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Designation: ~~B860 – 13~~ B860 – 15

Standard Specification for Zinc Master Alloys for Use in Hot Dip Galvanizing[1]

This standard is issued under the fixed designation B860; 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.

1. Scope*

1.1 This specification covers zinc master alloys which are used in hot dip galvanizing for the purpose of adjusting the concentration of certain alloying elements in the molten zinc bath. Table 1 covers the chemical composition of these materials which include six master alloys of zinc-aluminum (brightener) and one master alloy of zinc-antimony.

ASTM	Common		UNS
Type A-1	90/10 Zn/Al	High Purity	Z30750
Type A-2	90/10 Zn/Al	Low Purity	Z31710
Type A-3	95/5 Zn/Al	High Purity	Z30503
Type A-4	95/5 Zn/Al	Low Purity	Z31510
Type A-5	96/4 Zn/Al	High Purity	Z31520
Type A-6	96/4 Zn/Al	Low Purity	Z30504
Type S-1	90/10 Zn/Sb		Z55710

NOTE 1—The master alloys in Specification B860 are intended to be used primarily in hot-dip galvanizing to adjust the concentration of certain elements in a molten zinc bath, and differ from the zinc-aluminum alloys in Specification B997 which are intended to be used primarily in molten zinc-aluminum.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to become familiar with all hazards including those identified in the appropriate ~~Material~~ Safety Data Sheet ~~(MSDS)~~(SDS) for this product/material as provided by the manufacturer, to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.*

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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]

B897 Specification for Configuration of Zinc and Zinc Alloy Jumbo, Block, Half Block, and Slab Ingot
B899 Terminology Relating to Non-ferrous Metals and Alloys
B997 Specification for Zinc-Aluminum Alloys in Ingot Form for Hot-Dip Coatings
E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition
E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)
E536 Test Methods for Chemical Analysis of Zinc and Zinc Alloys

2.3 *ISO Standards:*[3]

ISO 3815-1 Zinc and zinc alloys — Part 1: Analysis of solid samples by optical emission spectrometry
ISO 3815-2 Zinc and zinc alloys — Part 2: Analysis by inductively coupled plasma optical emission spectrometry

[1] This specification is under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.04 on Zinc and Cadmium.

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[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~~standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

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

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TABLE 1 Chemical Requirements Composition, % (Range or Maximum Value)[A]

Type A-1	90 % Zinc–10 % Aluminum (90/10 Zn/Al)	High Purity
Type A-2	90 % Zinc–10 % Aluminum (90/10 Zn/Al)	Low Purity
Type A-3	95 % Zinc–5 % Aluminum (95/5 Zn/Al)	High Purity
Type A-4	95 % Zinc–5 % Aluminum (95/5 Zn/Al)	Low Purity
Type A-5	96 % Zinc–4 % Aluminum (96/4 Zn/Al)	High Purity
Type A-6	96 % Zinc–4 % Aluminum (96/4 Zn/Al)	Low Purity
Type S-1	90 % Zinc–10 % Antimony (90/10 Zn/Sb)	

UNS[B]	Type A-1 90/10 Zn/Al Z30750	Type A-2 90/10 Zn/Al Z31710	Type A-3 95/5 Zn/Al Z30503	Type A-4 95/5 Zn/Al Z31510	Type A-5 96/4 Zn/Al Z31520	Type A-6 96/4 Zn/Al Z30504	Type S-1 90/10 Zn/Sb Z55710
Fe	0.05 max	0.15 max	0.05 max	0.15 max	0.05 max	0.15 max	0.03 max
~~Pb~~	~~0.005 max~~	~~0.4 max~~	~~0.005 max~~	~~0.4 max~~	~~0.005 max†~~	~~0.4 max~~	~~0.015 max~~
Pb	0.005 max	0.4 max	0.005 max	0.4 max	0.005 max	0.4 max	0.015 max
Cd	0.004 max	...	0.004 max	...	0.004 max	...	0.003 max
Cu	0.035 max	0.5 max	0.035 max	0.5 max	0.035 max	0.5 max	0.003 max
Mg	...	...	...	...	0.06 max	0.06 max	
Sn	0.003 max	...	0.003 max	...	0.003 max	...	0.01 max
As	...	...	...	...	...	...	0.015 max
Al	9.5–10.5	9.5–10.5	4.5–5.5	4.5–5.5	4.0-4.5	4.0-4.5	...
Sb[C]	...	...	...	...	...	...	9.5–10.5
Others, Total	0.01 max	0.25 max	0.01 max	0.25 max	0.01 max	0.25 max	0.03 max
Zn[D]	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder

[A] The following applies to all specified limits in this table: For purposes of determining conformance with this specification, an observed value obtained from analysis shall be rounded off to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of Practice E29.
[B] UNS numbers in conformance with Practice E527.
[C] Chemical method under development.
[D] For information only. Quantitative determination of this element is not required. Zinc is assumed to be the difference between 100 % and the sum of those elements listed above.

~~† Corrected editorially.~~

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3. Terminology

3.1 Terms defined in Terminology B899 shall apply unless defined otherwise in this standard.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *brightener bar, n*—brightener bar is a zinc alloy containing aluminum which is added to the galvanizing bath to adjust the aluminum content of the bath to: suppress the formation of iron-zinc alloy layers, increase the brightness and ductility of the galvanized coating, and improve the drainage of zinc from the work as it exits the bath; also called brightener.

4. Ordering Information

4.1 Orders for ingots under this specification shall include the following information:
4.1.1 Quantity, lb,
4.1.2 Alloy type (see Table 1),
4.1.3 Size and type of ingot (jumbo, type 1 block, type 2 block, slab or other ingot shape), if not manufacturer's standard,
4.1.4 Specification number and year date,
4.1.5 Source inspection (see Section 8), and
4.1.6 Marking (see Section 10).

5. Materials and Manufacture

5.1 The material covered by this specification shall be of uniform quality and shall be free from harmful contamination. The ingot surface shall contain a minimum of dross and adhering foreign matter.

6. Chemical Requirements

6.1 *Limits*—The alloys shall conform to the requirements as to chemical composition prescribed in Table 1. Conformance shall be determined by the producer by analyzing samples taken at the time the ingots are made. If the producer has determined the chemical composition of the metal during the course of manufacture, he shall not be required to sample and analyze the finished product.

6.2 In case of dispute, the following requirements shall apply:
6.2.1 *Number of Samples*—Samples for verification of chemical composition shall be taken as follows:
6.2.1.1 Not less than five ingots shall be taken at random from each car or truckload of the same alloy for sampling. Each heat in the shipment shall be represented. If the shipment is less than a carload lot, one sample ingot shall be taken for each 10 000 lb (4540 kg) or fraction thereof. When it is deemed necessary, a sample may be taken from each melt of 1000 lb (454 kg) or more.

6.3 *Methods of Sampling*—Samples from ingots for determination of chemical composition shall be taken in accordance with one of the following methods: