Designation: B107/B107M – 13

Standard Specification for Magnesium-Alloy Extruded Bars, Rods, Profiles, Tubes, and Wire[1]

This standard is issued under the fixed designation B107/B107M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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

1. Scope*

1.1 This specification covers magnesium-alloy extruded bars, rods, profiles, tubes, and wire of the composition given 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 order acceptance form a part of this specification to the extent referenced herein.

2.2 *ASTM Standards:*[2]

B117 Practice for Operating Salt Spray (Fog) Apparatus

B296 Practice for Temper Designations of Magnesium Alloys, Cast and Wrought

B557 Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products

B557M Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products (Metric)

B660 Practices for Packaging/Packing of Aluminum and Magnesium Products

B666/B666M Practice for Identification Marking of Aluminum and Magnesium Products

B951 Practice for Codification of Unalloyed Magnesium and Magnesium-Alloys, Cast and Wrought

B953 Practice for Sampling Magnesium and Magnesium Alloys for Spectrochemical Analysis

B954 Test Method for Analysis of Magnesium and Magnesium Alloys by Atomic Emission Spectrometry

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

3. Terminology

3.1 *Definitions:*

3.1.1 *extruded bar*—a solid extrusion, long in relation to its cross-sectional dimensions, having a symmetrical cross section that is square or rectangular with sharp or rounded corners or edges, or is a regular hexagon or octagon, and whose width or greatest distance between parallel faces is over 0.375 in. [10 mm].

3.1.2 *extruded profile*—a hollow or solid extrusion, long in relation to its cross-sectional dimensions, whose cross section is other than that of wire, rod, bar, or tube.

3.1.3 *extruded rod*—a solid round extrusion, long in relation to its diameter, whose diameter is over 0.375 in. [10 mm].

3.1.4 *extruded tube*—a hollow extrusion, long in relation to its cross-sectional dimensions, which is symmetrical and is round, square, rectangular, hexagonal, octagonal, or elliptical with sharp or rounded corners, and has a uniform wall thickness except as affected by corner radii.

3.1.5 *producer*—the primary manufacturer of a material.

3.1.6 *supplier*—includes only the category of jobbers and distributors as distinct from producer.

3.1.7 *wire*—a solid section long in relation to its cross-sectional dimensions, having a cross section that is round, hexagonal, or octagonal, and whose diameter, width, or greatest distance between parallel faces is up through 0.375 in. [10

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

Current edition approved Nov. 1, 2013. Published December 2013. Originally approved in 1936. Last previous edition approved in 2012 as B107/B107M – 12. DOI: 10.1520/B0107_B0107M-13.

[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.

***A Summary of Changes section appears at the end of this standard**

TABLE 1 Chemical Requirements[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 the course of routine analysis to be in amounts greater than the specified limits, further analysis shall be made to determine that the total of these other elements is not in excess of the limits specified in the last column of the table.

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-off to the nearest unit in the last right-hand place of figures used in expressing the specified limit.

Alloy[B]		Composition, %														
UNS No.	ASTM No.	Magnesium	Aluminum	Calcium	Copper	Iron	Lithium	Manganese	Neodymium	Nickel	Rare Earths	Silicon	Yttrium	Zirconium, min	Zinc	Other Impurities, each	Total Other[C] Impurities
M11311	AZ31B	remainder	2.5-3.5	0.04	0.05	0.005		0.20-1.0		0.005		0.10		...	0.6-1.4		0.30
M11312	AZ31C	remainder	2.4-3.6	...	0.10	...		0.15-1.0[D]		0.03		0.10		...	0.50-1.5		0.30
M11610	AZ61A	remainder	5.8-7.2	...	0.05	0.005		0.15-0.5		0.005		0.10		...	0.40-1.5		0.30
M11800	AZ80A	remainder	7.8-9.2	...	0.05	0.005		0.12-0.5		0.005		0.10		...	0.20-0.8		0.30
M15100	M1A	remainder	...	0.30	0.05	...		1.2-2.0		0.01		0.10		...	...		0.30
M18432	WE43B	remainder	...	...	0.02	0.010	0.2	0.03	2.0-2.5	0.005	1.9[E]	...	3.7-4.3	0.40-1.0	[F]	0.01	...
M18434	WE43C	remainder	...	...	0.02	0.005		0.03	2.0-2.5	0.0020	0.3-1.0[G]		3.7-4.3	0.2-1.0	0.06	0.01	...
M18410	WE54A	remainder	...	...	0.03	...	0.2	0.03	1.5-2.0	0.005	2.0[E]	0.01	4.75-5.5	0.40-1.0	0.20	0.2	...
M16400	ZK40A	remainder	...	...	...	...		...		...		...		0.45	3.5–4.5		0.30
M16600	ZK60A	remainder	...	...	...	...		...		...		...		0.45	4.8-6.2		0.30

[A] Limits are in weight percent maximum unless shown as a range or otherwise stated.
[B] These alloy designations were established in accordance with Practice B951 (see also Practice E527).
[C] Includes listed elements for which no specific limit is shown.
[D] Manganese minimum limit need not be met if iron is 0.005 %, or less.
[E] Other Rare Earths shall be principally heavy rare earths, for example, Gadolinium, Dysprosium, Erbium, and Ytterbium. Other Rare Earths are derived from the Yttrium, typically 80 % Yttrium 20 % heavy rare earths.
[F] Zinc + Silver content shall not exceed 0.20 % in WE43B.
[G] Other Rare Earths are heavy rare earths, such as Gadolinium, Dysprosium, Erbium, Samarium, and Ytterbium. The total of Gadolinium + Dysprosium + Erbium shall be 0.3-1.0 %. Samarium shall not exceed 0.04 % and Ytterbium shall not exceed 0.02 %

mm], or having a symmetrical cross section that is square or rectangular (excluding flattened wire) with sharp or rounded corners or edges.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *capable of*—means that the test need not be performed by the producer of the material. However, should subsequent testing by the purchaser establish that the material does not meet these requirements, the material shall be subject to rejection.

4. Ordering Information

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

4.1.1 This specification number,

4.1.2 Quantity in pieces or pounds [kilograms],

4.1.3 Alloy (Section 6),

4.1.4 Temper (Section 7),

4.1.5 Nominal cross-sectional dimensions as follows:

4.1.5.1 For rod and round wire—diameter,

4.1.5.2 For square corner bars and wire—depth and width,

4.1.5.3 For sharp cornered hexagonal or octagonal bars and wire—distance across flats,

4.1.5.4 For round tube—outside or inside diameter and wall thickness,

4.1.5.5 For square or sharp cornered other than round tube—distance across flats and wall thickness,

4.1.5.6 For round cornered bars and wire; profiles; tube other than round, square, rectangular, hexagonal or octagonal with sharp corners—drawing required,

4.1.6 Length,

4.1.7 Surface finish (see 10.2),

4.1.8 Whether inspection or witness of inspection and tests by the purchaser's representative is required prior to material shipment (Section 11),

4.1.9 Whether certification is required (Section 13),

4.1.10 Whether marking for identification is required (Section 14 and Practice B660).

4.1.11 Whether special packaging is required for shipment (Section 15).

5. Quality Assurance

5.1 *Responsibility for Inspection*—Unless otherwise specified in the contract or purchase order, the producer or supplier is responsible for the performance of all inspection and test requirements specified herein. Except as otherwise specified in the contract or order, the producer or supplier may use his own or any other suitable facilities for the performance of the

inspection and test requirements specified herein, unless disapproved by the purchaser at the time the order is placed. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to assure that material conforms to prescribed requirements.

6. Chemical Composition

6.1 *Limits*—The bars, rods, profiles, tubes, or wire shall conform to the chemical requirements in Table 1.

6.2 *Number of Samples*—The number of samples taken for determination of chemical composition shall be as follows:

6.2.1 When samples are taken at the time extrusion ingots are cast for determination of conformance to Table 1, one sample shall be taken for each group of ingots of the same alloy, poured at the same time, from the same source of molten metal when a batch process is employed. In cases where a continuous casting process is employed, one sample shall be taken for each quantity of material cast equivalent in size (weight or volume) to the last holding vessel before casting or 5000 lb [2270 kg], whichever is less. Ingots not conforming to Table 1 shall be rejected.

6.2.2 Unless compliance is established by 6.2.1, sampling of the finished product shall be in accordance with Practice E55. One sample shall be taken for each 4000 lb (2000 kg) or less of material comprising the lot, except that not more than one analysis shall be required per piece.

6.3 *Methods of Chemical Analysis*—Any suitable method of chemical analysis may be used. In case of dispute, the analysis shall be made by methods given in Test Method B954 or any other standard methods of analysis approved by ASTM unless some other method is agreed upon.

7. Tensile Requirements

7.1 *Limits*—The bars, rods, profiles, tubes, and wire shall conform to the tensile properties requirements in Table 2 unless other agreement is made between producer or supplier and purchaser. Properties for sizes and tempers not shown in Table 2 shall be as agreed by producer or supplier and purchaser.

7.2 *Number of Specimens*—From material having nominal weight of less than 1 lb/linear ft [through 1.7 kg/linear m], one tension test sample shall be taken for each 1000 lb [500 kg] or fraction thereof in the shipment. For material having a nominal weight of 1 lb/linear ft [over 1.7 kg/linear m] or more, one tension test shall be taken for each 1000 ft [300 m] or fraction thereof in the shipment. Other procedures for selecting samples may be employed if agreed upon by the seller and the purchaser.

7.3 Geometry of test specimens and the location in the product from which they are taken shall be as specified in Test Methods B557 and B557M.

7.4 *Test Methods*—The tension tests shall be made in accordance with Test Methods B557 and B557M.

7.5 *Retests*—If any tension specimen fails to conform to the requirements prescribed in Table 2, two additional specimens shall be selected and tested from other bars, rods, profiles, tubes, or wire 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 7.2.

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 100 psi and each value for elongation shall be rounded to the nearest 0.5 %, both in accordance with the rounding method of Practice E29.

Alloy[A]		Temper[A]	Form	Specified Diameter or Thickness	Over-Through	Specified Cross-Sectional Area, in.^{2} or OD of Tube, in.	Tensile Strength, min		Yield Strength (0.2 % offset), min		Elongation in 2 in. [50 mm] or 4 × Dia., min, %[B,C]
UNS No.	ASTM No.			in.[D,E]	[mm]		ksi	[MPa]	ksi	[MPa]	
M11311	AZ31B	F	bars, rods, profiles, and wire	0.249 and under	[...–6.30]	all	35.0	[240]	21.0	[145]	7
				0.250–1.499	[6.30–40.00]	all	35.0	[240]	22.0	[150]	7
				1.500–2.499	[40.00–60.00]	all	34.0	[235]	22.0	[150]	7
				2.500–4.999	[60.00–130.00]	all	32.0	[220]	20.0	[140]	7
			hollow profiles	all		all	32.0	[220]	16.0	[110]	8
			tubes	0.028–0.250	[0.70–6.30]	6.000 [150.00] and under	32.0	[220]	20.0	[140]	8
				0.250–0.750	[6.30–20.00]		32.0	[220]	16.0	[110]	4
M11610	AZ61A	F	bars, rods, profiles, and wire	0.249 and under	[...–6.30]	all	38.0	[260]	21.0	[145]	8
				0.250–2.499	[6.30–60.00]	all	40.0	[275]	24.0	[165]	9
				2.500–4.999	[60.00–130.00]	all	40.0	[275]	22.0	[150]	7

TABLE 2 *Continued*

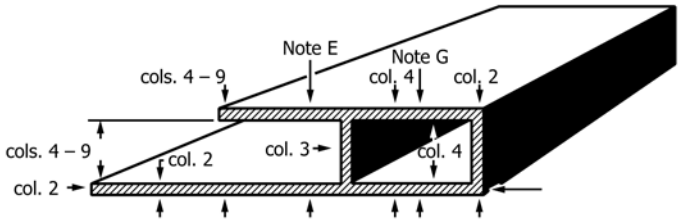
Alloy[A]		Temper[A]	Form	Specified Diameter or Thickness	Over-Through	Specified Cross-Sectional Area, in.^{2} or OD of Tube, in.	Tensile Strength, min		Yield Strength (0.2 % offset), min		Elongation in 2 in. [50 mm] or 4 × Dia., min, %[B,C]
UNS No.	ASTM No.			in.[D,E]	[mm]		ksi	[MPa]	ksi	[MPa]	
			hollow profiles	all		all	36.0	[250]	16.0	[110]	7
			tubes	0.028–0.750	[0.70–20.00]	6.000 [150.00] and under	36.0	[250]	16.0	[110]	7
M11800	AZ80A	F	bars, rods, solid profiles, and wire	0.249 and under	[...–6.30]	all	43.0	[295]	28.0	[195]	9
				0.250–1.499	[6.30–40.00]	all	43.0	[295]	28.0	[195]	8
				1.500–2.499	[40.00–60.00]	all	43.0	[295]	28.0	[195]	6
				2.500–4.999	[60.00–130.00]	all	42.0	[290]	27.0	[185]	4
M11800	AZ80A	T5	bars, rods, solid profiles, and wire	0.249 and under	[...–6.30]	all	47.0	[325]	30.0	[205]	4
				0.250–2.499	[6.30–60.00]	all	48.0	[330]	33.0	[230]	4
				2.500–4.999	[60.00–130.00]	all	45.0	[310]	30.0	[205]	2
M15100	M1A	F	bars, rods, profiles, and wire	0.249 and under	[...–6.30]	all	30.0	[205]	[F]	[F]	2
				0.250–1.499	[6.30–40.00]	all	32.0	[220]	[F]	[F]	3
				1.500–2.499	[40.00–60.00]	all	32.0	[220]	[F]	[F]	2
				2.500–4.999	[60.00–130.00]	all	29.0	[200]	[F]	[F]	2
			hollow profiles	all		all	28.0	[195]	[F]	[F]	2
			tubes	0.028–0.750	[0.70–20.00]	6.000 [150.00] and under	28.0	[195]	[F]	[F]	2
M18430	WE43B	T5	bars, rods, solid profiles and wire	0.250-1.999	[6.3-50.00]	all	36.0	[250]	23.0	[160]	4
M18430	WE43B	T5	bars, rods, solid profiles and wire	2.00-5.00	[50-130.00]	all	35.0	[240]	22.0	[150]	4
M18430	WE43B	T6	bars, rods, solid profiles and wire	0.250-1.999	[6.3-50.00]	all	36.0	[250]	22.0	[150]	4
M18430	WE43B	T6	bars, rods, solid profiles and wire	2.00-5.00	[50-130.00]	all	35.0	[240]	20.0	[140]	4
M18434	WE43C	T5	bars, rods, solid profiles and wire	0.5 - 4.75	[12.7-120.00]	all	44.0	[303]	28.0	[195]	6
M18410	WE54A	T5	bars, rods, solid profiles and wire	0.250-1.999	[6.3-50.00]	all	36.0	[250]	26.0	[180]	4
M18410	WE54A	T5	bars, rods, solid profiles and wire	2.00-5.00	[50-130.00]	all	36.0	[250]	25.0	[170]	4

TABLE 2 *Continued*

Alloy[A]		Temper[A]	Form	Specified Diameter or Thickness	Over-Through	Specified Cross-Sectional Area, in.^{2} or OD of Tube, in.	Tensile Strength, min		Yield Strength (0.2 % offset), min		Elongation in 2 in. [50 mm] or 4 × Dia., min, %[B,C]
UNS No.	ASTM No.			in.[D,E]	[mm]		ksi	[MPa]	ksi	[MPa]	
M18410	WE54A	T6	bars, rods, solid profiles and wire	0.250-1.999	[6.3-50.00]	all	38.0	[260]	26.0	[180]	4
M18410	WE54A	T6	bars, rods, solid profiles and wire	2.00-5.00	[50-130.00]	all	36.0	[250]	25.0	[175]	4
M16400	ZK40A	T5	bars, rods, profiles, and wire	all		3.000 [1900] and under	37.0	[255]	34.0	[235]	4.0
			hollow profiles	all		all	40.0	[275]	37.0	[255]	4.0
			tubes	0.062–0.500	[1.60–12.50]	3.000 [80.00] and under	40.0	[275]	36.0	[255]	4.0
M16600	ZK60A	F	bars, rods, profiles and wire	all		4.999 [3200] and under	43.0	[295]	31.0	[215]	5
						5.000–39.999 [3201–26 000]	43.0	[295]	31.0	[215]	6
			hollow profiles	all		all	40.0	[275]	28.0	[195]	5
			tubes	0.028–0.750	[0.70–20.00]	3.000 [80.00] and under	40.0	[275]	28.0	[195]	5
M16600	ZK60A	T5	bars, rods, profiles,and wire	all		4.999 [3200] and under	45.0	[310]	36.0	[250]	4
						5.000–24.999 [3201–16 000]	45.0	[310]	34.0	[235]	6
						25.000–39.999 [16 001–26 000]	43.0	[295]	31.0	[215]	6
			hollow profiles	all		all	46.0	[315]	38.0	[260]	4
			tubes	0.028–0.250	[0.70–6.30]	3.000 [80.00] and under	46.0	[315]	38.0	[260]	4
				0.094–1.188	[2.50–30.00]	3.001 [80.00]–8.500 [215]	44.0	[305]	33.0	[230]	4

[A] See Practice B296.
[B] Elongation of full-section and machined sheet-type specimens is measured in 2 in. [50 mm] of machined round specimens, in 4 × specimen dia. [5 × dia. in metric].
[C] For material of such dimensions that a standard test specimen cannot be obtained, for wire less than 0.125 in. diameter [3.2 mm diameter], or for material thinner than 0.062 in. [1.60 mm] the test for elongation is not required.
[D] Intermediate dimensions shall be rounded off to the third decimal place in accordance with Practice E29.
[E] Wall thickness of tubes.
[F] Not required.

TABLE 3 Cross-Sectional Tolerances for Bars, Rods, Profiles, and Wire[A]



Specified Dimension, in.	Tolerance[B,C] in. ±							
	Metal Dimensions		Space Dimensions					
	Allowable Deviation from Specified Dimension Where 75% or More of the Dimension is Metal[D]		Allowable Deviation from Specified Dimension Where More than 25% of the Dimension is Space[E,F]					
	All Except Those Covered By Column 3	Wall Thickness[G,H,I] Completely Enclosing Space 0.11 in.^{2} and Over (Eccentricity)	At Dimensioned Points 0.250–0.624 in. from Base of Leg	At Dimensioned Points 0.625–1.249 in. from Base of Leg	At Dimensioned Points 1.250–2.499 in. from Base of Leg	At Dimensioned Points 2.500–3.999 in. from Base of Leg	At Dimensioned Points 4.000–5.999 in. from Base of Leg	At Dimensioned Points 6.000–8.000 in. from Base of Leg
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
Circumscribing Circle Sizes Less than 10 in. in Dia								
0.124 and under	0.006	±10 % of specified	0.010	0.012	...	...	...	...
0.125–0.249	0.007	dimension:	0.012	0.014	0.016	...	...	...
0.250–0.499	0.008	±0.060 max	0.014	0.016	0.018	0.020	...	...
0.500–0.749	0.009	±0.010 min	0.016	0.018	0.020	0.022	...	...
0.750–0.999	0.010		0.018	0.020	0.022	0.025	0.30	...
1.000–1.499	0.012		0.021	0.023	0.026	0.030	0.035	...
1.500–1.999	0.014		0.024	0.026	0.031	0.036	0.042	0.050
2.000–3.999	0.024		0.034	0.038	0.048	0.057	0.068	0.080
4.000–5.999	0.034		0.044	0.050	0.064	0.078	0.094	0.110
6.000–7.999	0.044		0.054	0.062	0.082	0.099	0.120	0.140
8.000–9.999	0.054		0.064	0.074	0.100	0.120	0.145	0.170
Circumscribing Circle Sizes 10 in. in Dia and Over								
0.124 and under	0.014	±15 % of specified	0.018	0.020	...	...	...	...
0.125–0.249	0.015	dimension:	0.019	0.022	0.028	...	...	...
0.250–0.499	0.016	±0.090 max	0.020	0.024	0.030	0.050	...	...
0.500–0.749	0.017	±0.015 min	0.022	0.027	0.040	0.060	...	...
0.750–0.999	0.018		0.023	0.030	0.050	0.070	0.090	...
1.000–1.499	0.019		0.024	0.034	0.060	0.080	0.100	...
1.500–1.999	0.024		0.034	0.044	0.070	0.090	0.110	0.170
2.000–3.999	0.034		0.044	0.054	0.080	0.100	0.120	0.180
4.000–5.999	0.044		0.054	0.064	0.090	0.110	0.130	0.190
6.000–7.999	0.054		0.064	0.074	0.100	0.120	0.140	0.200
8.000–9.999	0.064		0.074	0.084	0.110	0.130	0.150	0.210
10.000–11.999	0.074		0.084	0.094	0.120	0.140	0.160	0.220
12.000–13.999	0.084		0.094	0.104	0.130	0.150	0.170	0.230
14.000–15.999	0.094		0.104	0.114	0.140	0.160	0.180	0.240
16.000–17.999	0.104		0.114	0.124	0.150	0.170	0.190	0.250
18.000–19.999	0.114		0.124	0.134	0.160	0.180	0.200	0.260
20.000–21.999	0.124		0.134	0.144	0.170	0.190	0.210	0.270
22.000–23.999	0.134		0.144	0.154	0.180	0.200	0.220	0.280

[A] These tolerances are applicable to the average profile. Wider tolerances may be required for some profiles and closer tolerances may be possible for others.

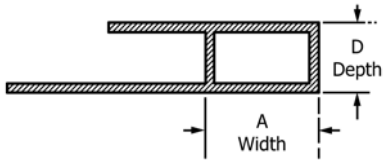
[B] The tolerances applicable to a dimension composed of two or more component dimensions is the sum of the tolerances of the component dimensions if all of the component dimensions are indicated.

[C] When a tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum dimensions permissible under the tolerance.

[D] These tolerances do not apply to space dimensions such as dimensions *X* and *Z* of the example even when *Y* is 75 % or more of *X*. For the tolerance applicable to dimensions *X*, use Col. 4, 5, 6, 7, 8 or 9, dependent on distance *A* and the circumscribing circle diameter.

[E] At points less than 0.250 in. from base of leg the tolerances in Column 2 are applicable.

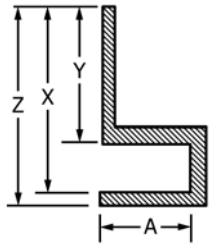
[F] The following tolerances apply where the space is completely enclosed (hollow profiles): For the width (*A*) the tolerance is the value shown in Column 4 for the depth (*D*), the tolerance is the value shown in Column 4 for the width (*A*). In no case is the tolerance for either width or depth less than at the corners (Column 2, metal dimensions).



Example—Hollow profile having 1 by 3 in. rectangular outside dimensions and having a circumscribing circle diameter less than 10 in.: width tolerance is± 0.024 in. and depth tolerance ±0.034 in. (Tolerances at corners, Column 2, metal dimensions, are ±0.024 in. for the width and ±0.012 in. for the depth.)

[G] Where dimensions specified are outside and inside, rather than wall thickness itself, the allowable deviation (eccentricity) given in Column 3 applies to mean wall thickness (mean wall thickness is the average of two wall thickness measurements taken at opposite sides of the void).

[H] In the case of Class 1 Hollow Profiles the standard wall thickness tolerance for extruded round tube is applicable. (A Class 1 Hollow Profile is one whose void is round and 1 in. or more in diameter and whose weight is equally distributed on opposite sides of two or more equally spaced axes.)



[I] Tolerance applicable to the wall thickness enclosing the void of hollow and semihollow profiles is subject to negotiation when the nominal thickness of one wall is three times or greater than that of the opposite wall.

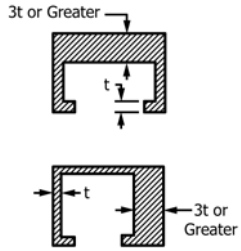
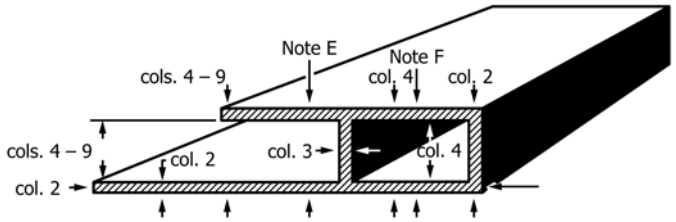


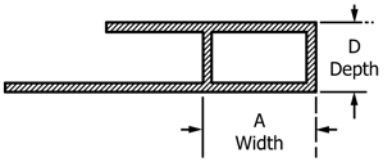
TABLE 4 Cross Section Tolerances for Bars, Rods, Profiles, and Wire [Metric][A]



Specified Dimensions (mm)		Tolerance[B,C] mm ±							
		Metal Dimensions		Space Dimensions					
		Allowable Deviation from Specified Dimension Where 75 % or More of the Dimension is Metal[D]		Allowable Deviation from Specified Dimension Where More than 25 % of the Dimension is Space[E,F]					
		All Except Those Covered by Column 3	Wall Thickness Completely Enclosing Space 7.0 mm and Over (Eccentricity) [G,H,I]	At Dimensioned Points Over 5 through 15 mm from Base of Leg	At Dimensioned Points Over 15 through 30 mm from Base of Leg	At Dimensioned Points Over 30 through 60 mm from Base of Leg	At Dimensioned Points Over 60 through 100 mm from Base of Leg	At Dimensioned Points Over 100 through 150 mm from Base of Leg	At Dimensioned Points Over 150 through 200 mm from Base of Leg
Col. 1		Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
Over	Through	Circumscribing Circle Sizes Thru 250 mm in Diameter							
0	3.20	0.15	±10 % of specified	0.25	0.30	...	...	...	...
3.20	6.30	0.18	dimensions:	0.30	0.36	0.41	...	...	...
6.30	12.50	0.20	±1.50 max	0.36	0.41	0.46	0.50	...	...
12.50	20.00	0.23	±0.25 min	0.41	0.46	0.50	0.56	...	...
20.00	25.00	0.25		0.46	0.50	0.56	0.64	0.76	...
25.00	40.00	0.30		0.54	0.58	0.66	0.76	0.88	...
40.00	50.00	0.36		0.60	0.66	0.78	0.92	1.05	1.25
50.00	100.00	0.60		0.86	0.96	1.20	1.45	1.70	2.05
100.00	150.00	0.86		1.10	1.25	1.65	2.00	2.40	2.80
150.00	200.00	1.10		1.35	1.55	2.10	2.50	3.05	3.55
200.00	250.00	1.35		1.65	1.90	2.50	3.05	3.70	4.30
		Circumscribing Circle Sizes Over 250 mm in Diameter							
0	3.20	0.36	±15 % of specified	0.46	0.50	...	...	...	...
3.20	6.30	0.38	dimensions:	0.48	0.56	0.72	...	...	...
6.30	12.50	0.41	±2.30 max	0.50	0.60	0.76	1.25	...	...
12.50	20.00	0.43	±0.38 min	0.56	0.68	1.00	1.50	...	...
20.00	25.00	0.46		0.58	0.76	1.25	1.80	2.30	...
25.00	40.00	0.48		0.60	0.86	1.50	2.05	2.55	...
40.00	50.00	0.60		0.86	1.10	1.80	2.30	2.80	4.30
50.00	100.00	0.86		1.10	1.35	2.05	2.55	3.05	4.55
100.00	150.00	1.10		1.35	1.65	2.30	2.80	3.30	4.85
150.00	200.00	1.35		1.65	1.90	2.55	3.05	3.55	5.10
200.00	250.00	1.65		1.90	2.15	2.80	3.20	3.80	5.35
250.00	300.00	1.90		2.15	2.40	3.05	3.55	4.05	5.60
300.00	350.00	2.15		2.40	2.65	3.30	3.80	4.30	5.85
350.00	400.00	2.40		2.65	2.90	3.55	4.05	4.55	6.10
400.00	450.00	2.65		2.90	3.15	3.80	4.30	4.85	6.35
450.00	500.00	2.90		3.15	3.40	4.05	4.55	5.10	6.60
500.00	550.00	3.15		3.40	3.65	4.30	4.85	5.25	6.85
550.00	600.00	3.40		3.65	3.90	4.55	5.10	5.60	7.10

[A] These tolerances are applicable to the average profile. Wider tolerances may be required for some profiles and closer tolerances may be possible for others.
[B] The tolerances applicable to a dimension composed of two or more component dimensions is the sum of the tolerances of the component dimensions if all of the component dimensions are indicated.
[C] When a tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum dimensions permissible under the tolerance.
[D] These tolerances do not apply to space dimensions such as dimensions X and Z of the example even when Y is 75 % or more of X. For the tolerance applicable to dimensions X, use columns 4, 5, 6, 7, 8 or 9, dependent on distance A and the circumscribing circle diameter.
[E] At points less than 6.30 mm in from base of leg the tolerances in Column 2 are applicable.

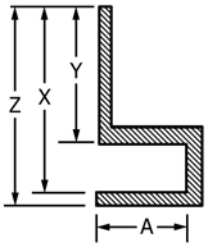
[F] The following tolerances apply where the space is completely enclosed (hollow profiles): For the width (A) the tolerance is the value shown in Column 4 for the depth (D). For the depth (D), the tolerance is the value shown in Column 4 for the width (A). In no case is the tolerance for either width or depth less than at the corners (Column 2, metal dimensions).



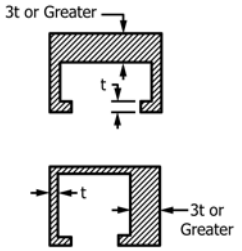
Example—Hollow profile having 25 mm by 75 mm rectangular outside dimensions and having a circumscribing circle diameter less than 250 mm: width tolerance is ±0.60 mm and depth tolerance ±1 mm. Tolerances at corners, Column 2, metal dimensions, are ±0.60 mm for the width and ±0.25 mm for the depth.)

[G] Where dimensions specified are outside and inside, rather than wall thickness itself, the allowable deviation (eccentricity) given in Column 3 applies to mean wall thickness (mean wall thickness is the average of two wall thickness measurements taken at opposite sides of the void).

[H] In the case of Class 1 Hollow Profiles the standard wall thickness tolerance for extruded round tube is applicable. (A Class 1 Hollow Profile is one whose void is round and 25 mm or more in diameter and whose weight is equally distributed on opposite sides of two or more equally spaced axes.)



[I] Tolerance applicable to the wall thickness enclosing the void of hollow and semihollow profiles is subject to negotiation when the nominal thickness of one wall is three times or greater than that of the opposite wall.



8. Corrosion Resistance

8.1 Corrosion rate of WE43C, tested in accordance with 8.2, shall be less than 50mpy.

8.2 Corrosion rate shall be determined in accordance with Practice B117 except that, prior to exposure, specimens shall be accurately weighed to within ±0.01 g (W_1). Specimens shall be exposed to the salt spray for not less than 120 h. Following exposure, specimens shall be rinsed with tap water and cleaned of adherent corrosion product by immersing in a hot 190 °F [88 °C] 20 % chromic acid for 1 to 2 min. Cleaned specimens shall be rinsed in hot water, dried in a stream of hot air, and weighed (W_2). The measured weight loss (WL) shall be calculated (W_1 - W_2) and used for calculating corrosion rate, using the following equation:

$$CR\ (mcd) = WL/(SA \times EP)$$
$$CR\ [mils\ (0.001\ in.)\ per\ year] = (CR\ (mcd)/D) \times 143.7 \quad (1)$$

where:

WL = measure weight loss in mg,
SA = total surface area of specimen in cm^2,
EP = exposure time in days,
D = density, 1.82 g/cm^3, and
mcd = mg/cm^2 per day.

8.3 Corrosion resistance (8.1) is a periodic test and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

9. Dimensional Tolerances

9.1 Variations from the specified cross-sectional dimensions shall not exceed the amounts prescribed in Tables 3-10 as applicable.

9.2 Straightness shall conform to the requirements of Tables 11-14.

9.3 Variation in length shall not exceed the amount permitted by Table 15.

9.4 Variations from any specified angles shall not exceed the amount permitted by Table 16.

9.5 Roughness of surface of bars, rods, and profiles shall not exceed the amount permitted by Table 17.

9.6 Variations from a specified radius shall not exceed the amount permitted by Table 18.

9.7 Flatness shall conform to the requirements of Table 19.

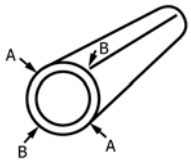
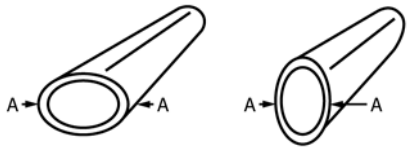
9.8 The allowable deviation from a specified contour shall be 0.005 in./in. [0.005 mm/mm] of chord length, 0.005 in. [0.13 mm] min; not applicable to more than 90° of any arc.

9.9 The allowable deviation from square of cut ends other than on wire shall not exceed 1°.

10. Workmanship, Finish and Appearance

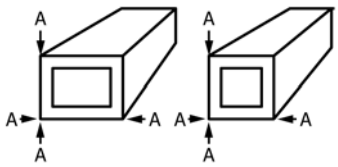
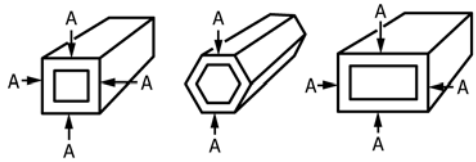
10.1 All material shall be of uniform quality, free from injurious surface defects, and shall have a workmanlike finish.

TABLE 5 Diameter Tolerances for Round Tubes

Specified Outside or Inside Diameter, in. [mm][D]		Tolerance, ±, in. [mm][A]	
		Allowable Deviation of Mean Diameter[B] from Specified Diameter (Size)	Alowable Deviation of Diameter at any Point from Specified Diameter (Ovality)[C]
			
		Difference Between ½ (AA + BB) and Specified Diameter	Difference Between AA and Specified Diameter
Column 1		Column 2	Column 3
Over	Through		
0.499 and under	[...–12.50]	0.008 [0.20]	0.016 [0.40]
0.500–0.999	[12.50–25.00]	0.010 [0.25]	0.020 [0.50]
1.000–1.999	[25.00–50.00]	0.012 [0.30]	0.025 [0.64]
2.000–3.999	[50.00–100.00]	0.015 [0.38]	0.030 [0.76]
4.000–5.999	[100.00–150.00]	0.025 [0.64]	0.050 [1.25]
6.000–7.999	[150.00–200.00]	0.035 [0.88]	0.075 [1.90]
8.000–9.999	[200.00–250.00]	0.045 [1.15]	0.100 [2.55]
10.000–11.999	[250.00–300.00]	0.055 [1.40]	0.125 [3.20]
12.000–13.999	[300.00–350.00]	0.065 [1.65]	0.150 [3.80]
14.000–15.999	[350.00–400.00]	0.075 [1.90]	0.175 [4.45]
16.000–17.999	[400.00–450.00]	0.085 [2.15]	0.200 [5.10]

[A] When a tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.
[B] Mean diameter is the average of two diameter measurements taken at right angles to each other at any point along the length.
[C] Not applicable if the wall thickness is less than 2½ % of the outside diameter.
[D] When outside diameter, inside diameter, and wall thickness are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.

TABLE 6 Width and Depth Tolerances for Square, Rectangular, Hexagonal and Octagonal Tubes

Specified Width or Depth, in. [mm][C]	Tolerance, ±, in. [mm][A]			
	Allowable Deviation of Width or Depth at Corners from Specified Width or Depth 		Allowable Deviation of Width or Depth Not at Corners from Specified Width or Depth[B] 	
	Difference Between AA and Specified Width or Depth		Difference Between AA and Specified Width, Depth, or Distance Across Flats	
	Square, Rectangular		Square, Hexagonal Octagonal	Rectangular
Column 1		Column 2	Column 3	Column 4
	Over Through			
0.500–0.749	[12.50–20.00]	0.012 [0.30]	0.020 [0.50]	The tolerance for the width is the value in Column 3 for a dimension equal to the depth, and conversely, but in no case is the tolerance less than at the corners.[D]
0.750–0.999	[20.00–25.00]	0.014 [0.36]	0.020 [0.50]	
1.000–1.999	[25.00–50.00]	0.018 [0.46]	0.025 [0.64]	
2.000–3.999	[50.00–100.00]	0.025 [0.64]	0.035 [0.88]	
4.000–4.999	[100.00–130.00]	0.035 [0.88]	0.045 [1.15]	
5.000–5.999	[130.00–150.00]	0.045 [1.15]	0.055 [1.40]	
6.000–6.999	[150.00–180.00]	0.055 [1.40]	0.065 [1.65]	
7.000–7.999	[180.00–200.00]	0.065 [1.65]	0.075 [1.90]	
8.000–8.999	[200.00–230.00]	0.075 [1.90]	0.085 [2.15]	
9.000–9.999	[230.00–250.00]	0.085 [2.15]	0.095 [2.40]	
10.000–10.999	[250.00–280.00]	0.095 [2.40]	0.105 [2.65]	
11.000–12.999	[280.00–330.00]	0.105 [2.65]	0.115 [2.90]	

[A] When a tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.
[B] Not applicable if wall thickness is less than 2½ % of the equivalent round diameter. The equivalent round diameter is the diameter of a circle having a circumference equal to the perimeter of the tube.
[C] When outside, inside, and wall thickness dimensions are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.
[D] Example—The width tolerance of 1 by 3 in. [25 by 75 mm] rectangular tube in Column 3 is± 0.025 in. [±0.64 mm] and the depth tolerance is ±0.035 in. [±0.88 mm].

10.2 The extruded rod, bar, profiles, tube, or wire shall be supplied in the finish specified by the purchaser. One of these finishes should be specified:

10.2.1 Plain (mill finish), or

10.2.2 Plain and oiled.

11. Inspection

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

11.2 When such inspection or witness of inspection and testing is agreed upon, the producer or supplier shall afford the purchaser's representative all reasonable facilities to determine that the material meets the requirements of this specification. Inspection shall be conducted so there is no necessary interference with the producer's or supplier's operation.

12. Rejection

12.1 Material failing to conform to the requirements of this specification, or in which defects are discovered during subsequent manufacturing operations, may be rejected. If rejected, the seller shall be responsible only for replacement of the material to the purchaser. All of the rejected material shall be returned to the producer or supplier.

13. Certification

13.1 The producer or supplier shall, on request, furnish to the purchaser a certificate stating that each lot has been sampled, tested, and inspected in accordance with this specification, and has met the requirements.

14. Product Marking

14.1 When specified in the contract or purchase order, all material shall be marked in accordance with Fed. Std. No. 184 except that this specification number shall be used.

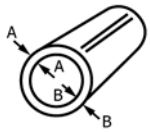
14.2 The requirements specified in 14.1 are minimum; marking systems that involve added information, larger characters, and greater frequencies are acceptable under this specification and shall be agreed upon between the producer or supplier and purchaser.

14.3 Smaller straight bars, rods, tubes, sections, and wire shall be identified by two tags marked with the information in 14.1 and attached, not farther than 2 ft (610 mm) from each end, to the product in each bundle, box, or lift unless other agreement is made.

15. Packaging and Package Marking

15.1 The material shall be packaged to provide adequate protection during normal handling and transportation and each

TABLE 7 Wall Thickness Tolerances for Round Tubes

Specified Wall Thickness, in.[D]	Tolerance, ±, in.[A,B]				
	Allowable Deviation of Mean Wall Thickness[C] from Specified Wall Thickness 				Allowable Deviation of Wall Thickness at any Point from Mean Wall Thickness[C] (Eccentricity) 
	Difference Between ½ (AA + BB) and Specified Wall Thickness				
	Outside Diameter, in.				
	1.249 and Under	1.250–2.999	3.000–4.999	5.000 and Over	Difference Between AA and Mean Wall Thickness
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
0.046 and under	0.006	...	...	...	±10% of the mean wall thickness (±0.060 in. max, ± 0.010 in. min)
0.047–0.061	0.007	0.008	0.008	0.010	
0.062–0.077	0.008	0.008	0.009	0.012	
0.078–0.124	0.009	0.009	0.010	0.015	
0.125–0.249	0.009	0.009	0.013	0.020	
0.250–0.374	0.011	0.011	0.016	0.025	
0.375–0.499	...	0.015	0.021	0.035	
0.500–0.749	...	0.020	0.028	0.045	
0.750–0.999	...	...	0.035	0.055	
1.000–1.499	...	...	0.045	0.065	
1.500–2.000	...	...	...	0.075	
2.001–2.499	...	...	...	0.085	±0.120 in. max
2.500–2.999	...	...	...	0.095	
3.000–3.499	...	...	...	0.105	
3.500–4.000	...	...	...	0.115	

[A] When outside diameter, inside diameter, and wall thickness are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.
[B] When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.
[C] The mean wall thickness of round tube is the average of two measurements taken opposite each other.
[D] When dimensions specified are outside and inside, rather than wall thickness itself, the allowable deviation at any point (eccentricity) is ±10 % of the mean wall thickness; ±0.060 in. max,± 0.010 in. min.

package shall contain only one size, alloy, or temper of material unless otherwise agreed. The type of packaging and gross weight of containers shall, unless otherwise agreed upon, be at the seller's discretion, provided they are such as to ensure acceptance by common or other carriers for safe transportation at the lowest rate to the delivery point.

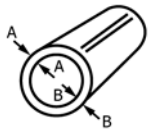
15.2 Each shipping container shall be marked with the purchase order number, material size, specification number, alloy and temper, gross and net weights, and the manufacturer's name or trademark.

15.3 When specified in the contract or purchase order, material shall be preserved, packaged, and packed in accordance with the requirements of Practices B660. The applicable level shall be as specified in the contract or purchase 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. Keywords

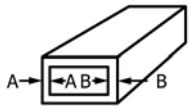
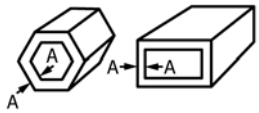
16.1 compositions; dimensional tolerances; extrusions; magnesium; mechanical properties

TABLE 8 Wall Thickness Tolerances for Round Tubes [Metric]

Specified Wall Thickness, mm[D]		Tolerance, ±, mm[A,B]				
		Allowable Deviation of Mean Wall Thickness[C] from Specified Wall Thickness				Allowable Deviation of Wall Thickness at any Point from Mean Wall Thickness[A] (Eccentricity)
						
		Difference Between ½ (AA + BB) and Specified Wall Thickness				Difference Between AA and Mean Wall Thickness
		Outside Diameter, mm				
		Up Through 30	Over 30 Through 80	Over 80 Through 130	Over 130	Difference Between AA and Mean Wall Thickness
Column 1		Column 2	Column 3	Column 4	Column 5	Column 6
Over	Through					
0	1.20	0.15	...	...	...	±10 % of the mean wall thickness (±1.50 mm max, ±0.25 mm min)
1.20	1.60	0.18	0.20	0.20	0.25	
1.60	2.00	0.20	0.20	0.23	0.30	
2.00	3.20	0.23	0.25	0.25	0.38	
3.20	6.30	0.25	0.25	0.33	0.50	
6.30	10.00	0.28	0.28	0.40	0.64	
10.00	12.50	...	0.38	0.53	0.88	
12.50	20.00	...	0.50	0.72	1.15	±10 % of the mean wall thickness (±1.50 mm max, ±0.25 mm min)
20.00	25.00	...	...	0.98	1.40	
25.00	35.00	...	...	1.15	1.65	
35.00	50.00	...	...	...	1.90	
50.00	60.00	...	...	...	2.15	±3.00 mm
60.00	80.00	...	...	...	2.40	
80.00	90.00	...	...	...	2.65	
90.00	100.00	...	...	...	2.90	

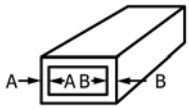
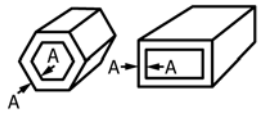
[A] When outside diameter, inside diameter, and wall thickness are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.
[B] When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.
[C] The mean wall thickness of round tube is the average of two measurements taken opposite to each other.
[D] When dimensions specified are outside and inside, rather than wall thickness itself, the allowable deviation at any point (eccentricity) is ±10 % of the mean wall thickness; ±1.50 mm max,± 0.25 mm min.

TABLE 9 Wall Thickness Tolerances for Square, Rectangular, Hexagonal, and Octagonal Tubes

Specified Wall Thickness,[D] in.	Tolerance, ±, in.[A,B]			
	Allowable Deviation of Mean[C] Wall Thickness from Specified Wall Thickness 		Allowable Deviation of Wall Thickness at any Point from Mean Wall Thickness[C] (*Eccentricity*) 	
	Difference Between ½ (AA + BB) and Specified Wall Thickness		Difference Between AA and Mean Wall Thickness	
	Circumscribing Circle Diameter, in.[E]			
	4.999 and Under	5.000 and Over	4.999 and Under	5.000 and Over
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5
0.046 and under	0.005	0.008	0.005	±10% of the mean wall thickness (±0.060 in. max, ±0.010 in. min)
0.047–0.061	0.006	0.009	0.007	
0.062–0.124	0.007	0.010	0.010	
0.125–0.249	0.008	0.015	0.015	
0.250–0.374	0.011	0.020	0.025	
0.375–0.499	0.014	0.030	0.030	
0.500–0.749	0.025	0.040	0.040	
0.750–0.999	0.035	0.050	0.050	
1.000–1.499	0.045	0.060	0.060	
1.500–2.000	...	0.070	...	

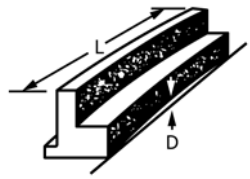
[A] When outside, inside, and wall thickness dimensions are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.
[B] When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.
[C] The mean wall thickness of other than round tube is the average of two measurements taken opposite each other at approximate center line of tube and perpendicular to the longitudinal axis of the cross section.
[D] When dimensions specified are outside and inside, rather than wall thickness itself, the allowable deviation at any point (eccentricity) is ±10 % of the mean wall thickness; ±0.060 in. max,± 0.010 in. min.
[E] The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the tube.

TABLE 10 Wall Thickness Tolerances for Square, Rectangular, Hexagonal, and Octagonal Tubes [Metric]

Specified Wall Thickness[D], mm		Tolerance, ±, mm[A,B]			
		Allowable Deviation of Mean[C] Wall Thickness from Specified Wall Thickness  Difference Between ½ (AA + BB) and Specified Wall Thickness		Allowable Deviation of Wall Thickness at any Point from Mean Wall Thickness[C] (Eccentricity)  Difference Between AA and Mean Wall Thickness	
		Circumscribing Circle Diameter, mm[E]			
		0 through 130	Over 130	0 through 130	Over 130
Column 1					
Over	Through	Column 2	Column 3	Column 4	Column 5
0	1.20	0.13	0.20	0.13	±10 % of the mean wall thickness (±1.50 mm, max ±0.25 mm min)
1.20	1.60	0.15	0.23	0.18	
1.60	3.20	0.18	0.25	0.25	
3.20	6.30	0.20	0.38	0.38	
6.30	10.00	0.28	0.50	0.64	
10.00	12.50	0.36	0.76	0.76	
12.50	20.00	0.64	1.00	1.00	
20.00	25.00	0.88	1.25	1.25	
25.00	35.00	1.15	1.50	1.50	
35.00	50.00	...	1.75	...	

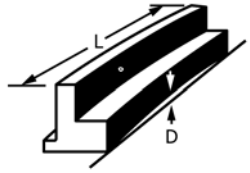
[A] When outside, inside, and wall thickness dimensions are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.
[B] When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.
[C] The mean wall thickness of other than round tube is the average of two measurements taken opposite each other at approximate centerline of tube and perpendicular to the longitudinal axis of the cross section.
[D] When dimensions specified are outside and inside, rather than wall thickness itself, the allowable deviation at any point (eccentricity) is ±10 % of the mean wall thickness; ±1.50 mm max, ±0.25 mm min.
[E] The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the tube.

TABLE 11 Straightness Tolerances for Bars, Rods, Profiles, and Tubes in Straight Lengths

Product	Specified Dia (Rod); Specified Width (Bar); Circumscribing Circle Dia[B] (Profiles); Specified OD or Width (Tube), in.	Specified Thickness (Rectangles); Minimum Thickness (Profiles), in.	Tolerance,[A] in.	
			Allowable Deviation from Straight 	
			In Any Foot or Less of Length	In Total Length of Piece
Rod; square, hexagonal, and octagonal bar	all	...	0.0125	0.0125 × length in ft
Rectangular bar and profiles	1.499 and under	0.094 and under	0.050	0.050 × length in ft
		0.095 and over	0.0125	0.0125 × length in ft
	1.500 and over	all	0.0125	0.0125 × length in ft
Tube	0.500–5.999	...	0.010	0.010 × length in ft
	6.000 and over	...	0.020	0.020 × length in ft

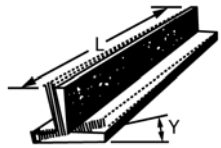
[A] When weight of piece on flat surface minimizes deviation.
[B] The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the cross section of the extruded product.

TABLE 12 Straightness Tolerances for Bars, Rods, Profiles, and Tubes in Straight Lengths [Metric]

Product	Specified Dia (Rod); Specified Width (Bar); Circumscribing Circle Dia[B] (Profiles); Specified OD or Width (Tube), mm	Specified Thickness (Rectangles); Minimum Thickness (Profiles), mm	Tolerance,[A] mm	
			Allowable Deviation from Straight 	
			mm in any metre or less of length	mm in total length of piece
Rod, square, hexagonal, and octagonal bar	over 40 thru 80	all	1	1 × length in m
	over 40 thru 80	all	2	2 × length in m
	over 80	all	4	4 × length in m
Rectangular bar and profiles	thru 40	thru 2.50	4	4 × length in m
		over 2.50	1	1 × length in m
	over 40	all	1	1 × length in m
Tube	thru 12.50	all	1	1 × length in m
	over 12.50	all	2	2 × length in m

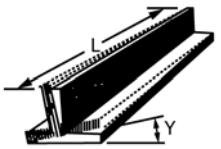
[A] When weight of piece of flat surface minimizes deviation.
[B] The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the cross section of the extruded product.

TABLE 13 Twist Tolerances for Bars, Profiles, and Other-Than-Round Tubes[A]

Specified Width (Bar and Tube); Circumscribing Circle Dia[B] (Profiles), in.	Specified Thickness (Rectangles); Minimum Thickness (Profiles), in.	Tolerance, °	
		In Any Foot or Less of Length	Allowable Deviation from Straight 
			In Total Length of Piece
1.499 and under	all	1	1° × length in ft: 7° max
1.500–2.999	all	½	½ ° × length in ft: 5° max
3.000 and over	all	¼	¼ ° × length in ft: 3° max

[A] Twist is normally measured by placing the extruded section on a flat surface and measuring the maximum distance at any point along its length between the bottom surface of the section and the flat surface. From this measurement, the deviation from true straightness is subtracted. The remainder is the twist. To convert the standard twist tolerance (deg) to an equivalent linear value, the tangent of the standard tolerance is multiplied by the width of the surface of the section that is on the flat surface.
[B] The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the cross section of the extruded product.

TABLE 14 Twist Tolerances for Bars, Profiles, and Other-Than-Round Tubes [Metric][A]

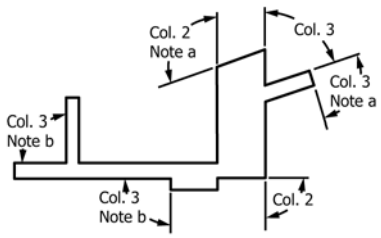
Specified Width (Bar and Tube); Circumscribing Circle Dia[B] (Profiles), mm	Specified Thickness (Rectangles); Minimum Thickness (Profiles), mm	Tolerance, °	
		In Any Metre or Less of Length	Allowable Deviation from Straight  In Total Length of Piece
0 through 40.00	all	3	3° × length in m: 7° max
Over 40.00 through 80.00	all	1.5	1.5° × length in m: 5° max
Over 80.00	all	0.75	0.75° × length in m: 3° max

[A] Twist is normally measured by placing the extruded section on a flat surface and measuring the maximum distance at any point along its length between the bottom surface of the section and the flat surface. From this measurement, the deviation from true straightness is subtracted. The remainder is the twist. To convert the standard twist tolerance (°) to an equivalent linear value, the tangent of the standard tolerance is multiplied by the width of the surface of the section that is on the flat surface.
[B] The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the cross section of the extruded product.

TABLE 15 Length

Specified Circumscribing Circle Diameter (Profiles); Specified Diameter (Rod); Specified Width (Bar), in.	Tolerance, in. [mm] Allowable Deviation From Specified Length			
	Specified Length, ft [m]			
	Up through 12 [4]	Over 12 [4] through 30 [9]	Over 30 [9] through 50 [15]	Over 50 [15]
Under 3.000 [79.00]	+ ⅛ [3]	+ ¼ [6]	+ ⅜ [10]	+ 1 [25]
3.000–7.999 [80.00–199.00]	+ 3⁄16 [5]	+ 5⁄16 [8]	+ 7⁄16 [11]	+ 1 [25]
8.000 [200.00] and over	+ ¼ [6]	+ ⅜ [10]	+ ½ [13]	+ 1 [25]

TABLE 16 Angularity Tolerances for Bars, Profiles, Other-Than-Round Tubes, and Wire[A]

Minimum Specified Leg or Metal Thickness, in.	Tolerance, ±, ° 	
	Ratio:[B,C] Leg or Surface Length to Leg or Metal Thickness	
	1 and less	Over 1
Column 1	Column 2	Column 3
0.187 [4.9] and under	1	2
0.188–0.749 [5.00–19.9]	1	1½
0.750 [120.00] and over	1	1

[A] The permissible deviation from specified angle on all other-than-round tubes shall be ±2°.
[B] When the space between the surfaces forming an angle is all metal, values in Column 2 apply if the larger surface length to metal thickness ratio is 1 or less.
[C] When two legs are involved, the one having the larger ratio determines the applicable column.

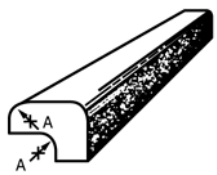
TABLE 17 Surface Roughness

Specified Section Thickness, in. [mm]	Allowable Depth of Defect[A], max, in. [mm]
Under 0.064 [1.64]	0.0015 [0.038]
0.064–0.125 [1.65–3.19]	0.002 [0.050]
0.126–0.188 [3.20–4.79]	0.0025 [0.065]
0.189–0.250 [4.80–6.29]	0.003 [0.075]
0.251–0.500 [6.30–12.49]	0.004 [0.100]
0.501 and over [12.50 and over]	0.008 [0.200]

[A] Includes die lines and handling marks.

TABLE 18 Corner and Fillet Radii Tolerances for Bars, Profiles, Tubes, and Wire

NOTE 1—1 in. = 25.4 mm.

Allowable Deviation from Specified Radius 

Difference between radius A and specified radius	
Specified Radius, in. [mm]	Tolerance, in. [mm]
Sharp corners	±1⁄64 [± 0.40]
0.187 [5.00] and under	±1⁄64 [± 0.40]
0.188 [5.01] and over	±10 %

TABLE 19 Flatness Tolerances for Bars, Profiles, and Other-Than-Round Tubes

Product	Minimum Thickness of Metal Forming the Surface, in. [mm]	Tolerance, in. [mm]	
		In Any 1 in. [25 mm] or Less of Width[A]	Widths Over 1 in. [25 mm][A]
Bars and Semi-hollow and Solid Profiles	all	0.004 [0.10]	0.004 × width, in. [mm]
Hollow Profiles and Tubes	0.187 [5.00] and under	0.006 [0.15]	0.006 × width, in. [mm]
	0.188 [5.01] and over	0.004 [0.10]	0.004 × width, in. [mm]

[A] Flatness in the length direction is the same as straightness (Table 11).

APPENDIX

(Nonmandatory Information)

X1. GENERAL INFORMATION

X1.1 The resistance to salt water corrosion of Alloys AZ31B, AZ61A, WE43B, WE43C, and WE54A is substantially the same and superior to Alloy M1A, and are greatly superior to AZ31C, ZK40A, and ZK60A. All the alloys have a specific gravity of about 1.8. Alloy AZ31B has good extrusion characteristics and moderate mechanical properties. Alloy AZ31C has the same characteristics as Alloy AZ31B except that the impurity limits are greater. It is used for applications where the maximum in corrosion resistance is not necessary. Alloy AZ61A has extrusion characteristics and mechanical properties intermediate between Alloys AZ31B and AZ80A. Alloy AZ80A is stronger and harder than AZ61A. Alloy ZK60A combines high tensile strength with good ductility and has the highest compressive yield strength of any of the extrusion alloys. ZK40A possesses high yield strength and has better extrusion characteristics than ZK60A. Minimum compressive yield strength values that can be met are given in Table X1.1. Alloy M1A has the best extrusion characteristics. Alloys WE43B and WE54A have exceptional high-temperature strength and creep performance and can be used up to 500°F.

X1.2 The yield strength of magnesium 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 B557 and B557M. In case of dispute, the "Offset Method" shall be used. The unit deformation values given in Table X1.2 for use with the "Extension-Under-Load Method" are based on a modulus of elasticity

$$E = 6\,500\,000 \text{ psi } [44.8 \text{ GPa}] \quad \text{(X1.1)}$$

X1.3 Oil finish affords a measurable protection against tarnish and corrosion during shipment and storage of magnesium extrusions.

TABLE X1.1 Minimum Compressive Yield Strength Values

Alloy and Temper	Form	Cross-Sectional Area, in.^{2} [mm^2]	Compressive Yield Strength, min	
			ksi	[MPa]
ZK40A-T5	bars, rods, and profiles	4.999 [3250] and under	20.0	[135]
	hollow profiles	4.999 [3250] and under	20.0	[135]
ZK60A-F	bars, rods, and profiles	1.999 [1300] and under	27.0	[185]
		2.000–2.999 [1301–1950]	26.0	[180]
		3.000–4.999 [1951–3250]	25.0	[170]
		5.000–39.999 [3251–25 800]	20.0	[140]
	hollow profiles	all	20.0	[140]
ZK60A-T5	bars, rods, and profiles	1.999 [1300] and under	30.0	[200]
		2.000–2.999 [1301–1950]	28.0	[190]
		3.000–4.999 [1951–3250]	25.0	[170]
	hollow profiles	all	26.0	[180]

TABLE X1.2 Unit Deformation Values

Alloy		Temper	Yield Strength (0.2 % offset), min		Unit Deformation in./in. (mm/mm) of Gage Length
UNS No.	ASTM No.		ksi	[MPa]	
M11311	AZ31B	F	21.0	[145]	0.0052
			22.0	[152]	0.0054
			20.0	[138]	0.0051
			16.0	[110]	0.0045
M11610	AZ61A	F	21.0	[145]	0.0052
			24.0	[165]	0.0057
			22.0	[152]	0.0054
			16.0	[110]	0.0045
M11800	AZ80A	F	28.0	[193]	0.0063
			27.0	[186]	0.0062
M11800	AZ80A	T5	30.0	[207]	0.0066
			33.0	[228]	0.0071
M16400	ZK40A	T5	36.0	[248]	0.0075
			37.0	[255]	0.0077
M16600	ZK60A	F	31.0	[214]	0.0068
			28.0	[193]	0.0063
M16600	ZK60A	T5	36.0	[248]	0.0075
			38.0	[262]	0.0078
M18430	WE43B	T5	23.0	[160]	0.0055
			22.0	[150]	0.0054
M18430	WE43B	T6	22.0	[150]	0.0054
			20.0	[140]	0.0051
M18410	WE54A	T5	26.0	[180]	0.0060
			25.0	[170]	0.0058
M18410	WE54A	T6	26.0	[180]	0.0060
			25.0	[175]	0.0058

SUMMARY OF CHANGES

Committee B07 has identified the location of selected changes to this standard since the last issue (B107/B107M –12) that may impact the use of this standard. (Approved Nov. 1, 2013.)

(1) Added alloy WE43C to Table 1 and associated notes, Table 2, and X1.1.

(2) Added new Section 8 on corrosion resistance testing.