



Standard Specification for Magnesium-Alloy Sheet and Plate¹

This standard is issued under the fixed designation B 90/B 90M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope *

1.1 This specification covers magnesium alloys in sheet and plate form designated as shown in Table 1.

1.2 The values stated in either inch-pound or SI units are to be regarded separately as standards. The SI units are shown in brackets or in separate tables or columns. The values stated in each system are not exact equivalents; therefore, each system must be used independent of the other. Combining values from the two systems may result in nonconformance with the specification.

1.3 Unless the order specifies the “M” specification designation, the material shall be furnished to the inch-pound units.

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:

B 275 Practice for Codification of Certain Nonferrous Metals and Alloys, Cast and Wrought²

B 296 Practice for Temper Designations of Magnesium Alloys, Cast and Wrought²

B 557 Test Methods of Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products²

B 557M Test Methods of Tension Testing Wrought and Cast Aluminum- and Magnesium Alloy Products [Metric]²

B 660 Practices for Packaging/Packing of Aluminum and Magnesium Products²

B 661 Practice for Heat Treatment of Magnesium Alloys²

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specification³

E 35 Test Methods for Chemical Analysis of Magnesium and Magnesium Alloys⁴

E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition⁴

¹ This specification is under the jurisdiction of ASTM Committee B-7 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.04 on Magnesium Alloy Cast and Wrought Products.

Current edition approved Oct. 10, 1998. Published March 1999. Originally published as B 90 – 32 T. Last previous edition B 90 – 93.

² Annual Book of ASTM Standards, Vol 02.02.

³ Annual Book of ASTM Standards, Vol 14.02.

⁴ Annual Book of ASTM Standards, Vol 03.05.

2.3 Federal Standards:⁵

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

Fed. Std. No. 184 Identification Marking of Aluminum, Magnesium and Titanium

2.4 Military Standards:⁵

MIL-STD-129 Marking for Shipment and Storage

MIL-M-3171 Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on

3. Terminology

3.1 Definitions:

3.1.1 *plate*—a rolled product rectangular in cross section and form, of thickness 0.250 in., or more, [over 6.30 mm], either sheared or sawed edges.

3.1.2 *sheet*—a rolled product rectangular in cross section and form, of thickness of 0.006 through 0.249 in. [over 0.15 through 6.30 mm] with sheared, slit, or sawed edges.

4. Ordering Information

4.1 Orders for sheet and plate to this specification shall include the following information:

4.1.1 Quantity in pieces, pounds, or [kilograms]

4.1.2 Alloy (Section 5 and Table 1),

4.1.3 Temper (Section 6 and Table 2),

4.1.4 Thickness, width, and length,

4.1.5 Surface treatment (see 8.2),

4.1.6 Whether inspection is required at the manufacturer’s works (see 13.1), and

4.1.7 Whether certification of the material by the vendor is required (Section 15).

5. Chemical Composition

5.1 The sheet and plate shall conform to the chemical requirements in Table 1.

6. Tensile Properties

6.1 The sheet and plate shall conform to the tensile requirements in Table 2 [Table 3] unless other agreement is made between seller and purchaser. Properties for sizes and tempers not shown in Table 2 [Table 3] shall be as agreed upon by seller and purchaser.

⁵ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

TABLE 1 Chemical Composition Limits^A

NOTE 1—Analysis shall regularly be made only for the elements specifically mentioned in this table. If, however, the presence of other elements is suspected or indicated in amounts greater than the specified limits, further analysis shall be made to determine that these elements are not present in excess of the specified limits.

NOTE 2—The following applies to all specified limits in this table: For purposes of acceptance and rejection, an observed value or a calculated value obtained from analysis should be rounded to the nearest unit in the last right-hand place of figures used in expressing the specified limit.

	Composition % ^A												
	Al	Mn	R.E.	Zn	Zr	Ca	Cu	Fe	Ni	Si	Each	Total	Mg
AZ31B	2.5-3.5	0.20-1.0	...	0.6-1.4	...	0.04	0.05	0.005	0.005	0.10	...	0.30	Remainder

^A Limits are in weight percent maximum unless shown as a range.

TABLE 2 Tensile Requirements

NOTE 1—For purposes of determining conformance with this specification, each value for tensile strength and yield strength shall be rounded to the nearest 0.1 ksi, and each value for elongation shall be rounded to the nearest 0.5 %, both in accordance with the rounding method of Practice E 29.

Alloy and Temper	Specified Thickness, in.	Tensile Strength, min, ksi	Yield Strength (0.2 % Offset), min, ksi	Elongation in 2 in., or 4 × dia min, %
AZ31B-O	0.016–0.500	32.0 ^A	...	12
	0.501–2.000	32.0 ^A	...	10
	2.001–3.000	32.0 ^A	...	9
AZ31B-H24	0.016–0.249	39.0	29.0	6
	0.250–0.374	38.0	26.0	8
	0.375–0.500	37.0	24.0	8
	0.501–1.000	36.0	22.0	8
	1.001–2.000	34.0	20.0	8
	2.001–3.000	34.0	18.0	8
AZ31B-H26	0.250–0.374	39.0	27.0	6
	0.375–0.500	38.0	26.0	6
	0.501–0.750	37.0	25.0	6
	0.751–1.000	37.0	23.0	6
	1.001–1.500	35.0	22.0	6
	1.501–2.000	35.0	21.0	6

^A Tensile strength shall be 40.0 ksi max.

TABLE 3 Tensile Requirements [Metric]^A

Alloy and Temper	Specified Thickness, mm		Tensile Strength, MPa ^B		Yield Strength (0.2 % offset), MPa	Elongation, min %	
	Over	Through	Min	Max	Min	in 50 mm ^C	in 5 × dia (5.65 V A)
AZ31B-O	0.40	12.50	221	275	...	12	...
	12.50	50.00	221	275	9
	50.00	80.00	221	275	8
AZ31B-H24	0.40	6.30	269	...	200	6	...
	6.30	10.00	262	...	179	8	...
	10.00	12.50	255	...	165	8	...
	12.50	25.00	248	...	152	...	7
	25.00	50.00	234	...	138	...	7
	50.00	80.00	234	...	124	...	7
AZ31B-H26	6.30	10.00	269	...	186	6	...
	10.00	12.50	262	...	179	6	...
	12.50	20.00	255	...	172	...	5
	20.00	25.00	255	...	159	...	5
	25.00	40.00	241	...	152	...	5
	40.00	50.00	241	...	148	...	5

^A The basis for establishment of mechanical property limits as shown in Appendix X1.

^B To determine conformance to this specification each value for tensile strength shall be rounded to the nearest 1 MPa and each value for elongation to the nearest 0.5 %, both in accordance with the rounding-off method of Practice E 29.

^C Elongation in 50 mm apply for thicknesses up through 12.50 mm and in 5 × diameter (5.65 V A) for thicknesses over 12.50 mm where A is the cross-sectional area of the specimen.

7. Dimensional Tolerances

7.1 Variations from the specified thickness shall not exceed the amounts prescribed in Table 4 [Table 5].

7.2 Variations from the specified width shall not exceed the amounts prescribed in Table 6 [Table 7], Table 8 [Table 9], and Table 10 [Table 11].

7.3 Variations from the specified length shall not exceed the amounts prescribed in Table 12 [Table 13].

7.4 Squareness of sheet and plate shall conform to the requirements of Table 14 [Table 15].

7.5 Flatness of sheet and plate shall conform to the requirements of Table 16 [Table 17].

TABLE 4 Thickness Tolerances for Magnesium Flat and Coiled Sheet and Plate^A

Specified Thickness, in.	Thickness tolerance, in. ±						
	Specified Widths up to 18, incl	Over 18 through 36	Over 36 through 48	Over 48 through 54	Over 54 through 60	Over 60 through 66	Over 66 through 72
0.016–0.028	0.0015	0.002	0.0025	0.0035	0.004	0.004	0.004
0.029–0.036	0.002	0.002	0.0025	0.004	0.005	0.005	0.005
0.037–0.045	0.002	0.0025	0.003	0.004	0.005	0.005	0.005
0.046–0.068	0.0025	0.003	0.004	0.005	0.006	0.006	0.006
0.069–0.076	0.003	0.003	0.004	0.005	0.006	0.006	0.006
0.077–0.096	0.0035	0.0035	0.004	0.005	0.006	0.006	0.006
0.097–0.108	0.004	0.004	0.005	0.005	0.007	0.007	0.007
0.109–0.125	0.0045	0.0045	0.005	0.005	0.007	0.007	0.007
0.126–0.140	0.0045	0.0045	0.005	0.005	0.007	0.010	0.012
0.141–0.172	0.006	0.006	0.008	0.008	0.009	0.012	0.014
0.173–0.203	0.007	0.007	0.010	0.010	0.011	0.014	0.016
0.204–0.249	0.009	0.009	0.011	0.011	0.013	0.016	0.018
0.250–0.320	0.013	0.013	0.013	0.013	0.015	0.018	0.020
0.321–0.438	0.019	0.019	0.019	0.019	0.020	0.020	0.023
0.439–0.625	0.025	0.025	0.025	0.025	0.025	0.025	0.025
0.626–0.875	0.030	0.030	0.030	0.030	0.030	0.030	0.030
0.876–1.125	0.035	0.035	0.035	0.035	0.035	0.035	0.035
1.126–1.375	0.040	0.040	0.040	0.040	0.040	0.040	0.040
1.376–1.625	0.045	0.045	0.045	0.045	0.045	0.045	0.045
1.626–1.875	0.052	0.052	0.052	0.052	0.052	0.052	0.052
1.876–2.250	0.060	0.060	0.060	0.060	0.060	0.060	0.060
2.251–2.750	0.075	0.075	0.075	0.075	0.075	0.075	0.075
2.751–3.000	0.090	0.090	0.090	0.090	0.090	0.090	0.090
3.001–4.000	0.110	0.110	0.110	0.110	0.110	0.110	0.110
4.001–5.000	0.125	0.125	0.125	0.125	0.125	0.125	0.125
5.001–6.000	0.135	0.135	0.135	0.135	0.135	0.135	0.135

^A When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that applying to the mean of maximum and minimum dimensions permissible under the tolerance.

TABLE 5 Thickness Tolerances for Magnesium Flat and Coiled Sheet and Plate [Metric]^A

Specified Thickness, mm Over Through	Thickness tolerance, mm±						
	Specified Widths up to 450, incl.	Over 450 Through 900	Over 900 Through 1200	Over 1200 Through 1350	Over 1350 Through 1500	Over 1500 Through 1650	Over 1650 Through 1850
0.40–0.70	0.04	0.05	0.06	0.09	0.10	0.10	0.10
0.70–0.90	0.05	0.05	0.06	0.10	0.12	0.12	0.12
0.90–1.15	0.05	0.06	0.07	0.10	0.12	0.12	0.12
1.15–1.70	0.06	0.07	0.10	0.12	0.15	0.15	0.15
1.70–1.90	0.07	0.07	0.10	0.12	0.15	0.15	0.15
1.90–2.40	0.09	0.09	0.10	0.12	0.15	0.15	0.15
2.40–2.76	0.10	0.10	0.12	0.12	0.18	0.18	0.18
2.76–3.17	0.11	0.11	0.12	0.12	0.18	0.18	0.18
3.17–3.55	0.11	0.11	0.12	0.12	0.18	0.25	0.30
3.55–4.35	0.15	0.15	0.20	0.20	0.22	0.30	0.35
4.35–5.15	0.18	0.18	0.25	0.25	0.27	0.35	0.40
5.15–6.30	0.23	0.23	0.28	0.27	0.33	0.40	0.45
6.30–8.00	0.33	0.33	0.33	0.33	0.38	0.45	0.50
8.00–11.10	0.48	0.48	0.48	0.48	0.50	0.50	0.58
11.10–15.75	0.63	0.63	0.63	0.63	0.63	0.63	0.63
15.75–22.20	0.75	0.75	0.75	0.75	0.75	0.75	0.75
22.20–28.50	0.89	0.88	0.88	0.88	0.88	0.88	0.88
28.50–34.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00
34.90–41.25	1.14	1.14	1.14	1.14	1.14	1.14	1.14
41.25–47.60	1.32	1.32	1.32	1.32	1.32	1.32	1.32
47.60–57.15	1.52	1.52	1.52	1.52	1.52	1.52	1.52
57.15–69.85	1.90	1.90	1.90	1.90	1.90	1.90	1.90
69.85–76.20	2.28	2.25	2.25	2.25	2.25	2.25	2.25
76.20–100.00	2.79	2.75	2.75	2.75	2.75	2.75	2.75
100.00–125.00	3.15	3.15	3.15	3.15	3.15	3.15	3.15
125.00–150.00	3.40	3.40	3.40	3.40	3.40	3.40	3.40

^A When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that applying to the mean of maximum and minimum dimensions permissible under the tolerance.

7.6 Lateral bow of sheet and plate shall conform to the requirements of Table 18 [Table 19] and Table 20 [Table 21].

TABLE 6 Width Tolerances—Magnesium Flat Sheet^A

Specified Thickness, in.	Width tolerances, in. ±				
	Specified Widths up through 4	Over 4 through 18	Over 18 through 36	Over 36 through 54	Over 54 through 72
0.016–0.064	1/32	1/16	3/32	1/8	5/32
0.065–0.102	1/16	1/16	3/32	1/8	5/32
0.103–0.249	1/8	3/32	1/8	3/16	3/16

^A 0.016–0.099 sheared to above tolerances.
0.100–0.249 sawed or sheared to above tolerances.

TABLE 7 Width Tolerances, Magnesium Flat Sheet [Metric]^A

Specified Thickness, mm	Width tolerances, mm ±				
	Specified Widths up Through	Over 100 Through	Over 450 Through	Over 900 Through	Over 1350 Through
0.40–1.60	1.0	1.5	2.5	3	4
1.60–2.60	1.5	1.5	2.5	3	4
2.60–6.30	3.0	2.5	3.0	5	5

^A Over 0.40 through 2.50 sheared to above tolerances. Over 2.50 through 6.30 sawed or sheared to above tolerances.

TABLE 8 Width and Length Tolerances—Magnesium Sawed Flat Plate

Specified Thickness, in.	Tolerances, in. ± specified width ^A or length, in.			
	Up through 10	Over 10 through 48	Over 48 through 84	Over 84
0.250–6.000	3/32	3/16	1/4	5/16

^A Maximum width = 72 in.

TABLE 9 Width and Length Tolerances, Magnesium Sawed Flat Plate [Metric]

Specified Thickness, mm	Tolerances, mm ± specified width ^A or length			
	Up Through 250	Over 250 Through 1200	Over 1200 Through 2000	Over 2000
6.30–150.0	2.5	5	6.5	8

^A Maximum width = 1850 mm.

TABLE 10 Width Tolerances—Magnesium Coiled Sheet

Specified Thickness, in.	Width Tolerances, in. ±				
	Specified Widths up through 6	Over 6 through 12	Over 12 through 24	Over 24 through 48	Over 48 through 60
0.016–0.125	0.010	0.016	1/32	3/64	1/16

TABLE 11 Width Tolerances, Magnesium Coiled Sheet [Metric]

Specified Thickness, mm	Width Tolerances, mm ±				
	Specified Widths Up Through	Over 150 Through	Over 300 Through	Over 600 Through	Over 1200 Through
0.40–3.10	0.25	0.5	1	1	1.5

8. Workmanship, Finish and Appearance

8.1 All sheet and plate shall be commercially flat and free of buckles, shall be free of injurious surface defects, and have a workmanlike finish.

8.2 The sheet or plate shall be supplied in the finish specified by the purchaser. One of the following finishes should be specified:

- 8.2.1 Mill finish,
- 8.2.2 Mill finish and oiled,

TABLE 12 Length Tolerances—Magnesium Sheet^A

Specified Thickness, in.	Length tolerances, in. ±				
	Specified Lengths up through 18	Over 18 through 48	Over 48 through 120	Over 120 through 180	Over 180 through 540
0.016–0.249	1/16	3/32	1/8	5/32	1/4

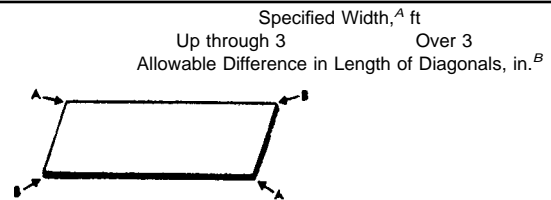
^A 0.016–0.099 sheared to above tolerances.
0.100–0.249 sawed or sheared to above tolerances.

TABLE 13 Length Tolerances-Magnesium Sheet [Metric]^A

Specified Thickness, mm	Length tolerance, mm ±				
	Specified Lengths up Through	Over 450 Through	Over 1200 Through	Over 3000 Through	Over 4550 Through
0.40–6.30	1.5	3	3	4	7

^A Over 0.40 through 2.50 sheared to above tolerances. Over 2.50 through 6.30 sawed or sheared to above tolerances.

TABLE 14 Squareness Tolerances—Magnesium Sheet and Plate

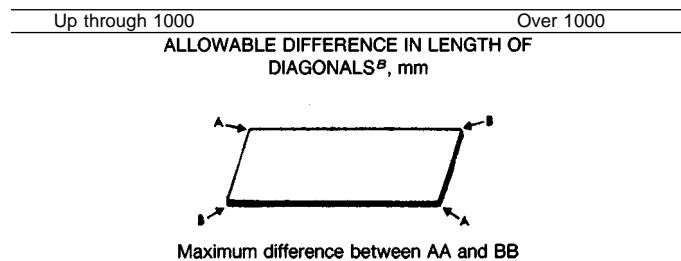


Specified Length, ft	Maximum Difference Between AA and BB	
Up through 12	3/32 × width, ft	5/64 × width, ft
Over 12	9/64 × width, ft	7/64 × width, ft

^A 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 specified width is 53 in. and specified length is 72 in. the tolerance is 5/64 in. × 5 = 25/64 in. This result is then rounded to 7/16 in. in accordance with next footnote.

^B Use values for calculating only. Round result upward to nearest 1/16 in.

TABLE 15 Squareness Tolerances, Magnesium Sheet and Plate [Metric]



Specified Length, mm	Up through 1000	Over 1000
Up through 3500	0.8 × each 100 mm ^A	0.7 × each 100 mm ^A
Over 3500	1.2 × each 100 mm ^A	1.0 × each 100 mm ^A

^A Above figures are for each 100 mm segment of width. If specified width is other than an exact multiple of 100 mm, tolerance is determined by using the next largest exact multiple. For example, if specified width is 750 mm and specified length is 2800 mm the tolerance is 0.8 mm × 8 = 6.4 mm. This result, if not a whole mm, is rounded upward to the nearest mm.

- 8.2.3 Chrome pickled, or
- 8.2.4 Chrome pickled and oiled.

9. Sampling for Chemical Analysis

9.1 *Ingots*—At least one sample shall be taken for each group of ingots of the same alloy poured from the same source

TABLE 16 Flatness Tolerances—Magnesium Flat Sheet and Plate

Specified Thickness, in.	Maximum Variation from Flat, ^A in.				
	AZ31B (-O and -H24 tempers)		AZ31B (-H26 temper)		HK31A and HM21A (all tempers)
	In any 1 ft ^B	In any 3 ft ^B	In any 1 ft ^B	In any 3 ft ^B	In any 6 ft or less
Under 0.126	commercially flat				
0.126–0.250	0.020	0.030	0.020	0.030	...
0.251–0.500	0.024	0.036	0.025	0.038	0.250
0.501–1.000	0.030	0.045	0.050	0.075	0.250
1.001–2.000	0.040	0.060	0.050	0.075	0.250

^A As measured with the plate resting on a flat surface, concave side upward, using a straightedge and a feeler gage, dial gage, or scale.

^B Standard measurement is on the 3-ft basis. Widths and lengths less than 3 ft, but more than 1 ft, have tolerances proportionately less than those for 3 ft, but not smaller than for any 1 ft. Widths and lengths less than 1 ft have tolerances proportionately less than those for any 1 ft.

TABLE 17 Flatness Tolerances, Magnesium Flat Sheet and Plate [Metric]

Specified Thickness, mm Over Through	Maximum Variation from Flat ^A mm				
	AZ31B (-O and H24 Tempers)		AZ31B (-H26 Temper)		HK31A and HM21A (all Tempers)
	In Any 300 mm ^B	In Any 900 mm ^B	In Any 300 mm ^B	In Any 900 mm ^B	In Any 1850 mm or Less
0–3.20	...				
3.20–6.30	0.50	0.75	0.50	0.75	6.35
6.30–12.50	0.60	0.90	0.63	0.95	6.35
12.50–25.00	0.75	1.10	1.25	1.90	6.35
25.00–50.00	1.00	1.50	1.25	1.90	6.35

^A As measured with the plate resting on a flat surface, concave side upward, using a straightedge and a feeler gage, dial gage, or scale.

^B Standard measurement is on the 900 mm basis. Widths and lengths less than 900 mm but more than 300 mm have tolerances proportionately less than those for 900 mm, but not smaller than for any 300 mm. Widths and lengths less than 300 mm have tolerances proportionately less than those for any 300 mm.

TABLE 18 Lateral Bow Tolerances—Magnesium Coiled Sheet

Specified Thickness, in.	Lateral Bow Tolerance, in.			
	Specified Length through 30	Over 30 through 60	Over 60 through 90	Over 90 through 120
0.016–0.125	1/16	1/4	1/2	1

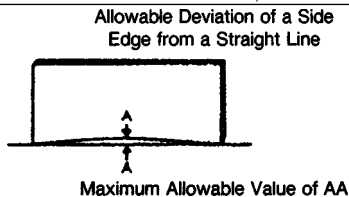
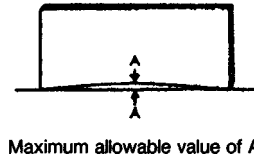


TABLE 19 Lateral Bow Tolerances, Magnesium Coiled Sheet [Metric]

Specified Thickness, mm Over Through	Specified Length—mm			
	Specified Length Through	Over 750 Through	Over 1500 Through	Over 2250 Through
0.40–3.20	1.55	6	13	25



10. Sampling for Tensile Properties

10.1 *Number of Tests*—One tension test specimen shall be taken from a sheet representing 1000 lb [455 kg] sheet or from a plate representing each 2000 lb [905 kg] of plate of the same alloy, temper, and thickness in the shipment or such other quantity as may be agreed upon by the seller and purchaser.

10.2 *Location of Specimens*—Tension test specimens shall be taken parallel to the direction of rolling. The specimen shall be taken midway between the two plate surfaces for plate in thicknesses of 0.500 through 1.500 in. [12.50 through 40 mm] and midway between the center and the surface of plate over 1.500 in. [40 mm] in thickness.

10.3 *Types of Specimens*—For sheet and plate less than 0.500 in. [12.50 mm] thick, the standard sheet-type specimen shown in Fig. 6 or for plate 0.500 in. [12.5 mm] or over those in Fig. 8 of Test Methods B 557 [Test B 557M] shall be used. If it is necessary to use specimens smaller than the standard specimens, they shall have dimensions proportional to those of Fig. 8 but not less than the following dimensions: reduced section, 1/4-in. [41.25 mm] diameter by 1-in. [20.00 mm] gage length; grip ends, 3/8-in. [9.5 mm] diameter; total length, 2 3/8 in. [60.3 mm] with shouldered ends, 3 in. [76.2 mm] with threaded ends, and 4 in. [101.6 mm] if tested with plain cylindrical ends. If material less than 3/4 in. [19.0 mm] in width is tested in full section because the specimens in Fig. 9 cannot be used, the elongation shall not be determined.

11. Methods of Chemical Analysis

11.1 Any suitable method of chemical analysis may be used. In case of dispute, the analysis shall be made by methods given in Methods E 35 or any other standard methods of analysis approved by ASTM unless some other method is agreed upon.

12. Methods of Tension Testing

12.1 *Tension Tests*—The tension tests shall be made in accordance with Test Methods B 557 [B 557M].

NOTE 1—The values obtained for the tensile properties covered by this specification are not seriously affected by variations in speed of testing. A considerable range of testing speed is permissible; however, the rate of stressing to the yield strength should not exceed 100 ksi/min [690 MPa], and above the yield strength, the movement per minute of the head under load should not exceed 0.5 in./in. [mm/mm] of gage length (or distance

of molten metal and analyzed to determine conformance to Table 1. Ingots not conforming shall be rejected.

9.2 *Finished Product*—Unless compliance is established by 9.1, sampling of the finished product shall be according to Method E 55. One sample shall be taken for 4000 lb [1815 kg] or less of material comprising the lot, except that not more than one analysis shall be required per piece.

TABLE 20 Lateral Bow Tolerances—Magnesium Flat Sheet and Plate

Specified Width, in.	Specified Thickness, in.	Allowable Deviation of a Side Edge from a Straight Line							
		Specified Length, in.							
		Through 30	Over 30 through 60	Over 60 through 90	Over 90 through 120	Over 120 through 150	Over 150 through 180	Over 180 through 210	Over 210 through 240
Tolerance, in.									
Under 4	0.016–0.125	1/16	1/4	1/2	1	1 1/2	2	3	4
4–34.99	0.016–0.249	1/32	1/16	3/32	1/8	3/16	1	1 1/2	2
35–72	0.016–0.249	1/32	1/16	3/32	1/8	3/16	5/16	7/16	9/16
Under 10.01	0.250–6.000	1/16	1/4	1/2	1	1 1/2	2	3	4
10.01–18	0.250–6.000	1/32	1/16	1/8	1/4	13/32	19/32	25/32	1
Over 18	0.250–6.000	1/32	1/16	3/32	1/8	3/16	5/16	7/16	9/16

TABLE 21 Lateral Bow Tolerances, Magnesium Flat Sheet and Plate [Metric]

Specified Width	Specified Thickness, mm	Allowable Deviation of a Side Edge from a Straight Line, mm									
		Specified Length, mm									
		Through 750	Over 750 Through 1500	Over 1500 Through 2250	Over 2250 Through 3000	Over 3000 Through 3750	Over 3750 Through 4550	Over 4550 Through 5250	Over 5250 Through 6000		
0	100	0.40	3.20	1.55	6.35	12.50	25.00	38.00	50.00	75.00	100.00
100	900	3.20	6.30	0.75	1.50	2.30	3.10	4.75	25.00	38.00	50.00
900		3.20	6.30	0.75	1.50	2.30	3.10	4.75	7.90	11.00	14.25
0	250	6.30	150	1.50	6.35	12.50	25.00	38.00	50.00	75.00	100.00
250	450	6.30	150	0.75	1.50	3.10	6.35	10.25	15.00	19.75	25.00
450		6.30	150	0.75	1.50	2.30	3.10	4.75	7.90	11.00	14.25

between grips for specimens not having reduced sections). Care must be exercised, especially when making yield strength determinations, that the speed of testing does not exceed the ability of the strain and load-indicating equipment to function satisfactorily.

12.2 *Retests*—If any tension specimen fails to conform to the requirements prescribed in Table 2 [Table 3], two additional specimens shall be selected and tested from other sheet or plate in the lot. If either of these specimens fails to conform to the applicable requirements, the material may be rejected. If, however, the failure of the specimens to conform to the requirements is the result of an inadequate thermal treatment, the material may be reheat treated and resampled in accordance with Section 9. Only one such reworking of the material shall be permitted.

13. Inspection

13.1 If the purchaser desires that his representative inspect or witness the inspection of material prior to shipment, such agreement shall be made by the purchaser and producer as part of the purchase contract.

13.2 When such inspection or witness of inspection and testing is agreed upon, the producer shall afford the purchaser's representative all reasonable facilities to satisfy him that the material meets the requirements of this specification. Inspection and tests shall be conducted so there is no unnecessary interference with the producer's operations.

14. Rejection

14.1 Material that fails to conform to this specification may be rejected, and if rejected, the producer's responsibility shall be limited to replacing the rejected material. The full weight of the rejected material shall be returned to the manufacturer.

15. Certification

15.1 When agreed in writing by the purchaser and seller, the seller shall certify that the material has been sampled, tested, and inspected in accordance with the provisions of the specification. Each certificate so furnished shall be signed by an authorized agent of the producer or seller.

16. Packaging and Package Marking

16.1 The material shall be packaged in such a manner as to prevent damage in ordinary handling and transportation. The type of packaging and gross weight of individual containers shall be left to the discretion of the producer unless otherwise agreed upon. Packaging methods and containers shall be so selected as to permit maximum utility of mechanical equipment in unloading and subsequent handling. Each package or container shall contain only one size, alloy or condition of material when packed for shipment unless otherwise agreed upon.

16.2 Each package or container shall be marked with the purchase order number, size of material, specification number, alloy and condition, gross and net weights, and name of the producer.

16.3 Packages or containers shall be such as to ensure acceptance by common or other carriers for safe transportation at the lowest rate to the point of delivery.

16.4 When specified in the contract or purchase order, material shall be preserved, packaged, and packed in accordance with the requirements of Practice B 660. The applicable levels shall be as specified in the contract or order. Marking for shipment of such material shall be in accordance with Fed. Std.

No. 123 for civil agencies and MIL-STD-129 for military agencies.

16.5 When specified in the contract or purchase order, material shall be marked in accordance with Fed. Std. No. 184.

APPENDIX

(Nonmandatory Information)

X1. EXPLANATORY NOTES

X1.1 General Information

X1.1.1 Alloy AZ31B is a general-purpose alloy with good weldability, high strength, and the best cold formability.

X1.2 Specific Gravity

X1.2.1 All of the alloys have a specific gravity of about 1.8.

X1.3 Protection

X1.3.1 Either the chrome pickle or the oil finish affords a measurable protection against tarnish and corrosion during shipment and storage of the sheet. The oil finish is frequently preferred by purchasers intending to perform forming or drawing operations on the sheet or plate. If desired, MIL-M-3171 can be used for the chrome pickle.

TABLE X1.1 Unit Deformation Values [includes Metric]

NOTE 1—The yield strength of magnesium-base alloys is defined as the stress at which the stress-strain curve deviates 0.2 % from the modulus line. It may be determined by the “Offset Method” or the “Extension-Under-Load Method” (the latter is often referred to as the “Approximate Method Without the Stress-Strain Diagram”) as described in Test Methods B 557 [B 557M]. In case of dispute, the “Offset Method” shall be used.

NOTE 2—The unit deformation values given in Table X1.1 for use with the “Extension-Under-Load Method” are based on a modulus of elasticity, $E = 6,500,000$ psi [4.48 GPa].

Alloy and Temper	Yield Strength (0.2 % offset), min, ksi (MPa)	Unit Deformation, in./in. (mm/mm) of gage length
AZ31B-H24	29.0 (200)	0.0065
	26.0 (179)	0.0060
	24.0 (165)	0.0057
	22.0 (152)	0.0054
	20.0 (138)	0.0051
	18.0 (124)	0.0048
AZ31B-H26	27.0 (186)	0.0062
	26.0 (179)	0.0060
	25.0 (172)	0.0058
	23.0 (159)	0.0055
	22.0 (152)	0.0054
	21.0 (145)	0.0052

SUMMARY OF CHANGES

This section identifies the location of changes that have been incorporated since the last issue.

(1) Alloys AZ31C, HK31A, HM21A, LA141A, and ZE10A were deleted from the standard.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 100 Barr Harbor Drive, West Conshohocken, PA 19428.