



# Standard Specification for Nuclear-Grade Silver-Indium-Cadmium Alloy<sup>1</sup>

This standard is issued under the fixed designation C752; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers silver-indium-cadmium alloy for use as a control material in light-water nuclear reactors.

1.2 The scope of this specification excludes the use of this material in applications where material strength of this alloy is a prime requisite. Also, this material must be protected from the primary water by a corrosion and wear resistant cladding.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

## 2. Referenced Documents

2.1 *ASTM Standards*:<sup>2</sup>

**C760** Test Methods for Chemical and Spectrochemical Analysis of Nuclear-Grade Silver-Indium-Cadmium Alloys

**C859** Terminology Relating to Nuclear Materials

**E105** Practice for Probability Sampling of Materials

2.2 *ANSI Standard*:

**B46.1** Surface Roughness<sup>3</sup>

**ANSI/ASME NQA-1** Quality Assurance Requirements for Nuclear Facility Applications<sup>3</sup>

2.3 *U.S. Government Standard*:

**Title 10 Code of Federal Regulations, Energy Part 50 (10CFR50)** Domestic Licensing of Production and Utilization Facilities<sup>4</sup>

## 3. Terminology

3.1 Terms shall be defined in accordance with the terminology in Terminology **C859**, except for the following:

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee **C26** on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee **C26.03** on Neutron Absorber Materials Specifications.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

<sup>4</sup> Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

3.1.1 A lot shall be defined as all parts produced from the same melt by the same process.

## 4. Ordering Information

4.1 The buyer shall specify the following information on the order:

4.1.1 Quantity,

4.1.2 Lot size, and

4.1.3 Dimensions and tolerances.

## 5. Materials and Manufacture

5.1 The identity of each lot by melt number shall be maintained at all stages of manufacture.

5.2 Parts produced to this specification shall be made from billets by hot working and cold finishing to size.

5.3 The cold-finished parts shall be produced to the finish condition and dimensions as specified in the purchase order.

## 6. Chemical Composition

6.1 The parts shall conform to the following chemical composition:

Element	Weight %
Indium	15.00 $\pm$ 0.25
Cadmium	5.00 $\pm$ 0.25
Total impurities, max	0.50 max
Silver	remainder
Lead	0.03 max
Bismuth	0.03 max

## 7. Workmanship, Finish, and Appearance

7.1 The surface of the cold-finished part shall be free of oxides, grease, oil, residual lubricants, inclusions, and other extraneous materials.

7.2 Surface defects such as folds, cracks, seams, slivers, and blisters shall be cause for rejection.

7.3 Surface roughness shall be per ANSI B46.1 not to exceed 0.81  $\mu\text{m}$  rms (32  $\mu\text{in}$ . rms).

## 8. Sampling

8.1 A sampling plan to meet the acceptance criteria shall be agreed to between the buyer and the seller. Samples for chemical analysis shall be taken after completion of all hot-working operations. Recommended Practice **E105** is referenced as a guide.

8.2 The sample shall be sufficient to perform quality control tests, acceptance tests and referee tests, as necessary.

8.2.1 Quality control tests,

8.2.2 Acceptance tests, and

8.2.3 Referee tests.

## 9. Methods of Chemical Analysis

9.1 Use analytical chemistry methods in accordance with Test Method **C760** or demonstrated alternate methods agreed upon between the buyer and the seller.

## 10. Inspection and Certification

10.1 Each part shall be visually inspected for cleanliness and the absence of defects.

10.2 Each part shall be inspected for dimensions as specified in the purchase order.

10.3 The seller shall furnish the buyer with certificates of tests showing the results of testing and inspection performed on each lot prior to shipment.

10.4 Data retention requirement shall be agreed upon between the buyer and seller.

## 11. Rejection and Rehearing

11.1 Rejection of a lot or a part for failure to meet this specification shall be reported by the buyer to the seller within

60 calendar days. Rejected material may be returned to the seller at the seller's expense, unless the buyer receives, within 3 weeks of notice of rejection, other instructions for disposition.

## 12. Packaging and Package Marking

12.1 Each part shall be individually wrapped or bagged and packed in low-sulfur, halogen-free suitable containers to prevent damage and contamination during shipment and storage.

12.2 The seller will be responsible for designing the shipping container to assure cleanliness, to provide adequate protection against damage during transportation, and to assure reasonable ease of unpacking.

12.3 Each container may contain material from up to two lots if they are clearly separated and marked with the following: purchase order number, purchase order specifications, gross, net, and tare weights, lot number, and manufacturer's alloy designation.

## 13. Quality Assurance

13.1 Quality assurance requirements shall be agreed upon between the buyer and the seller when specified in the purchase order. Code of Federal Regulations, Title 10 Part 50 Appendix B and ASME NQA-1 are referenced as guides.

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