



Standard Practice for Codification of Certain Nonferrous Metals and Alloys, Cast and Wrought¹

This standard is issued under the fixed designation B 275; 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.

^{ε1} NOTE—Summary of Changes was added editorially in November 2003.

1. Scope*

1.1 This practice covers a system originally adopted for designating light metals and alloys, cast and wrought, and later extended to certain heavier, base-metal die-casting alloys. Those designations which are currently being used in specifications under the jurisdiction of Committees B02 on Nonferrous Metals and Alloys and B07 on Light Metals and Alloys are listed in Table X2.1.

1.1.1 The alloy designations now being used in Committee B07 specifications for aluminum and aluminum-alloy wrought and cast products conform to ANSI H35.1. Alloys formerly codified by this practice and the corresponding ANSI designations are shown in Tables X3.1 and X3.2.

1.2 This practice also provides a system for designating magnesium alloys that has been used commercially since 1952, and thus is intended to be the registration source for new magnesium alloys. A record of designations along with the established compositions is given in Table X4.1.

1.3 The equivalent Unified Numbering System alloy designations shown in the appendixes are in accordance with Practice E 527.

2. Referenced Documents

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

2.2 ASTM Standards:

- B 37 Specification for Aluminum for Use in Iron and Steel Manufacture²
- B 80 Specification for Magnesium-Alloy Sand Castings²
- B 86 Specification for Zinc-Alloy Die Castings³
- B 93/B93M Specification for Magnesium Alloys in Ingot

Form for Sand Castings, Permanent Mold Castings, and Die Castings²

B 94 Specification for Magnesium-Alloy Die Castings²

B 102 Specification for Lead and Tin Alloy Die Castings³

B 240 Specification for Zinc Alloys in Ingot Form for Die Castings³

B 327 Specification for Aluminum-Alloy Hardeners Used in Making Zinc Die-Casting Alloys³

E 527 Practice for Numbering Metals and Alloys (UNS)⁴

2.3 ANSI Standard:

H35.1 Alloy and Temper Designation Systems for Aluminum⁵

3. Basis of Codification

3.1 The designations for alloys and unalloyed metals are based on their chemical composition limits.

NOTE 1—For aluminum and magnesium alloys, cast and wrought, standard limits for alloying elements and impurities are expressed to the following places:

Less than 0.0001 % (used only for magnesium alloys)	0.0000X
0.0001 to 0.001 %	0.000X
0.001 to 0.01 %	0.00X
0.01 to 0.10 %	
Unalloyed aluminum made by a refining process	0.0XX
Alloys and unalloyed aluminum or magnesium not made by a refining process	0.0X
0.10 through 0.55 %	0.XX
Over 0.55 %	0.X,X.X,XX.X

3.2 Designations shall be assigned, revised, and cancelled by Subcommittee B07.07 of ASTM Committee B07 on Light Metals and Alloys on written requests to its chairman. Complete chemical composition limits shall be submitted with request for assignment or revision of designations. Arbitrary assignments by other subcommittees or committees will not be recognized.

3.3 The temper designation, which is used for all metal forms except ingot, follows the alloy designation and is separated therefrom by a dash.

¹ This practice is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.03 on Aluminum Alloy Wrought Products.

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² *Annual Book of ASTM Standards*, Vol 02.02.

³ *Annual Book of ASTM Standards*, Vol 02.04.

⁴ *Annual Book of ASTM Standards*, Vol 01.01.

⁵ Available in the Related Materials section (gray pages) of the *Annual Book of ASTM Standards*, Vol 02.02.

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

4. Alloys

4.1 Designation for alloys shall consist of not more than two letters representing the alloying elements (Note 2) specified in the greatest amount, arranged in order of decreasing percentages, or in alphabetical order if of equal percentages, followed by the respective percentages rounded off to whole numbers and a serial letter (Notes 3 and 4). The full name of the base metal precedes the designation, but it is omitted for brevity when the base metal being referred to is obvious.

NOTE 2—For codification, an alloying element is defined as an element (other than the base metal) having a minimum content greater than zero either directly specified or computed in accordance with the percentages specified.

NOTE 3—The serial letter is arbitrarily assigned in alphabetical sequence starting with “A” (omitting “I” and “O”) and serves to differentiate otherwise identical designations. A serial letter is necessary to complete each designation.

NOTE 4—The designation of a casting alloy in ingot form is derived from the composition specified for the corresponding alloy in the form of castings. Thus, a casting ingot designation may consist of an alloy designation having one or more serial letters, one for each product composition, or it may consist of one or more alloy designations.

4.2 The letters used to represent alloying elements shall be those in Table 1.

4.3 In rounding percentages, the nearest whole number shall be used. If two choices are possible as when the decimal is followed by a 5 only, or a 5 followed only by zeros, the nearest even whole number shall be used.

TABLE 1 Letters Representing Alloying Elements

A—Aluminum	M—Manganese
B—Bismuth	N—Nickel
C—Copper	P—Lead
D—Cadmium	Q—Silver
E—Rare earths	R—Chromium
F—Iron	S—Silicon
G—Magnesium	T—Tin
H—Thorium	W—Yttrium
J—Strontium	X—Calcium
K—Zirconium	Y—Antimony
L—Lithium	Z—Zinc

4.4 When a range is specified for the alloying element, the rounded mean shall be used in the designation.

4.5 When only a minimum percentage is specified for the alloying element, the rounded minimum percentage shall be used in the designation.

5. Unalloyed Metals

5.1 Designations for unalloyed metals consist of the specified minimum purity, all digits retained but dropping the decimal point, followed by a serial letter (Note 3). The full name of the base metal precedes the designation, but it is omitted for brevity when the base metal being referred to is obvious.

6. Keywords

6.1 aluminum; lead; magnesium; tin; UNS designations; zinc

APPENDIXES

(Nonmandatory Information)

X1. EXAMPLES OF CODIFICATION

X1.1 *Example 1*—For Alloy CG181A in Specification B 327, “C” represents copper, the alloying element specified in the greatest amount; “G” represents magnesium, the alloying element specified in the second greatest amount; 18 indicates that the rounded mean copper percentage lies between 17 and 19; 1 signifies the nearest whole number for magnesium percentage; and “A” as the final letter indicates that this is the first alloy qualified and assigned under the designation CG181.

X1.2 *Example 2*—For Alloys AZ91A, B, and C, in Specification B 93/B 93M, “A” represents aluminum, the alloying

element specified in the greatest amount; “Z” represents zinc, the alloying element specified in the second greatest amount; “9” indicates that the rounded mean aluminum percentage lies between 8.6 and 9.4; “1” signifies that the rounded mean of the zinc lies between 0.6 and 1.4; and “A” as the final letter indicates that this is the first alloy whose composition qualified assignment of the designation AZ91. The final serial letters B and C signify alloys subsequently developed whose specified compositions differ slightly from the first and from one another but do not differ sufficiently to effect a change in the basic designation.

X2. DESIGNATIONS FOR METALS AND ALLOYS ASSIGNED IN CONFORMANCE WITH PRACTICE B 275, FOR CODIFICATION OF CERTAIN NONFERROUS METALS AND ALLOYS

X2.1 Designations for metals and alloys assigned in conformance with Practice B 275, and the ASTM specifications in

which they are used, are shown in Table X2.1.

TABLE X2.1 Designations Assigned for Nonferrous Metals and Alloys in Conformance with Practice B 275

Designation		ASTM Specifications				
ASTM B 275	UNS	B 37	B 102	B 86	B 240	B 327
Aluminum Alloy						
850A		*	...	...	...	...
900A		*	...	...	...	...
920A		*	...	...	...	...
950A		*	...	...	...	...
980A		*	...	...	...	...
990A		*	...	...	...	...
CG181A		...	...	...	...	*
G1C		...	...	...	...	*
ZG71A		...	...	...	...	*
Lead Alloy						
Y10A		...	*	...	...	...
YT155A		...	*	...	...	...
Tin Alloy						
CY44A		...	*	...	...	...
PY1815A		...	*	...	...	...
YC135A		...	*	...	...	...
Zinc Alloy						
AC41A	Z35531	...	...	*	...	...
AG40A	Z35520	...	...	*	...	...
AC41A	Z35530	...	...	...	*	...
AG40A	Z33521	...	...	...	*	...
AC43A	Z35541	...	...	*	...	...
AG40B	Z33523	...	...	*	...	...
AC43A	Z35540	...	...	...	*	...
AG40B	Z33522	...	...	...	*	...

* Alloys appear in applicable specifications which are found in the *Annual Book of ASTM Standards*, Vol 02.02.

X3. DESIGNATIONS FOR METALS AND ALLOYS FORMERLY ASSIGNED IN CONFORMANCE WITH B 275

X3.1 Designations assigned in conformance with this practice were used for wrought aluminum and wrought aluminum alloys in ASTM specifications prior to 1960 and for cast aluminum and aluminum alloys and ingot prior to 1974 but now designations conforming to the American National Standard Alloys and Temper Designation Systems for Aluminum

(ANSI H35.1) are standard with the Unified Numbering System, E 527 for information only. The former ASTM designations and the corresponding ANSI and UNS designations for wrought alloys are as shown in Table X3.1. Cast alloys and ingot are as shown in Table X3.2.

TABLE X3.1 Wrought Aluminum Alloys

Designations			Designations		
ANSI H35.1	Former B 275 – 63	UNS	ANSI H35.1	Former B 275 – 63	UNS
1060	996A	A91060	5056	GM50A	A95056
1100	990A	A91100	5083	GM41A	A95083
2011	CB60A	A92011	5086	GM40A	A95086
2014	CS41A	A92014	5154	GR40A	A95154
2017	CM41A	A92017	5254	GR40B	A95254
2018	CN42C	A92018	5454	GM31A	A95454
2024	CG42A	A92024	5456	GM51A	A95456
2117	CG30A	A92117	5652	GR20B	A95652
3003	M1A	A93003	6053	GS11B	A96053
3004	MG11A	A93004	6061	GS11A	A96061
4032	SG121A	A94032	6063	GS10A	A96063
5005	G1B	A95005	6101	GS10B	A96101
5050	G1A	A95050	7075	ZG62A	A97075
5052	GR20A	A95052			

TABLE X3.2 Cast Aluminum Alloys and Aluminum Alloys in Ingot Form^A

Designations			Designations		
ANSI H35.1	Former B 275 – 63	UNS	ANSI H35.1	Former B 275 – 63	UNS
201.0	CQ51A	A02010	380.0	SC84B	A03800
201.2	CQ51A	A02012	380.2	SC84C	A03802
...	CS42A ^B	...	A380.0	SC84A	A13800
208.0	CS43A	A02080	A380.1	SC84A-B	A13801
208.1	CS43A	A02081	383.0	SC102A	A03830
...	CS66A ^C	...	383.1	SC102A	A03831
222.0	CG100A	A02220	384.0	SC114A	A03840
222.1	CG100A	A02221	384.1	SC114A	A03841
...	CS72A ^D	...	...	SC122A ^C	...
...	CS74A ^C	...	...	SF101A ^D	...
238.0 ^E	CS104A	A02380	413.0	S12B	A04130
238.1 ^F	CS104A	A02381	413.2	S12C	A04132
242.0	CN42A	A02420	A413.0	S12A	A14130
242.1	CN42A	A02421	A413.1	S12A-B	A14131
295.0	C4A	A02950	443.0	S5B	A04430
295.1	C4A	A02951	443.1	S5B	A04431
...	SC64A ^G	...	443.2	S5A	A04432
...	SC64B ^G	...	A443.0 ^E	S5B	A14430
...	SC64C ^C	...	A443.1 ^F	S5B	A14431
319.0	SC64D	A03190	B443.0	S5A	A24430
319.1	SC64D	A03191	C443.0	S5C	A34430
328.0	SC82A	A03280	C443.1	S5C	A34431
328.1	SC82A	A03281	A444.0	S7A	A14440
332.0	SC103A	A03320	A444.2	S7A	A14442
332.1	SC103A	A03321	512.0 ^E	GS42A	A05120
...	SC104A ^H	...	512.2 ^F	GS42A	A05122
333.0	SC94A	A03330	...	GS31A ^D	...
333.1	SC94A	A03331	513.0	GZ42A	A05130
336.0	SN122A	A03360	513.2	GZ42A	A05132
336.1	SN122A	A03361	514.0	G4A	A05140
354.0	SC92A	A03540	514.1	G4A	A05141
354.1	SC92A	A03541	518.0	G8A	A05180
355.0	SC51A	A03550	518.1	G8A	A05181
355.1	SC51A	A03551	520.0	G10A	A05200
355.2	SC51C	A03552	520.2	G10A	A05202
C355.0	SC51B	A33550	535.0	GM70B	A05350
C355.2	SC51B	A33552	535.2	GM70B	A05352
356.0	SC70A	A03560	705.0	ZG32A	A07050
356.1	SC70A	A03561	705.1	ZG32A	A07051
356.2	SC70C	A03562	707.0	ZG42A	A07070
A356.0	SC70B	A13560	707.1	ZG42A	A07071
A356.2	SC70B	A13562	710.0	ZG61B	A07100
A357.0	SG71A	A03570	710.1	ZG61B	A07101
359.0	SC91A	A03590	711.0	ZG60A	A07110
359.2	SG91A	A03592	711.1	ZG60A	A07111
360.0	SG100B	A03600	712.0	ZG61A	A07120
360.2	SG100C	A03602	712.2	ZG61A	A07122
A360.0	SG100A	A13600	713.0	ZC81A	A07130
A360.1	SG100A-B	A13601	713.1	ZC81B	A07131

^A Alloys appear in applicable specifications in the *Annual Book of ASTM Standards*, Vol 02.02, except as otherwise noted.

^B Last appeared in B179 – 63.

^C Last appeared in B179 – 72.

^D Last appeared in B179 – 64.

^E Last appeared in B108 – 80.

^F Last appeared in B179 – 78.

^G Last appeared in B179 – 58.

^H Last appeared in B179 – 65.

X4. MAGNESIUM-ALLOY REGISTRATION

X4.1 A registration record of magnesium alloys with established designations and chemical composition is shown in Table X4.1.

TABLE X4.1 Magnesium-Alloy Registration Record

NOTE 1— These are cast or wrought product compositions (except M19xxx) casting ingot compositions may be different.

Designation		Chemical Composition, % max unless shown as a range or as min																
ASTM B275	UNS	Aluminum	Lithium	Manganese	Rare Earths	Zinc	Zirconium	Calcium	Copper	Iron	Silicon	Silver	Yttrium	Nickel	Other Elements			Magnesium
															Specific	Each	Total	
9980A	M19980			0.10					0.02					0.001	0.01 Sn, 0.01 Pb	0.05		99.80 min
9980B	M19981			0.10					0.02					0.005	0.01 Sn, 0.01 Pb	0.05		99.80 min
9990A	M19990	0.003		0.004						0.04	0.005			0.001	0.00007B, 0.0001 Cd	0.01		99.90 min
9995A	M19995	0.010		0.004						0.003	0.005			0.001	0.00003B	0.005		99.95 min
9998A ^A	M19998	0.004		0.002					0.0005	0.002	0.003			0.0005	0.01Ti, 0.00005 Cd, 0.00003B, 0.001 Pb	0.005		99.98 min
AM50A	M10500	4.4–5.4		0.26–0.6 ^B		0.22			0.010	0.004 ^B	0.10			0.002		0.02		remainder
AM60A ^C	M10600	5.5–6.5		0.13–0.6		0.22			0.35		0.50			0.03		0.30		remainder
AM60B	M10602	5.5–6.5		0.24–0.6 ^B		0.22			0.010	0.005 ^B	0.10			0.002		0.02		...
AM100A	M10100	9.3–10.7		0.10–0.35		0.30			0.10		0.30			0.01		0.30		remainder
AM100B ^D	M10102	9.4–10.6		0.13–0.35					0.08		1.0			0.01		0.30		remainder
AS41A ^C	M10410	3.5–5.0		0.20–0.50		0.12			0.06		0.50–1.5			0.03		0.30		remainder
AS41B	M10412	3.5–5.0		0.35–0.7 ^C		0.12			0.02	0.0035 ^C	0.50–1.5			0.002		0.02		remainder
AZ21A ^C	M11210	1.6–2.5		0.15		0.8–1.6		0.10–0.25	0.05	0.005	0.05			0.002		0.30		remainder
AZ31A ^D	M11310	2.5–3.5		0.20–1.0		0.6–1.4		0.30	0.05	0.005	0.30			0.005		0.30		remainder
AZ31B	M11311	2.5–3.5		0.20–1.0		0.6–1.4		0.04	0.05	0.005	0.10			0.005		0.30		remainder
AZ31C	M11312	2.4–3.6		0.15–1.0		0.50–1.5			0.10		0.10			0.03		0.30		remainder
AZ61A	M11610	5.8–7.2		0.15–0.5		0.40–1.5			0.05	0.005	0.10			0.005		0.30		remainder
AZ63A	M11630	5.3–6.7		0.15–0.35		2.5–3.5			0.25		0.30			0.01		0.30		remainder
AZ63B	M11632	5.3–6.7		0.15–0.7		2.5–3.5			0.02	0.003	0.10			0.002		0.30		remainder
AZ63C	M11634	5.3–6.7		0.15–0.7		2.5–3.5			0.05	0.003	0.30			0.003		0.30		remainder
AZ63D	M11636	5.0–7.0		0.15–0.7		2.0–4.0			0.10	0.003	0.30			0.003		0.30		remainder
AZ80A	M11800	7.8–9.2		0.12–0.5		0.20–0.8			0.05	0.005	0.10			0.005		0.30		remainder
AZ81A	M11810	7.0–8.1		0.13–0.35		0.40–1.0			0.10		0.30			0.01		0.30		remainder
AZ91A ^E	M11910	8.3–9.7		0.13–0.50		0.35–1.0			0.10		0.50			0.03		0.30		remainder
AZ91B	M11912	8.3–9.7		0.13–0.50		0.35–1.0			0.35		0.50			0.03		0.02	0.30	remainder
AZ91C	M11914	8.1–9.3		0.13–0.35		0.40–1.0			0.10		0.30			0.01		0.02	0.30	remainder
AZ91D	M11916	8.3–9.7		0.15–0.50 ^B		0.35–1.0			0.030	0.005 ^B	0.10			0.002		0.02	...	remainder
AZ91E	M11919	8.1–9.3		0.17–0.35		0.40–1.0			0.015	0.005 ^F	0.20			0.0010			0.30	remainder
AZ92A	M11920	8.3–9.7		0.10–0.35		1.6–2.4			0.25		0.30			0.01			0.30	remainder
AZ101A ^{C,D}	M11101	9.5–10.5		0.13–0.05		0.75–1.25			0.05	0.005	0.05			0.005	0.0002–0.0008 Be	0.30		remainder
EQ21A ^G	M18330				1.5–3.0 ^H		0.40–1.0		0.05–0.10			1.3–1.7		0.01			0.30	remainder
EZ33A	M12330				2.5–4.0	2.0–3.1	0.50–1.0		0.10					0.01			0.30	remainder
K1A	M18010						0.40–1.0 ^I										0.30	remainder
LA141A	M14141	1.0–1.5	13.0–15.0	0.15					0.005	0.005	0.004			0.005	0.005 Na		0.30	remainder
M1A	M15100			1.2–2.0				0.30	0.05		0.10			0.01			0.30	remainder
M1C ^C	M15102	0.01		0.50–1.3					0.02	0.03				0.001		0.05	0.30	remainder
TA54A ^E	M18540	3.0–4.0		0.20–0.7		0.30			0.05		0.30			0.01	4.0–6.0 Sn		0.30	remainder
QE22A	M18220				1.8–2.5 ^H		0.40–1.0		0.10			2.0–3.0		0.01			0.30	remainder
WE54A	M18410		0.20	0.15	1.5–4.0 ^J		0.40–1.0		0.03		0.01		4.75–5.5	0.005		0.20	0.30	remainder
WE43A	M18430		0.20	0.15	2.4–4.4 ^J	0.20	0.40–1.0		0.03	0.01	0.01		3.7–4.3	0.005		0.20	0.30	remainder
WE43B	M18432		0.18	0.03	2.4–4.4	0.10 ^K	0.3–1.0		0.02	0.010	0.01	0.10 ^K	3.7–4.3	0.005		0.01		remainder
ZC63A	M16331			0.25–0.75		5.5–6.5			2.4–3.0		0.20			0.01			0.30	remainder
ZE10A	M16100				0.12–0.22	1.0–1.5											0.30	remainder
ZE41A	M16410			0.15	0.75–1.75	3.5–5.0	0.40–1.0		0.10					0.01			0.30	remainder
ZE63A ^G	M16630				2.1–3.0	5.5–6.0	0.40–1.0		0.10					0.01			0.30	remainder
ZK40A ^L	M16400					3.5–4.5	0.45 min		0.10					0.01			0.30	remainder

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TABLE X4.1 Continued

Designation		Chemical Composition, % max unless shown as a range or as min															
ASTM B275	UNS	Aluminum	Lithium	Manga- nese	Rare Earths	Zinc	Zirconium	Calcium	Copper	Iron	Silicon	Silver	Yttrium	Nickel	Other Elements		Magne- sium
															Specific	Each		Total
ZK51A	M16510					3.6–5.5	0.50–1.0		0.10					0.01		0.30	remainder
ZK60A	M16600					4.8–6.2	0.45 min									0.30	remainder
ZK60B ^F	M16601					4.8–6.8	0.45 min									0.30	remainder
ZK61A	M16610					5.5–6.5	0.6–1.0		0.10					0.01		0.30	remainder

^A Registered by Domal (Domium Magnesium Limited).

^B For alloys AS41B, AM50A, AM60B, and AZ91D if either the minimum manganese or maximum iron content is not met, then the permissible iron to manganese ratio shall not exceed 0.010, 0.015, 0.021, and 0.032, respectively.

^C Registered by Dow Chemical Co.

^D No longer in active use.

^E Designations were assigned for use by the producer or by the International Magnesium Association but are not in ASTM specifications.

^F If the iron content exceeds 0.005 %, then the permissible iron to manganese ratio shall not exceed 0.032 for AZ91E alloy.

^G Magnesium Elecktron Inc., registered.

^H Rare earth elements are in the form of didymium, with not less than 70 % neodymium and remainder substantially praesodymium.

^I Zirconium range for sheet and plate shall be 0.45–1.0.

^J Rare earths consist of 2.0 to 2.5 % and 1.5 to 2.0 % neodymium for WE43A and WE54A, respectively, the remainder being heavy rare earths.

^K Zinc + Silver content shall not exceed 0.20 % in WE43B.

^L Chromasco Limited, registered.

SUMMARY OF CHANGES

Committee B07 has identified the location of selected changes to this standard since the last issue (B 275 – 96) that may impact the use of this standard.

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| <p>(1) Addition of “V” as the designated letter for Gadolinium</p> <p>(2) Corrected errors in Table X4.1, “Magnesium-Alloy Registration Record” on Alloys WE43A and WE43B, and made them consistent with B80, “Standard Specification for Magnesium-Alloy Sand Castings.”</p> | <p>(3) Corrected the notes associated with Table X4.1, “Magnesium-Alloy Registration Record” on alloys WE43A and WE43B (note J), and made them consistent with B80, “Standard Specification for Magnesium-Alloy Sand Castings.”</p> <p>(4) Corrected spelling of Elektron in note G.</p> |
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