



Standard Specification for Zinc¹

This standard is issued under the fixed designation B 6; 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 specification covers zinc metal made from ore or other material by a process of distillation or by electrolysis in five grades as follows:

- 1.1.1 LME Grade
- 1.1.2 Special High Grade
- 1.1.3 High Grade
- 1.1.4 Intermediate Grade
- 1.1.5 Prime Western Grade

NOTE 1—Certain continuous galvanizing grades are specified in Specification B 852. Other continuous galvanizing and controlled lead grades are not included in this specification but are covered by specific user purchasing specifications.

1.2 This specification does not cover zinc produced by “sweating” or remelting of secondary zinc.

1.3 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.

1.4 *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 the date of material purchase form a part of this specification to the extent referenced herein.

2.2 *ASTM Standards*:²

B 852 Specification for Continuous Galvanizing Grade

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.

(CGG) Zinc Alloys for Hot-Dip Galvanizing of Sheet Steel

B 897 Specification for the Configuration of Zinc and Zinc Alloy Jumbo and Block Ingot

B 899 Terminology Relating to Non-ferrous Metals and Alloys

B 914 Practice for Color Codes on Zinc and Zinc Alloy Ingot for Use in Hot-Dip Galvanizing of Steel

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E 47 Test Methods for Chemical Analysis of Zinc Die-Casting Alloys³

E 88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition

E 527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

E 536 Test Methods for Chemical Analysis of Zinc and Zinc Alloys

2.3 *ISO Standards*:⁴

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 shall be defined in accordance with Terminology B 899.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *LME Grade, n*—a grade of zinc containing a minimum of 99.995 % zinc, with controlled impurity levels, as specified in Table 1.

3.2.2 *Special High Grade, n*—a high purity grade of zinc containing a minimum of 99.990 % zinc, with controlled impurity levels, as specified in Table 1.

3.2.3 *High Grade, n*—a grade of zinc containing a minimum of 99.95 % zinc, with controlled impurity levels, as specified in Table 1.

3.2.4 *Intermediate Grade, n*—a grade of zinc containing a minimum of 99.5 % zinc, with controlled impurity levels, as specified in Table 1.

³ Withdrawn.

⁴ 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

NOTE 1—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 E 29.

Grade [UNS] ^A	Color Code ^B	Composition, %							
		Lead	Iron max	Cadmium max	Alumi- num max	Copper max	Tin max	Total Non-Zinc max	Zinc, min by difference
LME Grade (LME) [Z12002]	White	0.003 max	0.002	0.003	0.001	0.001	0.001	0.005	99.995
Special High Grade ^C (SHG) [Z13001]	Yellow	0.003 max	0.003	0.003	0.002	0.002	0.001	0.010	99.990
High Grade (HG) [Z14002]	Green	0.03 max	0.02	0.01	0.01	0.002	0.001	0.05	99.95
Intermediate Grade (IG) [Z16003]	Blue	0.45 max	0.05	0.01	0.01	0.20	...	0.5	99.5
Prime Western Grade (PWG) [Z18004]	Black	0.5–1.4	0.05	0.20	0.01	0.10	...	1.5	98.5

^A UNS designations were established in accordance with Practice E 527.

^B Refer to Practice B 914.

^C For London Metal Exchange (LME) purposes, Special High Grade zinc must be 99.995 % minimum zinc content by difference, corresponding to LME Grade in ASTM Specification B 6.

3.2.5 *Prime Western Grade, n*—a grade of zinc containing 0.5 to 1.4 % lead, a minimum of 98.5 % zinc, with controlled impurity levels, as specified in Table 1.

3.3 Abbreviations:

3.3.1 *LME*—LME Grade Zinc

3.3.2 *SHG*—Special High Grade Zinc

3.3.3 *HG*—High Grade Zinc

3.3.4 *IG*—Intermediate Grade Zinc

3.3.5 *PWG*—Prime Western Grade Zinc

4. Ordering Information

4.1 Orders for zinc metal under this specification shall include the following information:

4.1.1 ASTM designation and year of issue,

4.1.2 Quantity (weight),

4.1.3 Name of material (zinc metal),

4.1.4 Size (see Section 7), and

4.1.5 Grade (see Table 1).

5. Materials and Manufacture

5.1 The manufacturer shall use care to have each lot of zinc metal be as uniform in quality as possible.

6. Chemical Composition

6.1 The zinc metal shall conform to the requirements prescribed in Table 1.

7. Sizes and Shapes

7.1 Slabs varying in weight from 40 to 60 lb (18 to 27 kg) are all considered standard slabs.

7.2 Zinc metal may be ordered in jumbos or blocks, as specified in Specification B 897.

7.3 Zinc metal may also be ordered in anodes or other shapes.

8. Appearance

8.1 The zinc metal shall be reasonably free of surface corrosion and adhering foreign matter.

9. Sampling for Chemical Analysis

9.1 The producer may obtain representative samples from the molten metal during casting, and all or part of these samples may be cast into shapes suitable for use in spectrochemical methods.

9.2 If the zinc is in the form of standard slabs at the customer's plant, the sample for chemical analysis shall be taken in accordance with 9.2.1–9.2.5, inclusive.

9.2.1 *Selection of Portion*—A portion representative of the total shipment or order shall be selected at random for the final sample. The portion preferably shall be taken during loading or unloading. From lots containing at least 60 000 lb (27 300 kg) of zinc, one slab shall be taken from every 10 000 lb (4530 kg). From smaller lots, five slabs shall be taken.

9.2.2 *Preparation of Sample*—Each slab shall be cleaned thoroughly to rid the surface of extraneous material and drilled or sawed, without lubricant in accordance with 9.2.3 or 9.2.4. The drillings or sawings shall be subjected to the action of a strong magnet to remove any adventitious iron with which the sample may have become contaminated from the drill or saw.

NOTE 2—Sampling by sawing is not recommended for Special High Grade zinc because complete removal of the final traces of adventitious iron from sawings is difficult.

9.2.3 *Drilling*—Two holes shall be drilled, preferably from the bottom or brand side of each slab, at two points located along one diagonal of the slab so that each point is halfway between the center and one extremity of the diagonal. If two holes from each slab do not yield the weight of sample prescribed in 9.2.5, a third hole shall be drilled at the center of each slab. Each hole shall be bored completely through the slab, care being taken to avoid starting the drill in a depression and to adjust the feed to give drillings 0.010 to 0.020 in. (0.25 to 0.51 mm) in thickness. The drill used preferably shall be one twisted from flat stock. The diameter of the drill shall be ½ in. (12.7 mm) for Special High Grade zinc, and shall be ⅝ in. (7.9 mm) for other grades of zinc. The drillings shall be broken or cut with clean shears into pieces not over ½ in. in length and mixed thoroughly.

9.2.4 *Sawing*—Using, preferably, a heat treated high-speed steel saw, make two cuts completely across and through the slab from one long side to the other. Each cut shall be approximately halfway between the center and each end. The width of the saw cut shall be sufficient to give the weight of sample prescribed in 9.2.5, and cuttings from all the slabs shall be mixed thoroughly to form a uniform sample.

9.2.5 *Size of Sample and Storage*—The prepared sample shall weigh at least 1600 g for Special High Grade zinc, and at least 300 g for other grades of zinc. The properly mixed sample shall be split into three equal parts, each of which shall be placed in a sealed package, one for the manufacturer, one for the purchaser, and one for a referee, if necessary. Tight, leak-proof, paper sample envelopes or cardboard cartons may be used to hold the sample.

9.3 If the zinc is in shapes other than standard slabs, the sampling procedure shall be agreed upon between the manufacturer or seller and the purchaser.

9.4 Aspects of sampling and sample preparation not covered specifically in this specification shall be carried out in accordance with Practice E 88.

10. Methods of Chemical Analysis

10.1 The chemical compositions enumerated in this specification shall, in case of disagreement, be determined by methods mutually agreed upon. Preferably the method should be chosen from the ASTM methods listed in Table 2 approved for referee purposes, or, ISO 3815-1 or ISO 3815-2. Note Test Methods E 47 is for tin only.

11. Claims

11.1 Claims to be considered shall be made in writing to the manufacturer within 30 days of receipt of material at the purchaser's plant and the results of the purchaser's tests shall be given. The manufacturer shall be given one (1) week from date of receipt of such claim to investigate his records and then shall agree either to satisfy the claim or send a representative to the plant of the purchaser.

TABLE 2 Methods of Analysis

Method	ASTM Designation
Chemical analysis (for tin)	E 47
Chemical analysis	E 536

11.1.1 *Analysis of Car Lots*—No claims shall be considered unless the minimum samples as specified in 9.2.1 can be shown to such representative.

11.1.2 *Physical Defects of Individual Pieces*—No claims shall be considered unless the zinc metal in question, unused, can be shown to such representative.

11.1.3 When the zinc metal satisfies the chemical and physical requirements of this specification, it shall not be condemned for defects in manufacturing, for defects of alloys in which it is used, or for defects in the coating of zinc-coated products.

12. Investigation of Claims

12.1 The inspector representing the manufacturer shall examine all pieces where physical defects are claimed. If agreement is not reached, the question of fact shall be submitted to a mutually agreeable referee, whose decision shall be final.

12.2 On a question of metal contents, a sample shall be drawn in the presence of representatives of both the manufacturer and the purchaser as described in Section 8. The manufacturer and the purchaser shall each make an analysis, and if the results do not establish or dismiss the claim to the satisfaction of both parties, the third sample shall be submitted to a mutually agreeable referee, who shall determine the question of quality, and whose determination shall be final.

13. Settlement of Claims

13.1 The expenses of the manufacturer's representative and of the referee shall be paid by the loser or divided in proportion to concession made in case of compromise. In case of rejection being established, maximum damages shall be limited to the payment of freight both ways by the manufacturer for substitution of an equivalent weight of zinc metal conforming to this specification.

14. Product Marking

14.1 A brand, by which the manufacturer can be identified, shall be cast or die stamped in each slab, block, or ingot.

14.2 Each ingot, bundle, or skid shall be marked with the appropriate Color Code for that zinc grade per the requirements in Practice B 914.

15. Keywords

15.1 high grade zinc; prime western zinc; special high grade zinc; zinc; zinc metal

SUMMARY OF CHANGES

Committee B02 has identified the location of selected changes to this standard since the last issue (B 6 - 07) that may impact the use of this standard. (Approved November 1, 2008.)

(I) Revisions have been made to Sections **2.3** and **10.1** to add analytical spectrochemical methods **ISO 3815-1** and **ISO 3815-2**.

Committee B02 has identified the location of selected changes to this standard since the last issue (B 6 - 06) that may impact the use of this standard. (Approved May 1, 2007.)

(I) A reference to Specification **B 897** to specify the size and configuration of jumbo and block ingots was added.

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