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AMERICAN SOCIETY FOR TESTING AND MATERIALS

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Standard Practice for Identifying Test Methods for Breeder Reactor Core Materials¹

This standard is issued under the fixed designation E 764; 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.

^{ε1} NOTE—Keywords were added editorially in June 1995.

1. Scope

1.1 This practice covers the test methods that may be used for measuring physical and mechanical properties for solid metallic materials for use in the design and evaluation of fast-breeder reactor core materials.

1.2 The test methods referenced herein are applicable to the in-core portion of ducts, cladding (both end caps and tubing), wire wrap, spacer grids, wear pads, and welded structures.

1.3 The test methods are summarized in Table 1.

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

2. Referenced Documents

2.1 ASTM Standards:

- A 370 Test Methods and Definitions for Mechanical Testing of Steel Products²
- C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus³
- C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus³
- E 3 Methods of Preparation of Metallographic Specimens⁴
- E 8 Test Methods for Tension Testing of Metallic Materials⁴
- E 10 Test Method for Brinell Hardness of Metallic Materials⁴
- E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials⁴
- E 45 Test Methods for Determining the Inclusion Content of Steel⁴
- E 92 Test Method for Vickers Hardness of Metallic Materials⁴
- E 112 Test Methods for Determining the Average Grain Size⁴

- E 139 Practice for Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials⁴
- E 150 Practice for Conducting Creep and Creep-Rupture Tension Tests of Metallic Materials Under Conditions of Rapid Heating and Short Times⁵
- E 206 Definitions of Terms Relating to Fatigue Testing and the Statistical Analysis of Fatigue Data⁶
- E 228 Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer⁷
- E 384 Test Method for Microhardness of Materials⁴
- E 453 Practice for Examination of Fuel Element Cladding Including the Determination of the Mechanical Properties⁸
- E 521 Practice for Neutron Radiation Damage Simulation by Charged-Particle Irradiation⁸
- E 583-87 Practice for Systematizing the Development of (ASTM) Voluntary Consensus Standards for the Solution of Nuclear and Other Complex Problems⁸

3. Terminology

3.1 *Definitions*—For definitions, refer to the test method of interest.

3.2 Descriptions of Terms Specific to This Standard:

3.2.1 *cladding*—the metal tubing that contains the fuel or absorber materials, or both, in the reactor core. The cladding is typically located in elements bundled inside the reactor ducts. The cladding with the fuel is sealed by end caps that are welded to both ends of the tubing.

3.2.2 *component appearance*—Figures 1 and 2 show examples of typical core components for the fuel and control rod assemblies for the Fast-Flux Test Facility (FFTF).

3.2.3 *duct*—a tube (typically hexagonal, rhombic, or circular) containing fuel, absorber, or structural assemblies utilized in the operation or experimentation, or both, carried out in a fast-breeder reactor core. The ducts serve as structural members and provide flow channels for irradiation vehicles and facilitate insertion and removal of such assemblies.

3.2.4 *load pads*—sections of metal (generally coated with a hard substance) at various locations on the exterior duct surface that contact other load pads on surrounding ducts. The purpose of the load pad is to facilitate core compaction and assembly insertion/withdrawal by providing low-friction

¹ This practice is under the jurisdiction of ASTM Committee E-10 on Nuclear Technology and Applications and is the direct responsibility of Subcommittee E10.10 on Matrix Approaches to Standards for Nuclear Systems Technology.

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² Annual Book of ASTM Standards, Vol 01.03.

³ Annual Book of ASTM Standards, Vol 04.06.

⁴ Annual Book of ASTM Standards, Vol 03.01.

⁵ Discontinued—See 1983 Annual Book of ASTM Standards, Vol 03.01.

⁶ Discontinued—See 1986 Annual Book of ASTM Standards, Vol 03.01.

⁷ Annual Book of ASTM Standards, Vol 14.02.

⁸ Annual Book of ASTM Standards, Vol 12.02.