Designation: C992 – 16

Standard Specification for Boron-Based Neutron Absorbing Material Systems for Use in Nuclear Fuel Storage Racks in a Pool Environment[1]

This standard is issued under the fixed designation C992; 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 defines criteria for boron-based neutron absorbing material systems used in racks in a pool environment for storage of nuclear light water reactor (LWR) spent-fuel assemblies or disassembled components to maintain sub-criticality in the storage rack system.

1.2 Boron-based neutron absorbing material systems normally consist of metallic boron or a chemical compound containing boron (for example, boron carbide, B_4C) supported by a matrix of aluminum, steel, or other materials.

1.3 In a boron-based absorber, neutron absorption occurs primarily by the boron-10 isotope that is present in natural boron to the extent of 18.3 ± 0.2 % by weight (depending upon the geological origin of the boron). Boron, enriched in boron-10 could also be used.

1.4 The materials systems described herein shall be functional – that is always be capable to maintain a boron-10 areal density such that subcriticality is maintained depending on the design specification for the service life in the operating environment of a nuclear spent fuel pool.

1.5 Observance of this specification does not relieve the user of the obligation to conform to all applicable international, national, and local regulations.

1.6 *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 establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C859 Terminology Relating to Nuclear Materials

C1187 Guide for Establishing Surveillance Test Program for Boron-Based Neutron Absorbing Material Systems for Use in Nuclear Fuel Storage Racks In a Pool Environment

E105 Practice for Probability Sampling of Materials

E2971 Test Method for Determination of Effective Boron-10 Areal Density in Aluminum Neutron Absorbers using Neutron Attenuation Measurements

ASTM Dictionary of Engineering Science and Technology

2.2 *ANSI and ASME Standards:*[3]

ANSI N45.2.2 Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants

ASME NQA-1 Quality Assurance Requirements for Nuclear Facility Application

2.3 *U. S. Government Documents:*[4]

10CFR50 Title 10, CFR, Energy Part 50 — Licensing of Production and Utilization Facilities

10CFR72 Title 10, CFR, Energy Part 72 — Licensing Requirements for the Storage of Spent Fuel in an Independent Spent Fuel Storage Installation (ISFSI)

3. Terminology

3.1 Terms shall be defined in accordance with Terminology C859 or the ASTM Dictionary of Engineering Science and Technology

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *accelerated testing*—a procedure for investigating the potential for long-term changes in physical properties or chemical composition of a material important to safety, caused by a system operating parameter such as temperature, chemical environment or radiation.

3.2.1.1 *Discussion*—The procedure uses a value of the identified parameter that is outside the normal bound of the operating parameter being investigated, in order to (*1*) increase the rate of degradation, if any, (*2*) identify the operating limit for acceptable limit of the parameter, and (*3*) to provide information that might assist in interpreting the degradation

[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 the American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

[4] Available from Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.