



Designation: B440 – 12 (Reapproved 2021)

Standard Specification for Cadmium¹

This standard is issued under the fixed designation B440; 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 refined cadmium metal in slab, ball or stick form.

1.2 **Toxicity—Warning:** Soluble and respirable forms of cadmium may be harmful to human health and the environment in certain forms and concentrations. Therefore, ingestion and inhalation of cadmium should be controlled under the appropriate regulations of the U.S. Occupational Safety and Health Administration (OSHA). Cadmium-containing alloys and coatings should not be used on articles that will contact food or beverages, or for dental and other equipment that is normally inserted in the mouth. Similarly, if articles using cadmium-containing alloys or coatings are welded, soldered, brazed, ground, “flame-cut,” or otherwise heated during fabrication, adequate ventilation must be provided to maintain occupational cadmium exposure below the OSHA Permissible Exposure Level (PEL).

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 Safety Data Sheet (SDS) for this product/material as provided by the manufacturer, to establish appropriate safety, health, and environmental practices, and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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. Referenced Documents

2.1 *ASTM Standards:*²

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

E396 Test Methods for Chemical Analysis of Cadmium

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

3. Terminology

3.1 Terms shall be defined in accordance with Terminology B899.

4. Ordering Information

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

4.1.1 ASTM designation,

4.1.2 Quantity (weight),

4.1.3 Grade (Table 1), and

4.1.4 Shape and size (Section 7).

5. Materials and Manufacture

5.1 The cadmium shall be furnished in commercial standard forms or shapes requested by purchaser.

6. Chemical Requirements

6.1 The cadmium supplied shall conform to the requirements of Table 1 for one of the three grades.

7. Shape and Size

7.1 Various forms and sizes of commercially available cadmium are:

Form	Shape and Size
Ball	Spherical, about 2 in. (50.8 mm) in diameter
Stick	Bar, about 9 × ½ × ⅜ in. (229 × 9.5 mm) or stick about 9 × ½ in. (229 × 12.7 mm) in diameter.
Slab	Plate or bar, varying in weight from about 20 to 60 lb (9.0 to 27.2 kg)

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.

TABLE 1 Chemical Requirements^A

NOTE 1—With the mutual agreement of the buyer and seller, chemical limits for Tin, Silver, Antimony, Arsenic, and Mercury may also be assigned to the grades 99.95 and 99.99 Cd.

Element	Grade (UNS) ^B		
	99.95 Cd (L01951)	99.99 Cd (L01971)	99.995 Cd (L01981)
Cadmium, min. ^A	99.95 %	99.99 %	99.995 %
Iron, max. ppm	...	10	5
Copper, max. ppm	150	20	5
Nickel, max. ppm	...	10	5
Lead, max. ppm	250	100	20
Zinc, max. ppm	350	30	5
Thallium, max. ppm	35	35	5
Tin, max. ppm	...	...	1
Silver, max. ppm	...	...	1
Antimony, max. ppm	...	...	0.1
Arsenic, max. ppm	...	...	1
Mercury, max. ppm	...	...	0.1

^A Determined by difference.

^B UNS designations were established in accordance with Practice E527.

7.2 Cadmium may be ordered in other shapes and sizes as mutually agreed.

8. Workmanship, Finish, and Appearance

8.1 The supplier shall use care to have the quality of each lot of cadmium as uniform as possible.

8.2 The cadmium shall be reasonably free of adhering foreign material.

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 analysis.

9.2 For sampling cadmium in slab form a minimum of two pieces shall be selected for shipments of 500 lb (227 kg) or less, three pieces for shipments of 500 to 1000 lb (227 to 454 kg), and one additional piece for each additional 1000 lb (454 kg) or part thereof. For cadmium in ball or stick form a minimum of four pieces shall be selected for shipments of 500 lb (227 kg) or less, six pieces for shipments of 500 to 1000 lb (227 to 454 kg) and two additional pieces for each additional 1000 lb (454 kg) or part thereof.

9.3 The selected pieces shall be cleaned to rid the surface of extraneous material and then sawed, drilled, or milled, care being taken to avoid errors due to segregation within the pieces. The saw, drill, or cutter used shall be thoroughly cleaned. No lubricant shall be used in the operation, and the sawings, drillings, or millings shall be treated with a magnet to remove any particles of steel introduced in the taking of the samples. Equal weights of the sawings, drillings, or millings shall be taken from each piece sampled, and then combined

into one sample and thoroughly mixed. The total sample weight shall be not less than 300 g.

9.4 In those cases where the cadmium involved is in some other shape or form that does not lend itself to any of the above methods, the sampling procedure shall be agreed upon between the manufacturer or seller and purchaser. The method of 9.1 offers many advantages.

9.5 Aspects of sampling and sample preparation not covered specifically in this specification shall be carried out in accordance with Practice E88.

10. Method of Chemical Analysis

10.1 The chemical requirements enumerated in Table 1 shall, in case of disagreement, be determined by methods mutually agreed upon or by Test Methods E396.

11. Rejection

11.1 Material which fails to conform to the requirements of this specification may be rejected.

12. Claims

12.1 Claims to be considered shall be made to manufacturer or seller in writing within 30 days of receipt of material at the purchaser's plant, and the results of the test made by the purchaser shall accompany such claims. The manufacturer or seller shall be given 2 weeks from the receipt of the complaint to investigate his records and shall either agree to satisfy the claim, obtain a sample of the metal for investigation, or send a representative to the plant of the purchaser.

12.2 No claims shall be considered unless the minimum number of samples of unused cadmium shapes can be shown to such representative.

12.3 In a question of chemical composition, a sample shall be drawn by representatives of both parties in accordance with Section 10. The properly mixed and quartered sample shall be separated into three parts, each of which shall be placed in a sealed package, one for the manufacturer or seller, one for the purchaser and one for an umpire, if necessary. The manufacturer or seller and purchaser shall each perform an analysis. 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 umpire who shall determine the question of quality and whose determination shall be final.

13. Product Marking

13.1 The outside container shall be marked in such a way that the manufacturer or seller may be identified. The individual pieces of cadmium may also be marked at the discretion of the manufacturer or seller.

14. Keywords

14.1 cadmium; cadmium metal