Designation: B 440 – 00

# Standard Specification for Cadmium[1]

This standard is issued under the fixed designation B 440; 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 The values stated in inch-pound units are to be regarded as the standard.

1.3 *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).

1.4 *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 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 *ASTM Standards:*

B 899 Terminology Relating to Non-ferrous Metals and Alloys[2]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[3]

E 88 Practice for Sampling Nonferrous Metals and Alloys In Cast Form for Determination of Chemical Composition[4]

E 396 Test Methods for Chemical Analysis of Cadmium[4]

E 527 Practice for Numbering Metals and Alloys[5]

## 3. Terminology

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

## 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) and,

4.1.3 Grade (Table 1)

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. diameter |
| Stick | Bar, about 9 × ½ × 38 in. or stick about 9 × ½ in. in diameter. |
| Slab | Plate or bar, varying in weight from about 20 to 60 lb |

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.

[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] *Annual Book of ASTM Standards*, Vol 03.06.

[5] *Annual Book of ASTM Standards*, Vol 01.01.

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

**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 E 527.

9.2 For sampling cadmium in slab form a minimum of two pieces shall be selected for shipments of 500 lb or less, three pieces for shipments of 500 to 1000 lb (227 to 454 kg), and one additional piece for each additional 1000 lb or part thereof. For cadmium in ball or stick form a minimum of four pieces shall be selected for shipments of 500 lb or less, six pieces for shipments of 500 to 1000 lb and two additional pieces for each additional 1000 lb 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 E 88.

## 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 E 396.

## 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.

12.4 Expenses of the manufacturer's or seller's representatives and of the umpire shall be paid by the loser or divided in proportion to the concession made in case of compromise. In the case of rejection being established, the damages shall be limited to the payment of freight both ways by the manufacturer or seller for substitution of an equivalent weight of cadmium conforming to this specification.

## 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

## SUMMARY OF CHANGES

This section contains the principle changes to the standard that have been incorporated since the last issue.

(1) The caveat in section 1.4 was added editorially.
(2) Section 3. Terminology was added editorially.
(3) 1.3 was added.