



Standard Practices for Thermal Neutron Radiography of Materials¹

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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 (radiology, radiographic, and related terms are defined in Terminology E 1316). 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 practices will, however, produce reproducible results that could serve as standards. 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., is maintained through the practices. These practices are 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 these practices. 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. For further information on this important aspect of neutron radiology, refer to current documents of the National Committee on Radiation Protection and Measurement, the Code of Federal Regulations, the U.S. Nuclear Regulatory Commission, the

U.S. Department of Energy, the National Institute of Standards and Technology, and to applicable state and local codes.

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 E 94. (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.* (For more specific safety information see 1.4.)

2. Referenced Documents

2.1 ASTM Standards:

E 94 Guide for Radiographic Examination³

E 543 Practice for Agencies Performing Nondestructive Testing³

E 545 Test Method for Determining Image Quality in Direct Thermal Neutron Radiographic Examination³

E 803 Test Method for Determining the *L/D* Ratio of Neutron Radiography Beams³

E 1316 Terminology for Nondestructive Examinations³

E 1496 Test Method for Neutron Radiographic Dimensional Measurements³

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 *Annual Book of ASTM Standards*, Vol 03.03.

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..