



Designation: B860 – 09a^{ε1}

Standard Specification for Zinc Master Alloys for Use in Hot Dip Galvanizing¹

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.

^{ε1} NOTE—Table 1 was corrected editorially in May 2010.

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	...
Type A-6	96/4 Zn/Al Low Purity	...
Type S-1	90/10 Zn/Sb	Z55710

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) 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.*

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

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 Document Summary page on the ASTM website.

[B897 Specification for Configuration of Zinc and Zinc Alloy Jumbo Block and Half Block Ingot](#)

[B899 Terminology Relating to Non-ferrous Metals and Alloys](#)

[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](#)

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

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

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 ZXXXXX	Type A-6 96/4 Zn/Al ZXXXXX	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
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.

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:

6.3.1 Samples for chemical analysis shall be taken from the material by drilling, sawing, milling, turning, or clipping a

representative piece or pieces to obtain weight of prepared sample not less than 100 g. Sampling shall be in accordance with Practice E88.

6.3.2 By agreement, an optional method of sampling would be to select, at random, ingots of the same heat, melt together representative portions of each ingot selected, and cast a disc or suitable sample from the liquid composite for spectrographic or chemical analysis.

6.3.3 Samples for chemical analysis may also be in the form of a separately cast spectrographic disc specimen taken from the same pour used to cast the ingot.

6.3.4 Alternate procedures for sampling and exchange of samples shall be agreed upon between the producer and the customer.

6.4 *Method of Analysis*—The determination of chemical composition shall be made in accordance with suitable chemical Test Methods E536, suitable spectrochemical methods ISO3815-1 and ISO 3815-2, or other methods. In case of dispute, the results should preferably be secured by Test Methods E536, or ISO 3815-1 or ISO 3815-2 and shall be the basis of acceptance.

7. Size and Shape

7.1 Master alloys may be ordered as jumbos, blocks, slabs or other ingot configurations.

7.1.1 *Jumbo*—large casting of zinc or zinc alloy, having through holes for chains, designed for handling by mechanical equipment, which is also referred to as a jumbo or strip jumbo. See Specification B897 for additional details.

7.1.2 *Block*—large casting of zinc or zinc alloy, having lift pockets, designed for handling by mechanical equipment, which is also referred to as block. See Specification B897 for additional details.