



Designation: E636 – 14<sup>ε1</sup>

## Standard Guide for Conducting Supplemental Surveillance Tests for Nuclear Power Reactor Vessels<sup>1</sup>

This standard is issued under the fixed designation E636; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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<sup>ε1</sup> NOTE—The title of this guide was updated editorially in May 2017.

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### 1. Scope

1.1 This guide discusses test procedures that can be used in conjunction with, but not as alternatives to, those required by Practices E185 and E2215 for the surveillance of nuclear reactor vessels. The supplemental mechanical property tests outlined permit the acquisition of additional information on radiation-induced changes in mechanical properties of the reactor vessel steels.

1.2 This guide provides recommendations for the preparation of test specimens for irradiation, and identifies special precautions and requirements for reactor surveillance operations and post-irradiation test planning. Guidance on data reduction and computational procedures is also given. Reference is made to other ASTM test methods for the physical conduct of specimen tests and for raw data acquisition.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *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:<sup>2</sup>

E23 Test Methods for Notched Bar Impact Testing of Metallic Materials  
E185 Practice for Design of Surveillance Programs for

Light-Water Moderated Nuclear Power Reactor Vessels  
E399 Test Method for Linear-Elastic Plane-Strain Fracture Toughness  $K_{Ic}$  of Metallic Materials  
E1253 Guide for Reconstitution of Irradiated Charpy-Sized Specimens  
E1820 Test Method for Measurement of Fracture Toughness  
E1921 Test Method for Determination of Reference Temperature,  $T_0$ , for Ferritic Steels in the Transition Range  
E2215 Practice for Evaluation of Surveillance Capsules from Light-Water Moderated Nuclear Power Reactor Vessels  
E2298 Test Method for Instrumented Impact Testing of Metallic Materials

#### 2.2 ASME Standards:<sup>3</sup>

ASME Boiler and Pressure Vessel Code, Section III Subsection NB (Class 1 Components)

### 3. Significance and Use

3.1 Practices E185 and E2215 describe a minimum program for the surveillance of reactor vessel materials, specifically mechanical property changes that occur in service. This guide may be applied in order to generate additional information on radiation-induced property changes to better assist the determination of the optimum reactor vessel operation schemes.

### 4. Supplemental Mechanical Property Test

4.1 *Fracture Toughness Test*—This test involves the dynamic or static testing of a fatigue-precracked specimen during which a record of force versus displacement is used to determine material fracture toughness properties such as the plane strain fracture toughness ( $K_{Ic}$ ), the  $J$ -integral fracture toughness ( $J_{Ic}$ ), the  $J$ - $R$  curve, and the reference temperature ( $T_0$ ) (see Test Methods E399, E1820, and E1921, respectively). These test methods generally apply to elastic, ductile-to-brittle transition, or fully plastic behavior. The rate of specimen

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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<sup>3</sup> Available from American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017.