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Standard Guide for Use of Melt Wire Temperature Monitors for Reactor Vessel Surveillance¹

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^{ε1} NOTE—The title of this guide and the Referenced Documents were updated editorially in May 2017.

1. Scope

1.1 This guide describes the application of melt wire temperature monitors and their use for reactor vessel surveillance of light-water power reactors as called for in Practices E185 and E2215.

1.2 The purpose of this guide is to recommend the selection and use of the common melt wire technique where the correspondence between melting temperature and composition of different alloys is used as a passive temperature monitor. Guidelines are provided for the selection and calibration of monitor materials; design, fabrication, and assembly of monitor and container; post-irradiation examinations; interpretation of the results; and estimation of uncertainties.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

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. (See Note 1.)*

1.5 *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.*

¹ This guide is under the jurisdiction of ASTM Committee E10 on Nuclear Technology and Applications and is the direct responsibility of Subcommittee E10.02 on Behavior and Use of Nuclear Structural Materials.

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2. Referenced Documents

2.1 ASTM Standards:²

- E185 Practice for Design of Surveillance Programs for Light-Water Moderated Nuclear Power Reactor Vessels
- E706 Master Matrix for Light-Water Reactor Pressure Vessel Surveillance Standards
- E794 Test Method for Melting And Crystallization Temperatures By Thermal Analysis
- E900 Guide for Predicting Radiation-Induced Transition Temperature Shift in Reactor Vessel Materials
- E2215 Practice for Evaluation of Surveillance Capsules from Light-Water Moderated Nuclear Power Reactor Vessels

3. Significance and Use

3.1 Temperature monitors are used in surveillance capsules in accordance with Practice E2215 to estimate the maximum value of the surveillance specimen irradiation temperature. Temperature monitors are needed to give evidence of overheating of surveillance specimens beyond the expected temperature. Because overheating causes a reduction in the amount of neutron radiation damage to the surveillance specimens, this overheating could result in a change in the measured properties of the surveillance specimens that would lead to an unconservative prediction of damage to the reactor vessel material.

3.2 The magnitude of the reduction of radiation damage with overheating depends on the composition of the material and time at temperature. Guide E900 provides an accepted method for quantifying the temperature effect. Because the evidence from melt wire monitors gives no indication of the duration of overheating above the expected temperature as

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.