



Designation: **C751–16 C751 – 20**

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 after SI units are provided for information only and are not considered standard.

1.3 *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.*

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:*³

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

2.3 *U.S. Government Document:*⁴

[Title 10, 10 CFR 50 CFR, Energy Part 50 \(10 CFR 50\) Licensing of Domestic Title 10, Code of Federal Regulations, Energy Part 50—Domestic Licensing of Production and Utilization Facilities](#)

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:

3.1 *Definitions:*

3.1.1 Terms shall be defined in accordance with Terminology [C859](#), except for the following:

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

3.1.3 *pellet lot*—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.

3.1.4 *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.

3.1.5 *seller*—boron carbide pellet supplier.

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

¹ 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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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 Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036-10036, <http://www.ansi.org>.

⁴ Available from U.S. Government Printing Office, Washington, DC 20402. Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, <http://www.access.gpo.gov>.

3.3 ~~pellet lot~~—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~~—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-Test Methods C791 or demonstrated equivalent methods agreed upon between buyer and seller.

4.3 The ¹⁰B concentration (~~gram~~(grams 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,

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

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