57.0	..	5
2024-T861⑪	0.020–0.062	70.0	..	62.0	..	3
Flat sheet and plate	0.063–0.249	71.0	..	66.0	..	4
	0.250–0.499	70.0	..	64.0	..	4
	0.500	70.0	..	64.0	..	4
ALCLAD 2024⑥						
Alclad 2024-O	0.008–0.009	..	30.0	..	14.0	10
Sheet and plate	0.010–0.032	..	30.0	..	14.0	12
	0.033–0.062	..	30.0	..	14.0	12
	0.063–0.187	..	32.0	..	14.0	12
	0.188–0.499	..	32.0	..	14.0	12
	0.500–1.750	..	32.0⑤	..	..	12
Alclad 2024-T3⑧	0.008–0.009	58.0	..	39.0	..	10
Sheet	0.010–0.020	59.0	..	39.0	..	12
	0.021–0.062	59.0	..	39.0	..	15
	0.063–0.128	61.0	..	40.0	..	15
	0.129–0.249	62.0	..	40.0	..	15
Alclad 2024-T351⑦⑧	0.250–0.499	62.0	..	40.0	..	12
Plate	0.500–1.000	63.0⑤	..	42.0⑤	..	8
	1.001–1.500	62.0⑤	..	42.0⑤	..	7
	1.501–2.000	62.0⑤	..	42.0⑤	..	6
	2.001–3.000	60.0⑤	..	42.0⑤	..	4
	3.001–4.000	57.0⑤	..	41.0⑤	..	4
Alclad 2024-T361⑧⑪	0.020–0.062	61.0	..	47.0	..	8
Flat sheet and plate	0.063–0.187	64.0	..	48.0	..	9
	0.188–0.249	64.0	..	48.0	..	9
	0.250–0.499	64.0	..	48.0	..	9
	0.500	66.0⑤	..	49.0⑤	..	10
Alclad 2024-T4	0.010–0.020	58.0	..	36.0	..	12
Sheet	0.021–0.062	58.0	..	36.0	..	15
	0.063–0.128	61.0	..	38.0	..	15
Alclad 2024-T42④⑩	0.008–0.009	55.0	..	34.0	..	10
Sheet and plate	0.010–0.020	57.0	..	34.0	..	12
	0.021–0.062	57.0	..	34.0	..	15
	0.063–0.187	60.0	..	36.0	..	15
	0.188–0.249	60.0	..	36.0	..	15
	0.250–0.499	60.0	..	36.0	..	12
	0.500–1.000	61.0⑤	..	38.0⑤	..	8
	1.001–1.500	60.0⑤	..	38.0⑤	..	7
	1.501–2.000	60.0⑤	..	38.0⑤	..	6
	2.001–3.000	58.0⑤	..	38.0⑤	..	4
Alclad 2024-T62④⑩	0.010–0.062	60.0	..	47.0	..	5
Sheet and plate	0.063–0.187	62.0	..	49.0	..	5
	0.188–0.499	62.0	..	49.0	..	5
Alclad 2024-T72④⑩	0.010–0.062	56.0	..	43.0	..	5
Sheet	0.063–0.187	58.0	..	45.0	..	5
	0.188–0.249	58.0	..	45.0	..	5
Alclad 2024-T81	0.010–0.062	62.0	..	54.0	..	5
Flat sheet	0.063–0.187	65.0	..	56.0	..	5
	0.188–0.249	65.0	..	56.0	..	5
Alclad 2024-T851⑦	0.250–0.499	65.0	..	56.0	..	5
Plate	0.500–1.000	66.0⑤	..	58.0⑤	..	5

For all numbered footnotes, see page 7-21.

TABLE 7.2 Mechanical Property Limits—Heat-Treatable Alloys ① ⑭ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTH—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ③
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
ALCLAD 2024 (Continued)						
Alclad 2024-T861⑪ Flat sheet and plate	0.020–0.062 0.063–0.187 0.188–0.249 0.250–0.499 0.500	64.0 69.0 69.0 68.0 70.0⑤	.. ..	58.0 64.0 64.0 62.0 64.0⑤	.. ..	3 4 4 4 4
1½% ALCLAD 2024⑥						
1½% Alclad 2024-O Sheet and plate	0.188–0.499 0.500–1.750	.. ..	32.0 32.0⑤	.. ..	14.0 ..	12 12
1½% Alclad 2024-T3⑧ Sheet	0.188–0.249	63.0	..	41.0	..	15
1½% Alclad 2024-T351⑦⑧ Plate	0.250–0.499 0.500–1.000 1.001–1.500 1.501–2.000 2.001–3.000 3.001–4.000	63.0 63.0⑤ 62.0⑤ 62.0⑤ 60.0⑤ 57.0⑤	.. ..	41.0 42.0⑤ 42.0⑤ 42.0⑤ 42.0⑤ 41.0⑤	.. ..	12 8 7 6 4 4
1½% Alclad 2024-T361⑧⑪ Flat sheet and plate	0.188–0.249 0.250–0.499 0.500	65.0 65.0 66.0⑤	.. .. ..	49.0 48.0 49.0⑤	.. .. ..	9 9 10
1½% Alclad 2024-T42 Sheet and plate④⑩	0.188–0.249 0.250–0.499 0.500–1.000 1.001–1.500 1.501–2.000 2.001–3.000	61.0 61.0 61.0⑤ 60.0⑤ 60.0⑤ 58.0⑤	.. ..	37.0 37.0 38.0⑤ 38.0⑤ 38.0⑤ 38.0⑤	.. ..	15 12 8 7 6 4
1½% Alclad 2024-T62④⑩ Sheet and plate	0.188–0.499	62.0	..	49.0	..	5
1½% Alclad 2024-T72④⑩ Sheet	0.188–0.249	59.0	..	45.0	..	5
1½% Alclad 2024-T81 Flat sheet	0.188–0.249	66.0	..	57.0	..	5
1½% Alclad 2024-T851⑦ Plate	0.250–0.499 0.500–1.000	66.0 66.0⑤	.. ..	57.0 58.0⑤	.. ..	5 5
1½% Alclad 2024-T861⑪ Flat sheet and plate	0.188–0.249 0.250–0.499 0.500	70.0 69.0 70.0⑤	.. .. ..	65.0 63.0 64.0⑤	.. .. ..	4 4 4
ALCLAD ONE SIDE 2024⑥						
Alclad One Side 2024-O Sheet and plate	0.008–0.009 0.010–0.062 0.063–0.499	.. .. ..	31.0 31.0 32.0	.. .. ..	14.0 14.0 14.0	10 12 12
Alclad One Side 2024-T3⑧ Sheet	0.010–0.020 0.021–0.062 0.063–0.128 0.129–0.249	61.0 61.0 62.0 63.0	.. ..	40.0 40.0 41.0 41.0	.. ..	12 15 15 15
Alclad One Side 2024- T351⑦⑧ Plate	0.250–0.499	63.0	..	41.0	..	12
Alclad One Side 2024- T361⑧⑪ Sheet and plate	0.020–0.062 0.063–0.249 0.250–0.499	64.0 66.0 65.0	.. .. ..	48.0 49.0 48.0	.. .. ..	8 9 9
Alclad One Side 2024-T42④⑪ Sheet and plate	0.010–0.020 0.021–0.062 0.063–0.249 0.250–0.499	59.0 59.0 61.0 61.0	.. ..	35.0 36.0 37.0 37.0	.. ..	12 15 15 12
Alclad One Side 2024-T62④⑩ Sheet and plate	0.010–0.062 0.063–0.499	62.0 63.0	.. ..	48.0 49.0	.. ..	5 5
Alclad One Side 2024-T72④⑩ Flat sheet	0.010–0.062 0.063–0.249	58.0 59.0	.. ..	44.0 45.0	.. ..	5 5
Alclad One Side 2024-T81 Flat sheet	0.010–0.062 0.063–0.249	64.0 66.0	.. ..	56.0 57.0	.. ..	5 5
Alclad One Side 2024-T851⑦ Plate	0.250–0.499	66.0	..	57.0	..	5
Alclad One Side 2024-T861⑪ Sheet and plate	0.020–0.062 0.063–0.249 0.250–0.499	67.0 70.0 69.0	.. .. ..	60.0 65.0 63.0	.. .. ..	3 4 4

For all numbered footnotes, see page 7-21.

TABLE 7.2 Mechanical Property Limits—Heat-Treatable Alloys ① ⑭ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTH—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ③
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
1½% ALCLAD ONE SIDE 2024⑥						
1½% Alclad One Side 2024-O Sheet and plate	0.188–0.499	..	32.0	..	14.0	12
1½% Alclad One Side 2024-T3⑧ Sheet	0.188–0.249	63.0	..	41.0	..	15
1½% Alclad One Side 2024-T351⑦⑧ Plate	0.250–0.499	63.0	..	41.0	..	12
1½% Alclad One Side 2024-T361⑧⑪ Sheet and plate	0.188–0.249 0.250–0.499	66.0 65.0	.. ..	49.0 48.0	.. ..	9 9
1½% Alclad One Side 2024-T42④⑩ Sheet and plate	0.188–0.249 0.250–0.499	61.0 61.0	.. ..	37.0 37.0	.. ..	15 12
1½% Alclad One Side 2024-T62④⑩ Sheet and plate	0.188–0.499	63.0	..	49.0	..	5
1½% Alclad One Side 2024-T72④⑩ Flat sheet	0.188–0.249	59.0	..	45.0	..	5
1½% Alclad One Side 2024-T81 Flat sheet	0.188–0.249	66.0	..	57.0	..	5
1½% Alclad One Side 2024-T851⑦ Plate	0.250–0.499	66.0	..	57.0	..	5
1½% Alclad One Side 2024-T861⑪ Sheet and plate	0.188–0.249 0.250–0.499	70.0 69.0	.. ..	65.0 63.0	.. ..	4 4
2036						
2036-T4 Flat sheet	0.025–0.125	42.0	..	23.0	..	20

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ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	AXIS OF TEST SPECIMEN	TENSILE STRENGTH—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ③
			ULTIMATE		YIELD		
			min.	max.	min.	max.	
2124-T351⑦ Plate	1.000–1.499	Longitudinal Long Transverse	61.0 62.0	.. ..	45.0 42.0	.. ..	14 13
	1.500–2.000	Longitudinal Long Transverse Short Transverse	61.0 62.0 58.0	.. .. ..	45.0 42.0 38.0	.. .. ..	14 13 4.5
	2.001–3.000	Longitudinal Long Transverse Short Transverse	61.0 62.0 58.0	.. .. ..	45.0 41.0 38.0	.. .. ..	14 10 4
2124-T851⑦⑯ Plate	1.000–2.000	Longitudinal Long Transverse Short Transverse	66.0 66.0 64.0⑮	.. .. ..	57.0 57.0 55.0⑮	.. .. ..	6 5 1.5⑮
	2.001–3.000	Longitudinal Long Transverse Short Transverse	65.0 65.0 63.0	.. .. ..	57.0 57.0 55.0	.. .. ..	6 4 1.5
	3.001–4.000	Longitudinal Long Transverse Short Transverse	65.0 65.0 62.0	.. .. ..	56.0 56.0 54.0	.. .. ..	5 4 1.5
	4.001–5.000	Longitudinal Long Transverse Short Transverse	64.0 64.0 61.0	.. .. ..	55.0 55.0 53.0	.. .. ..	5 4 1.5
	5.001–6.000	Longitudinal Long Transverse Short Transverse	63.0 63.0 58.0	.. .. ..	54.0 54.0 51.0	.. .. ..	5 4 1.5

For all numbered footnotes, see page 7-21.

TABLE 7.2 Mechanical Property Limits—Heat-Treatable Alloys ① ⑭ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTH—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ③
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
2219						
2219-O Sheet and plate	0.020–2.000	..	32.0	..	16.0	12
2219-T31⑧ Flat sheet	0.020–0.039 0.040–0.249	46.0 46.0	.. ..	29.0 28.0	.. ..	8 10
2219-T351⑦⑧ Plate	0.250–2.000 2.001–3.000 3.001–4.000 4.001–5.000 5.001–6.000	46.0 44.0 42.0 40.0 39.0	.. ..	28.0 28.0 27.0 26.0 25.0	.. ..	10 10 9 9 8
2219-T37⑧ Flat sheet and plate	0.020–0.039 0.040–2.000 2.001–2.500 2.501–3.000 3.001–4.000 4.001–5.000	49.0 49.0 49.0 47.0 45.0 43.0	.. ..	38.0 37.0 37.0 36.0 35.0 34.0	.. ..	6 6 6 6 5 4
2219-T62④⑩ Sheet and plate	0.020–0.039 0.040–0.249 0.250–1.000 1.001–2.000	54.0 54.0 54.0 54.0	.. ..	36.0 36.0 36.0 36.0	.. ..	6 7 8 7
2219-T81 Flat sheet	0.020–0.039 0.040–0.249	62.0 62.0	.. ..	46.0 46.0	.. ..	6 7
2219-T851⑦ Plate	0.250–1.000 1.001–2.000 2.001–3.000 3.001–4.000 4.001–5.000 5.001–6.000	62.0 62.0 62.0 60.0 59.0 57.0	.. ..	46.0 46.0 45.0 44.0 43.0 42.0	.. ..	8 7 6 5 5 4
2219-T87 Flat sheet and plate	0.020–0.039 0.040–0.249 0.250–1.000 1.001–2.000 2.001–3.000 3.001–4.000 4.001–5.000	64.0 64.0 64.0 64.0 64.0 62.0 61.0	.. ..	52.0 52.0 51.0 51.0 51.0 50.0 49.0	.. ..	5 6 7 6 6 4 3
ALCLAD 2219⑥						
Alclad 2219-O Sheet and plate	0.020–0.499 0.500–2.000	.. ..	32.0 32.0⑤	.. ..	16.0 16.0⑤	12 ..
Alclad 2219-T31⑧ Flat sheet	0.040–0.099 0.100–0.249	42.0 44.0	.. ..	25.0 26.0	.. ..	10 10
Alclad 2219-T351⑦⑧ Plate	0.250–0.499	44.0	..	26.0	..	10
Alclad 2219-T37⑧ Flat sheet and plate	0.040–0.099 0.100–0.249 0.250–0.499	45.0 47.0 47.0	.. .. ..	34.0 35.0 35.0	.. .. ..	6 6 6
Alclad 2219-T62④⑩ Sheet and plate	0.020–0.039 0.040–0.099 0.100–0.249 0.250–0.499 0.500–1.000 1.001–2.000	44.0 49.0 51.0 51.0 54.0⑤ 54.0⑤	.. ..	29.0 32.0 34.0 34.0 36.0⑤ 36.0⑤	.. ..	6 7 7 8 8 7
Alclad 2219-T81 Flat sheet	0.020–0.039 0.040–0.099 0.100–0.249	49.0 55.0 58.0	.. .. ..	37.0 41.0 43.0	.. .. ..	6 7 7
Alclad 2219-T851⑦ Plate	0.250–0.499	58.0	..	42.0	..	8
Alclad 2219-T87 Flat sheet and plate	0.040–0.099 0.100–0.249 0.250–0.499	57.0 60.0 60.0	.. .. ..	46.0 48.0 48.0	.. .. ..	6 6 7
6061						
6061-O Sheet and plate	0.006–0.007 0.008–0.009 0.010–0.020 0.021–0.128 0.129–0.499 0.500–1.000 1.001–3.000	.. ..	22.0 22.0 22.0 22.0 22.0 22.0 22.0	.. ..	12.0 12.0 12.0 12.0 12.0	10 12 14 16 18 18 16
6061-T4 Sheet	0.006–0.007 0.008–0.009 0.010–0.020 0.021–0.249	30.0 30.0 30.0 30.0	.. ..	16.0 16.0 16.0 16.0	.. ..	10 12 14 16

For all numbered footnotes, see page 7-21.

TABLE 7.2 Mechanical Property Limits—Heat-Treatable Alloys ① ⑭ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTH—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ③
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
6061 (Continued)						
6061-T451⑦⑧ Plate	0.250–1.000	30.0	..	16.0	..	18
	1.001–3.000	30.0	..	16.0	..	16
6061-T42④⑩ Sheet and plate	0.006–0.007	30.0	..	14.0	..	10
	0.008–0.009	30.0	..	14.0	..	12
	0.010–0.020	30.0	..	14.0	..	14
	0.021–0.249	30.0	..	14.0	..	16
	0.250–1.000	30.0	..	14.0	..	18
	1.001–3.000	30.0	..	14.0	..	16
6061-T6 and T62④⑩ Sheet	0.006–0.007	42.0	..	35.0	..	4
	0.008–0.009	42.0	..	35.0	..	6
	0.010–0.020	42.0	..	35.0	..	8
	0.021–0.249	42.0	..	35.0	..	10
6061-T62④⑩ and T651⑦ Plate	0.250–0.499	42.0	..	35.0	..	10
	0.500–1.000	42.0	..	35.0	..	9
	1.001–2.000	42.0	..	35.0	..	8
	2.001–4.000	42.0	..	35.0	..	6
	4.001–6.000⑨	40.0	..	35.0	..	6
ALCLAD 6061⑥						
Alclad 6061-O Sheet and plate	0.010–0.020	..	20.0	..	12.0	14
	0.021–0.128	..	20.0	..	12.0	16
	0.129–0.499	..	20.0	..	12.0	18
	0.500–1.000	..	22.0⑤	..	..	18
	1.001–3.000	..	22.0⑤	..	..	16
Alclad 6061-T4 Sheet	0.010–0.020	27.0	..	14.0	..	14
	0.021–0.249	27.0	..	14.0	..	16
Alclad 6061-T451⑦⑧ Plate	0.250–0.499	27.0	..	14.0	..	18
	0.500–1.000	30.0⑤	..	16.0⑤	..	18
	1.001–3.000	30.0⑤	..	16.0⑤	..	16
Alclad 6061-T42④⑩ Sheet and plate	0.010–0.020	27.0	..	12.0	..	14
	0.021–0.249	27.0	..	12.0	..	16
	0.250–0.499	27.0	..	12.0	..	18
	0.500–1.000	30.0⑤	..	14.0⑤	..	18
	1.001–3.000	30.0⑤	..	14.0⑤	..	16
Alclad 6061-T6 and T62④⑩ Sheet	0.010–0.020	38.0	..	32.0	..	8
	0.021–0.249	38.0	..	32.0	..	10
Alclad 6061-T62④⑩ and T651⑦ Plate	0.250–0.499	38.0	..	32.0	..	10
	0.500–1.000	42.0⑤	..	35.0⑤	..	9
	1.001–2.000	42.0⑤	..	35.0⑤	..	8
	2.001–3.000	42.0⑤	..	35.0⑤	..	6
	3.001–4.000	42.0⑤	..	35.0⑤	..	6
	4.001–5.000⑨	40.0⑤	..	35.0⑤	..	6

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	AXIS OF TEST SPECIMEN	TENSILE STRENGTH—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ③
			ULTIMATE		YIELD		
			min.	max.	min.	max.	
7050							
7050-T7451⑤⑦⑧⑬ Plate	0.250–2.000	Longitudinal	74.0	..	64.0	..	10
		Long Transverse	74.0	..	64.0	..	9
	2.001–3.000	Longitudinal	73.0	..	63.0	..	9
		Long Transverse	73.0	..	63.0	..	8
		Short Transverse	68.0	..	59.0	..	2
	3.001–4.000	Longitudinal	72.0	..	62.0	..	9
		Long Transverse	72.0	..	62.0	..	6
		Short Transverse	68.0	..	58.0	..	3
	4.001–5.000	Longitudinal	71.0	..	61.0	..	9
		Long Transverse	71.0	..	61.0	..	5
		Short Transverse	67.0	..	57.0	..	3
	5.001–6.000	Longitudinal	70.0	..	60.0	..	8
		Long Transverse	70.0	..	60.0	..	4
		Short Transverse	67.0	..	57.0	..	3
	6.001-7.000	Longitudinal	69.0	..	59.0	..	7
		Long Transverse	69.0	..	59.0	..	4
		Short Transverse	66.0	..	56.0	..	3
	7.001-8.000	Longitudinal	68.0	..	58.0	..	6
		Long Transverse	68.0	..	58.0	..	4
		Short Transverse	65.0	..	55.0	..	3

For all numbered footnotes, see page 7-21.