



Designation: ~~C751–07 (Reapproved 2012)~~ C751 – 16

Standard Specification for Nuclear-Grade Boron Carbide Pellets¹

This standard is issued under the fixed designation C751; 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 applies to boron carbide pellets for use as a control material in nuclear reactors.
- 1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 ASTM Standards:²

[C559 Test Method for Bulk Density by Physical Measurements of Manufactured Carbon and Graphite Articles](#)

[C750 Specification for Nuclear-Grade Boron Carbide Powder](#)

[C791 Test Methods for Chemical, Mass Spectrometric, and Spectrochemical Analysis of Nuclear-Grade Boron Carbide](#)

[C859 Terminology Relating to Nuclear Materials](#)

[E105 Practice for Probability Sampling of Materials](#)

2.2 ANSI Standard:

[ANSI/ASME NQA-1 Quality Assurance Program Requirements for Nuclear Facilities³](#)

2.3 U.S. Government Document:

[Title 10, CFR, Energy Part 50 \(10 CFR 50\) Licensing of Domestic Production and Utilization Facilities⁴](#)

3. Terminology

3.1 Terms shall be defined in accordance with Terminology [C859](#), or ASTM Dictionary of Engineering Science and Technology, except for the following:

3.2 *buyer*—the organization issuing the purchase order.

3.3 *pellet lot*—~~that~~ quantity of pellets produced from one boron carbide powder lot using one set of process parameters. The pellet lot size shall be agreed upon between seller and buyer.

3.4 *powder lot*—a fixed quantity of boron carbide powder blended together such that samples taken in accordance with Section [7](#) on Sampling can be considered as representative of the entire fixed quantity.

3.5 *seller*—~~the~~ boron carbide pellet supplier.

4. Chemical Composition

4.1 The starting boron carbide powder used to produce these pellets shall be in accordance with Specification [C750](#).

4.2 Analytical chemistry methods used to test pellets for conformance with this specification shall be those of Method [C791](#) or demonstrated equivalent methods agreed upon between buyer and seller.

4.3 The ¹⁰B concentration (gram ¹⁰B per unit volume or grams ¹⁰B per unit length) may be specified by the buyer. The buyer should consider the following in specifying the allowable range in ¹⁰B concentration:

4.3.1 Variations in chemical composition,

4.3.2 Bulk pellet density,

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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.

³ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

⁴ Available from U.S. Government Printing Office, Washington, DC 20402.

4.3.3 Boron isotopic composition, and

4.3.4 Pellet dimensions.

4.4 The finished boron carbide pellets shall conform to the chemical analysis in **Table 1**.

■ **TABLE 1 †—Chemical Analysis of Finished Boron Carbide Pellets**

Constituent	Limits
Total boron (<u>B</u>)	81.0 % weight, max 73.0 % weight, min
Nitric acid-soluble boron (<u>B</u>)	0.5 % weight, max
Water-soluble boron (<u>B</u>)	0.2 % weight, max
Calcium (<u>Ca</u>)	0.3 % weight, max
Iron (<u>Fe</u>)	1.0 % weight, max
Total boron + total carbon (<u>B+C</u>)	98.0 % weight, min
Fluoride (<u>F</u>)	25 µg/g, max
Chloride (<u>Cl</u>)	75 µg/g, max
Water	750 µg/g, max ^A

^AUltimate usage of the pellets in a control rod may require drying to a lower moisture level.

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