



# Standard Practice for Codification of Certain Nonferrous Metals and Alloys, Cast and Wrought<sup>1</sup>

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 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 Department of Defense.*

## 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 have 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 (UNS) alloy designations shown in the appendixes are in accordance with Practice **E 527**.

## 2. Referenced Documents

2.1 The following documents form a part of this practice to the extent referenced herein:

2.2 *ASTM Standards*:<sup>2</sup>

**B 37** Specification for Aluminum for Use in Iron and Steel Manufacture

**B 80** Specification for Magnesium-Alloy Sand Castings

**B 86** Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings

**B 93/B93M** Specification for Magnesium Alloys in Ingot Form for Sand Castings, Permanent Mold Castings, and Die Castings

**B 94** Specification for Magnesium-Alloy Die Castings

**B 102** Specification for Lead- and Tin-Alloy Die Castings

**B 240** Specification for Zinc and Zinc-Aluminum (ZA) Alloys in Ingot Form for Foundry and Die Castings

**B 327** Specification for Master Alloys Used in Making Zinc Die Casting Alloys

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

2.3 *ANSI Standard*:<sup>3</sup>

**H35.1** Alloy and Temper Designation Systems for Aluminum

## 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 with a dash.

<sup>3</sup> Available in the Related Materials section (gray pages) of the *Annual Book of ASTM Standards*, Vol 02.02.

<sup>1</sup> 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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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto: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.

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

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 |       |      |       |       |
|----------------|--------|---------------------|-------|------|-------|-------|
| Practice 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 PRACTICE 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 UNS, Practice 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<sup>A</sup>

| Designations       |                      |        | Designations        |                      |        |
|--------------------|----------------------|--------|---------------------|----------------------|--------|
| ANSI H35.1         | Former<br>B 275 – 63 | UNS    | ANSI H35.1          | Former<br>B 275 – 63 | UNS    |
| 201.0              | CQ51A                | A02010 | 380.0               | SC84B                | A03800 |
| 201.2              | CQ51A                | A02012 | 380.2               | SC84C                | A03802 |
| ...                | CS42A <sup>B</sup>   | ...    | A380.0              | SC84A                | A13800 |
| 208.0              | CS43A                | A02080 | A380.1              | SC84A-B              | A13801 |
| 208.1              | CS43A                | A02081 | 383.0               | SC102A               | A03830 |
| ...                | CS66A <sup>C</sup>   | ...    | 383.1               | SC102A               | A03831 |
| 222.0              | CG100A               | A02220 | 384.0               | SC114A               | A03840 |
| 222.1              | CG100A               | A02221 | 384.1               | SC114A               | A03841 |
| ...                | CS72A <sup>D</sup>   | ...    | ...                 | SC122A <sup>C</sup>  | ...    |
| ...                | CS74A <sup>C</sup>   | ...    | ...                 | SF101A <sup>D</sup>  | ...    |
| 238.0 <sup>E</sup> | CS104A               | A02380 | 413.0               | S12B                 | A04130 |
| 238.1 <sup>F</sup> | 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 <sup>G</sup>   | ...    | 443.2               | S5A                  | A04432 |
| ...                | SC64B <sup>G</sup>   | ...    | A443.0 <sup>E</sup> | S5B                  | A14430 |
| ...                | SC64C <sup>C</sup>   | ...    | A443.1 <sup>F</sup> | 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 <sup>F</sup>  | GS42A                | A05120 |
| ...                | SC104A <sup>H</sup>  | ...    | 512.2 <sup>F</sup>  | GS42A                | A05122 |
| 333.0              | SC94A                | A03330 | ...                 | GS31A <sup>D</sup>   | ...    |
| 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 |

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

<sup>B</sup> Last appeared in Specification B 179 – 63.

<sup>C</sup> Last appeared in Specification B 179 – 72.

<sup>D</sup> Last appeared in Specification B 179 – 64.

<sup>E</sup> Last appeared in Specification B 108 – 80.

<sup>F</sup> Last appeared in Specification B 179 – 78.

<sup>G</sup> Last appeared in Specification B 179 – 58.

<sup>H</sup> Last appeared in Specification B 179 – 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 a min |               |              |             |                 |                    |           |                        |               |        |                      |              |         |                |              |                       |                |                |                                            |
|-----------------------|---------|-----------------------------------------------------------------|---------------|--------------|-------------|-----------------|--------------------|-----------|------------------------|---------------|--------|----------------------|--------------|---------|----------------|--------------|-----------------------|----------------|----------------|--------------------------------------------|
| Prac-<br>tice<br>B275 | UNS     | Magne-<br>sium                                                  | Alumi-<br>num | Cal-<br>cium | Cop-<br>per | Gado-<br>linium | Iron               | Lithium   | Man-<br>ganese         | Neod-<br>mium | Nickel | Rare<br>Earths       | Sili-<br>con | Silver  | Stron-<br>tium | Yt-<br>trium | Zinc                  | Zirco-<br>nium | Other Elements |                                            |
|                       |         |                                                                 |               |              |             |                 |                    |           |                        |               |        |                      |              |         |                |              |                       |                | Specific       | Each                                       |
| 9980A                 | M19980  | 99.80 min                                                       |               |              | 0.02        |                 |                    |           | 0.10                   |               | 0.001  |                      |              |         |                |              |                       |                |                | 0.01 Sn, 0.05<br>0.01 Pb                   |
| 9980B                 | M19981  | 99.80 min                                                       |               |              | 0.02        |                 |                    |           | 0.10                   |               | 0.005  |                      |              |         |                |              |                       |                |                | 0.01 Sn, 0.05<br>0.01 Pb                   |
| 9990A                 | M19990  | 99.90 min                                                       | 0.003         |              |             |                 | 0.04               |           | 0.004                  |               | 0.001  |                      | 0.005        |         |                |              |                       |                |                | 0.00007B, 0.01<br>0.0001<br>Cd             |
| 9995A                 | M19995  | 99.95 min                                                       | 0.010         |              |             |                 | 0.003              |           | 0.004                  |               | 0.001  |                      | 0.005        |         |                |              |                       |                |                | 0.00003B, 0.005<br>0.01Ti, 0.005           |
| 9998A                 | M19998  | 99.98 min                                                       | 0.004         |              | 0.0005      |                 | 0.002              |           | 0.002                  |               | 0.0005 |                      | 0.003        |         |                |              |                       |                |                | 0.00005<br>Cd,<br>0.00003B,<br>0.001<br>Pb |
| AJ52A <sup>A</sup>    | M17520  | remainder                                                       | 4.5–5.5       |              | 0.010       |                 | 0.004 <sup>B</sup> |           | 0.24–0.6 <sup>B</sup>  |               | 0.001  |                      | 0.10         |         | 1.7–2.3        |              | 0.22                  |                |                | 0.01                                       |
| AJ62A <sup>A</sup>    | M177620 | remainder                                                       | 5.5–6.6       |              | 0.010       |                 | 0.04 <sup>B</sup>  |           | 0.24–0.6 <sup>B</sup>  |               | 0.001  |                      | 0.10         |         | 2.0–2.8        |              | 0.22                  |                |                | 0.01                                       |
| AM50A                 | M10500  | remainder                                                       | 4.4–5.4       |              | 0.010       |                 | 0.004 <sup>B</sup> |           | 0.26–0.6 <sup>B</sup>  |               | 0.002  |                      | 0.10         |         |                |              | 0.22                  |                |                | 0.02                                       |
| AM60A                 | M10600  | remainder                                                       | 5.5–6.5       |              | 0.35        |                 |                    |           | 0.13–0.6               |               | 0.03   |                      | 0.50         |         |                |              | 0.22                  |                |                | 0.30                                       |
| AM60B                 | M10602  | remainder                                                       | 5.5–6.5       |              | 0.010       |                 |                    |           | 0.24–0.6 <sup>B</sup>  |               | 0.002  |                      | 0.10         |         |                |              | 0.22                  |                |                | ...                                        |
| AM100AM               | M10100  | remainder                                                       | 9.3–10.7      |              | 0.10        |                 | 0.005 <sup>B</sup> |           | 0.10–0.35              |               | 0.01   |                      | 0.30         |         |                |              | 0.30                  |                |                | 0.30                                       |
| AM100BM               | M10102  | remainder                                                       | 9.4–10.6      |              | 0.08        |                 |                    |           | 0.13–0.35              |               | 0.01   |                      | 1.0          |         |                |              |                       |                |                | 0.30                                       |
| AS21A                 | M10210  | remainder                                                       | 1.8–2.5       |              | 0.01        |                 | 0.005              |           | 0.18–0.7               |               | 0.001  |                      | 0.7–2.1      |         |                |              | 0.20                  |                |                | 0.01                                       |
| AS21B <sup>A</sup>    | M10212  | remainder                                                       | 1.8–2.5       |              | 0.008       |                 | 0.0035             |           | 0.05–0.15              |               | 0.001  |                      | 0.06–0.25    |         | 0.7–1.2        |              | 0.25                  |                |                | 0.01                                       |
| AS41A                 | M10410  | remainder                                                       | 3.5–5.0       |              | 0.06        |                 |                    |           | 0.20–0.50              |               | 0.03   |                      | 0.50–1.5     |         |                |              | 0.12                  |                |                | 0.30                                       |
| AS41B                 | M10412  | remainder                                                       | 3.5–5.0       |              | 0.02        |                 | 0.0035             |           | 0.35–0.7               |               | 0.002  |                      | 0.50–1.5     |         |                |              | 0.12                  |                |                | 0.02                                       |
| AZ21A                 | M11210  | remainder                                                       | 1.6–2.5       | 0.10–0.25    | 0.05        |                 | 0.005              |           | 0.15                   |               | 0.002  |                      | 0.05         |         |                |              | 0.8–1.6               |                |                | 0.30                                       |
| AZ31A                 | M11310  | remainder                                                       | 2.5–3.5       | 0.30         | 0.05        |                 | 0.005              |           | 0.20–1.0               |               | 0.005  |                      | 0.30         |         |                |              | 0.6–1.4               |                |                | 0.30                                       |
| AZ31B                 | M11311  | 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                                       |
| AZ31C                 | M11312  | remainder                                                       | 2.4–3.6       |              | 0.10        |                 | 0.005              |           | 0.15–1.0               |               | 0.03   |                      | 0.10         |         |                |              | 0.50–1.5              |                |                | 0.30                                       |
| AZ61A                 | M11610  | remainder                                                       | 5.8–7.2       |              | 0.05        |                 | 0.005              |           | 0.15–0.5               |               | 0.005  |                      | 0.10         |         |                |              | 0.40–1.5              |                |                | 0.30                                       |
| AZ63A                 | M11630  | remainder                                                       | 5.3–6.7       |              | 0.25        |                 | 0.003              |           | 0.15–0.35              |               | 0.01   |                      | 0.30         |         |                |              | 2.5–3.5               |                |                | 0.30                                       |
| AZ63B                 | M11632  | remainder                                                       | 5.3–6.7       |              | 0.02        |                 | 0.003              |           | 0.15–0.7               |               | 0.002  |                      | 0.10         |         |                |              | 2.5–3.5               |                |                | 0.30                                       |
| AZ63C                 | M11634  | remainder                                                       | 5.3–6.7       |              | 0.05        |                 | 0.003              |           | 0.15–0.7               |               | 0.003  |                      | 0.30         |         |                |              | 2.5–3.5               |                |                | 0.30                                       |
| AZ63D                 | M11636  | remainder                                                       | 5.0–7.0       |              | 0.10        |                 | 0.003              |           | 0.15–0.7               |               | 0.003  |                      | 0.30         |         |                |              | 2.0–4.0               |                |                | 0.30                                       |
| AZ80A                 | M11800  | remainder                                                       | 7.8–9.2       |              | 0.05        |                 | 0.005              |           | 0.12–0.5               |               | 0.005  |                      | 0.10         |         |                |              | 0.20–0.8              |                |                | 0.30                                       |
| AZ81A                 | M11810  | remainder                                                       | 7.0–8.1       |              | 0.10        |                 | 0.005              |           | 0.13–0.35              |               | 0.01   |                      | 0.30         |         |                |              | 0.40–1.0              |                |                | 0.30                                       |
| AZ91A                 | M11910  | remainder                                                       | 8.3–9.7       |              | 0.10        |                 | 0.005              |           | 0.13–0.50              |               | 0.03   |                      | 0.50         |         |                |              | 0.35–1.0              |                |                | 0.30                                       |
| AZ91B                 | M11912  | remainder                                                       | 8.3–9.7       |              | 0.35        |                 | 0.003              |           | 0.13–0.50              |               | 0.03   |                      | 0.50         |         |                |              | 0.35–1.0              |                |                | 0.30                                       |
| AZ91C                 | M11914  | remainder                                                       | 8.1–9.3       |              | 0.10        |                 | 0.005 <sup>B</sup> |           | 0.13–0.35              |               | 0.01   |                      | 0.30         |         |                |              | 0.40–1.0              |                |                | 0.30                                       |
| AZ91D                 | M11916  | remainder                                                       | 8.3–9.7       |              | 0.030       |                 | 0.005 <sup>B</sup> |           | 0.15–0.50 <sup>B</sup> |               | 0.002  |                      | 0.10         |         |                |              | 0.35–1.0              |                |                | 0.02                                       |
| AZ91E                 | M11919  | remainder                                                       | 8.1–9.3       |              | 0.015       |                 | 0.005 <sup>C</sup> |           | 0.17–0.35              |               | 0.0010 |                      | 0.20         |         |                |              | 0.40–1.0              |                |                | ...                                        |
| AZ92A                 | M11920  | remainder                                                       | 8.3–9.7       |              | 0.25        |                 | 0.005              |           | 0.10–0.35              |               | 0.01   |                      | 0.30         |         |                |              | 1.6–2.4               |                |                | 0.30                                       |
| AZ101A                | M11101  | remainder                                                       | 9.5–10.5      |              | 0.05        |                 | 0.005              |           | 0.13–0.05              |               | 0.005  |                      | 0.05         |         |                |              | 0.75–1.25             |                |                | 0.0002–<br>0.0008<br>Be                    |
| EQ21A                 | M18330  | remainder                                                       |               | 0.05–0.10    |             | 1.0–1.7         | 0.010              |           |                        |               | 0.01   | 1.5–3.0 <sup>D</sup> |              | 1.3–1.7 |                |              | 0.20–0.50             |                | 0.40–1.0       | 0.30                                       |
| EV31A <sup>E</sup>    | M12310  | remainder                                                       |               | 0.01         | 0.10        |                 |                    |           |                        | 2.6–3.1       | 0.0020 | 0.4 <sup>F</sup>     |              | 0.05    |                |              | 0.3–1.0               |                |                | 0.01                                       |
| EZ33A                 | M12330  | remainder                                                       |               |              |             |                 |                    |           |                        |               | 0.01   | 2.5–4.0              |              |         |                |              | 2.0–3.1               |                | 0.50–1.0       | 0.30                                       |
| K1A                   | M18010  | remainder                                                       |               |              |             |                 |                    |           |                        |               |        |                      |              |         |                |              | 0.40–1.0 <sup>G</sup> |                |                | 0.30                                       |
| LA141A                | M14141  | remainder                                                       | 1.0–1.5       |              | 0.005       |                 | 0.005              | 13.0–15.0 | 0.15                   |               | 0.005  |                      | 0.004        |         |                |              |                       |                | 0.005<br>Na    | 0.30                                       |



Chemical Composition, % max unless shown as a range or as a min

| Practice<br>B275 | UNS    | Magne-<br>sium | Alumi-<br>num | Cal-<br>cium | Cop-<br>per | Gado-<br>linium | Iron  | Lithium | Man-<br>ganese | Neod-<br>mium | Nickel | Rare<br>Earths       | Sili-<br>con | Silver  | Stron-<br>tium | Yt-<br>trium | Zinc     | Zirco-<br>nium | Other Elements |               |
|------------------|--------|----------------|---------------|--------------|-------------|-----------------|-------|---------|----------------|---------------|--------|----------------------|--------------|---------|----------------|--------------|----------|----------------|----------------|---------------|
|                  |        |                |               |              |             |                 |       |         |                |               |        |                      |              |         |                |              |          |                | Specific       | Each<br>Total |
| M1A              | M15100 | remainder      |               | 0.30         | 0.05        |                 |       |         | 1.2–2.0        |               | 0.01   |                      | 0.10         |         |                |              |          |                |                | 0.30          |
| M1C              | M15102 | remainder      | 0.01          |              | 0.02        |                 | 0.03  |         | 0.50–1.3       |               | 0.001  |                      |              |         |                |              |          |                |                | 0.30          |
| TA54A            | M18540 | remainder      | 3.0–4.0       |              | 0.05        |                 |       |         | 0.20–0.7       |               | 0.01   |                      | 0.30         |         |                |              | 0.30     |                |                | 0.30          |
| QE22A            | M18220 | remainder      |               |              | 0.10        |                 |       |         |                |               | 0.01   | 1.8–2.5 <sup>D</sup> |              |         |                |              |          |                |                |               |
| WE54A            | M18410 | remainder      |               |              | 0.03        |                 |       | 0.20    | 0.03           | 1.5–2.0       | 0.005  | 1.5–4.0 <sup>H</sup> | 0.01         | 2.0–3.0 |                | 4.75–5.5     |          | 0.40–1.0       |                | 0.30          |
| WE43A            | M18430 | remainder      |               |              | 0.03        |                 | 0.01  | 0.2     | 0.15           | 2.0–2.5       | 0.005  | 2.4–4.4 <sup>H</sup> | 0.01         |         |                | 3.7–4.3      | 0.20     | 0.40–1.0       |                | 0.20          |
| WE43B            | M18432 | remainder      |               |              | 0.02        |                 | 0.010 | 0.2     | 0.03           | 2.0–2.5       | 0.005  | 2.4–4.4              |              | /       |                | 3.7–4.3      | /        | 0.40–1.0       |                | 0.01          |
| ZC63A            | M16331 | remainder      |               |              | 2.4–3.0     |                 |       |         | 0.25–0.75      |               | 0.01   |                      | 0.20         |         |                |              | 5.5–6.5  |                |                | 0.30          |
| ZE10A            | M16100 | remainder      |               |              |             |                 |       |         |                |               |        | 0.12–0.22            |              |         |                | 1.0–1.5      |          |                |                | 0.30          |
| ZE41A            | M16410 | remainder      |               |              | 0.10        |                 |       |         | 0.15           |               | 0.01   | 0.75–1.75            |              |         |                | 3.5–5.0      | 0.40–1.0 |                |                | 0.30          |
| ZK40A            | M16400 | remainder      |               |              | 0.10        |                 |       |         |                |               | 0.01   |                      |              |         |                | 3.5–4.5      | 0.45 min |                |                | 0.30          |
| ZK51A            | M16510 | remainder      |               |              | 0.10        |                 |       |         |                |               | 0.01   |                      |              |         |                | 3.6–5.5      | 0.50–1.0 |                |                | 0.30          |
| ZK60A            | M16600 | remainder      |               |              |             |                 |       |         |                |               |        |                      |              |         |                | 4.8–6.2      | 0.45 min |                |                | 0.30          |
| ZK60B            | M16601 | remainder      |               |              |             |                 |       |         |                |               |        |                      |              |         |                | 4.8–6.8      | 0.45 min |                |                | 0.30          |
| ZK61A            | M16610 | remainder      |               |              | 0.10        |                 |       |         |                |               | 0.01   |                      |              |         |                | 5.5–6.5      | 0.6–1.0  |                |                | 0.30          |

<sup>A</sup>Alloys AJ52A, AJ62A, and AS21B are patented compositions for elevated temperature applications. Interested parties are invited to submit information regarding the identification of alternatives to these compositions to ASTM International. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this specification. Users of this specification 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.

<sup>B</sup>For alloys AS41B, AM50A, AJ52A, AM60B, AJ62A, 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.

<sup>C</sup>If the iron content exceeds 0.005 %, then the permissible iron to manganese ratio shall not exceed 0.032 for AZ91E alloy.

<sup>D</sup>Rare earth elements are in the form of didymium, with not less than 70 % neodymium and remainder substantially praseodymium.

<sup>E</sup>Alloy EV31A is a patented composition, suitable for elevated temperature applications. Interested parties are invited to submit information regarding the identification of alternatives to these compositions to ASTM International. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this specification. Users of this specification 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.

<sup>F</sup>Other Rare Earths may also be present to a total maximum of 0.4 %. These Rare Earths shall principally be cerium, lanthanum, and praseodymium.

<sup>G</sup>Zirconium range for sheet and plate shall be 0.45–1.0.

<sup>H</sup>Other Rare Earths shall be principally heavy rare earths, such as gadolinium, dysprosium, erbium, and ytterbium. Other Rare Earths are derived from the yttrium, typically 80 % yttrium and 20 % heavy rare earths.

<sup>I</sup>Zinc + Silver content shall not exceed 0.20 % in WE43B.

## SUMMARY OF CHANGES

Committee B07 has identified the location of selected changes to this standard since the last issue (B 275 – 04) that may impact the use of this standard.

- |                                                                                                                                                                                                                                                      |                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>(1) Added alloys AJ52A AJ62A, AS21A, AS21B, and EV31A to <b>Table X4.1</b>.</p> <p>(2) Corrected Mn on WE54A to match Specification <b>B 80</b> values.</p> <p>(3) Removed alloy ZE63A from <b>Table X4.1</b> because it is no longer in use.</p> | <p>(4) Removed unnecessary notes from <b>Table X4.1</b>.</p> <p>(5) Reordered <b>Table X4.1</b> so that elements are listed alphabetically.</p> |
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