



Designation: B 860 – 01

An American National Standard

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

This standard is issued under the fixed designation B 860; 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 three 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	Zxxxxx
Type S-1	90/10 Zn/Sb	Z55710

1.2 *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 Data Sheet 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:

- B 899** Terminology Relating to Non-ferrous Metals and Alloys²
- E 29** Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications³
- E 47** Test Methods for Chemical Analysis of Zinc Die-Casting Alloys⁴
- E 88** Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition⁵

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 Annual Book of ASTM Standards, Vol 02.04.

³ Annual Book of ASTM Standards, Vol 14.02.

⁴ Discontinued; see 1997 Annual Book of ASTM Standards, Vol 03.05.

⁵ Annual Book of ASTM Standards, Vol 03.05.

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 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 Zxxxxx	Type S-1 90/10 Zn/Sb Z55710
Fe	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	0.015 max
Cd	0.004 max	...	0.004 max	...	0.003 max
Cu	0.035 max	0.5 max	0.035 max	0.5 max	0.003 max
Sn	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	...
Sb ^C	...	...	...	...	9.5–10.5
Others, Total	0.01 max	0.25 max	0.01 max	0.25 max	0.03 max
Zn ^D	Remainder	Remainder	Remainder	Remainder	Remainder

^AThe 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 E 29^{E 29}.

^BUNS numbers in conformance with Practice E 527^{E 527}.

^CChemical method under development.

^DFor 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.

E 527 Practice for Numbering Metals and Alloys (UNS)⁶

E 536 Test Method for Chemical Analysis of Zinc and Zinc Alloys⁷

3. Terminology

3.1 Terms shall be defined in accordance with Terminology B 899^{B 899}.

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, if not manufacturer's standard,

⁶ Annual Book of ASTM Standards, Vol 01.01

⁷ Annual Book of ASTM Standards, Vol 03.06.

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



- 4.1.4 Specification number and year date,
- 4.1.5 Source inspection (see Section 7), and
- 4.1.6 Marking (see Section 9).

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 E 88E 88.

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 A sample disc from each approved alloy heat shall accompany the shipment and shall be used to confirm adherence to the specification.

6.4 *Method of Analysis*—The determination of chemical composition shall be made in accordance with suitable chemical (Test Methods E 536 or E 47E 536E 47 (tin only)), or other methods. In case of dispute, the results secured by Test Method E 536E 536 shall be the basis of acceptance.

7. Source Inspection

7.1 If the purchaser desires that his representative inspect or witness the inspection and testing of the product prior to shipment, such agreement shall be made by the purchaser and producer or supplier as part of the contract or purchase order.

7.2 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 satisfy him that the product meets the requirements of this specification. Inspection and tests shall be conducted in such a manner that there is no unnecessary interference with the producer's operations.

8. Rejection and Rehearing

8.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing. If the rehearing establishes that the material does not conform to the requirements of this specification, it should be rejected and returned to the producer.

9. Identification Marking

9.1 All ingots shall be properly marked for identification with the producer's name or brand.

9.2 Each bundle or skid shall be identified with the bundle weight and the producer's heat number.

10. Packaging

10.1 Unless otherwise specified, the ingot shall be packaged to provide easy access for unloading by overhead crane or forklift. Each package shall contain only one alloy unless otherwise agreed upon.

11. Keywords

11.1 brightener; zinc; zinc alloys; zinc-aluminum alloy; zinc-antimony alloy; zinc master alloys; zinc metal