



Standard Test Method for Application and Analysis of Helium Accumulation Fluence Monitors for Reactor Vessel Surveillance, E706 (IIIC)¹

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1. Scope

1.1 This test method describes the concept and use of helium accumulation for neutron fluence dosimetry for reactor vessel surveillance. Although this test method is directed toward applications in vessel surveillance, the concepts and techniques are equally applicable to the general field of neutron dosimetry. The various applications of this test method for reactor vessel surveillance are as follows:

1.1.1 Helium accumulation fluence monitor (HAFM) capsules,

1.1.2 Unencapsulated, or cadmium or gadolinium covered, radiometric monitors (RM) and HAFM wires for helium analysis,

1.1.3 Charpy test block samples for helium accumulation, and

1.1.4 Reactor vessel (RV) wall samples for helium accumulation.

1.2 *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:

C 859 Terminology Relating to Nuclear Materials²

E 170 Terminology Relating to Radiation Measurements and Dosimetry³

E 184 Practice for Effects of High-Energy Neutron Radiation on the Mechanical Properties of Metallic Materials, E 706 (IB)⁴

E 244 Test Method for Atom Percent Fission in Uranium and Plutonium Fuel (Mass Spectrometric Method)²

E 261 Test Method for Determining Neutron Fluence, Fluence Rate, and Spectra by Radioactivation Techniques³

E 482 Guide for Application of Neutron Transport Methods for Reactor Vessel Surveillance, E 706 (IID)⁴

E 560 Practice for Extrapolating Reactor Vessel Surveillance Dosimetry Results, E 706 (IC)⁴

E 693 Practice for Characterizing Neutron Exposures in Iron and Low Alloy Steels in Terms of Displacements Per Atom (DPA), E 706 (ID)⁴

E 706 Master Matrix for Light-Water Reactor Pressure Vessel Surveillance Standards⁴

E 844 Guide for Sensor Set Design and Irradiation for Reactor Surveillance, E 706 (IIC)⁴

E 853 Practice for Analysis and Interpretation of Light-Water Reactor Surveillance Results, E 706 (IA)⁴

E 854 Test Method for Application and Analysis of Solid State Track Recorder (SSTR) Monitors for Reactor Surveillance, E 706 (IIIB)⁴

E 900 Guide for Predicting Neutron Radiation Damage to Reactor Vessel Materials, E 706 (IIF)⁴

E 944 Guide for Application of Neutron Spectrum Adjustment Methods in Reactor Surveillance, E 706 (IIA)⁴

E 1005 Test Method for Application and Analysis of Radiometric Monitors for Reactor Vessel Surveillance, E 706 (IIIA)⁴

E 1018 Guide for Application of ASTM Evaluated Cross Section Data File, E 706 (IIB)⁴

E 1214 Guide for Use of Melt Wire Temperature Monitors for Reactor Vessel Surveillance, E 706 (IIIE)⁴

E 2005 Guide for the Benchmark Testing of Reactor Dosimetry in Standard and Reference Neutron Fields, E 706 (IIE-1)⁴

E 2006 Guide for the Benchmark Testing of LWR Calculations, E 706 (IIE-2)⁴

3. Terminology

3.1 **Definitions**—For definition of terms used in this test method, refer to Terminology C 859 and E 170. For terms not defined therein, reference may be made to other published glossaries.⁵

4. Summary of the HAFM Test Method

4.1 Helium accumulation fluence monitors (HAFMs) are

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² *Annual Book of ASTM Standards*, Vol 12.01.

³ *Annual Book of ASTM Standards*, Vol 12.02.

⁴ *Annual Book of ASTM Standards*, Vol 12.02. The roman numeral-alphabetical designation at the end of this title indicates that a brief description of this standard may be found in Matrix E 706.

⁵ See *Dictionary of Scientific Terms*, 3rd Edition, Sybil P. Parker, Ed., McGraw Hill, Inc.