



Standard Guide for Thermal Neutron Radiography of Materials¹

This standard is issued under the fixed designation E748; 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 *Purpose*—Practices to be employed for the radiographic examination of materials and components with thermal neutrons are outlined herein. They are intended as a guide for the production of neutron radiographs that possess consistent quality characteristics, as well as aiding the user to consider the applicability of thermal neutron radiology. Statements concerning preferred practice are provided without a discussion of the technical background for the preference. The necessary technical background can be found in Refs (1-16).²

1.2 *Limitations*—Acceptance standards have not been established for any material or production process (see Section 5 on Basis of Application). Adherence to the guide will, however, produce reproducible results. Neutron radiography, whether performed by means of a reactor, an accelerator, subcritical assembly, or radioactive source, will be consistent in sensitivity and resolution only if the consistency of all details of the technique, such as neutron source, collimation, geometry, film, etc., are maintained. This guide is limited to the use of photographic or radiographic film in combination with conversion screens for image recording; other imaging systems are available. Emphasis is placed on the use of nuclear reactor neutron sources.

1.3 *Interpretation and Acceptance Standards*—Interpretation and acceptance standards are not covered by this guide. Designation of accept-reject standards is recognized to be within the cognizance of product specifications.

1.4 *Safety Practices*—General practices for personnel protection against neutron and associated radiation peculiar to the neutron radiologic process are discussed in Section 17. Jurisdictional nuclear regulations will also apply.

1.5 *Other Aspects of the Neutron Radiographic Process*—For many important aspects of neutron radiography such as technique, files, viewing of radiographs, storage of

radiographs, film processing, and record keeping, refer to Guide E94, which covers these aspects for x-ray radiography. (See Section 2.)

1.6 The values stated in either SI or inch-pound units are to be regarded as the standard.

1.7 *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:³

- E94 Guide for Radiographic Examination
- E543 Specification for Agencies Performing Nondestructive Testing
- E545 Test Method for Determining Image Quality in Direct Thermal Neutron Radiographic Examination
- E803 Test Method for Determining the *L/D* Ratio of Neutron Radiography Beams
- E1316 Terminology for Nondestructive Examinations

2.2 ASNT Standard:

- Recommended Practice SNT-TC-1A for Personnel Qualification and Certification⁴

2.3 ANSI Standard:

- ANSI/ASNT-CP-189 Standard for Qualification and Certification of Nondestructive Testing Personnel⁵

2.4 AIA Document:

- NAS-410 Nondestructive Testing Personnel Qualification and Certification⁶

¹ These practices are under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and are the direct responsibility of Subcommittee E07.05 on Radiology (Neutron) Method.

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² The boldface numbers in parentheses refer to the list of references at the end of these practices.

³ 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.

⁴ Available from the American Society for Nondestructive Testing, 1711 Arlington Lane, P.O. Box 28518, Columbus, OH 43228-0518.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

⁶ Available from Aerospace Industries Association of America, Inc., 1250 Eye St., NW, Washington, DC 20005..