Designation: E1734 – 16a

Standard Practice for Radioscopic Examination of Castings[1]

This standard is issued under the fixed designation E1734; 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 This practice covers a uniform procedure for radioscopic examination of castings. Radioscopic examination of weldments can be found in E1416.

1.2 This practice applies only to radioscopic examination in which an image is finally presented on a display screen (monitor) for evaluation. Test part acceptance may be based on a static or dynamic image. The examination results may be recorded for later review. This practice does not apply to fully automated systems in which evaluation is performed automatically by a computer.

1.3 Due to the many complex geometries and part configurations inherent with castings, it is necessary to recognize the potential limitations associated with obtaining complete radioscopic coverage. Consideration shall be given to areas where geometry or part configuration does not allow for complete radioscopic coverage.

1.4 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.5 *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:*[2]

E94 Guide for Radiographic Examination

E543 Specification for Agencies Performing Nondestructive Testing

E747 Practice for Design, Manufacture and Material Grouping Classification of Wire Image Quality Indicators (IQI) Used for Radiology

E1000 Guide for Radioscopy

E1025 Practice for Design, Manufacture, and Material Grouping Classification of Hole-Type Image Quality Indicators (IQI) Used for Radiology

E1165 Test Method for Measurement of Focal Spots of Industrial X-Ray Tubes by Pinhole Imaging

E1255 Practice for Radioscopy

E1316 Terminology for Nondestructive Examinations

E1411 Practice for Qualification of Radioscopic Systems

E1416 Practice for Radioscopic Examination of Weldments

E1453 Guide for Storage of Magnetic Tape Media that Contains Analog or Digital Radioscopic Data

E1475 Guide for Data Fields for Computerized Transfer of Digital Radiological Examination Data

E1647 Practice for Determining Contrast Sensitivity in Radiology

E1742 Practice for Radiographic Examination

E2002 Practice for Determining Total Image Unsharpness and Basic Spatial Resolution in Radiography and Radioscopy

E2339 Practice for Digital Imaging and Communication in Nondestructive Evaluation (DICONDE)

E2903 Test Method for Measurement of the Effective Focal Spot Size of Mini and Micro Focus X-ray Tubes

2.2 *ASNT Standards:*[3]

ASNT SNT-TC-1A Personnel Qualification and Certification in Nondestructive Testing

ANSI/ASNT CP-189 Personnel Qualification and Certification in Nondestructive Testing

2.3 *National Aerospace Standard:*

NAS-410 NAS Certification and Qualification of Nondestructive Personnel (Quality Assurance Committee)[4]

2.4 *Other Standards:*.

ISO 9712 Non-Destructive Testing—Qualification and Certification of NDT Personnel[5]

[1] This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.01 on Radiology (X and Gamma) Method.

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[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.

[3] Available from The American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518.

[4] Available from Aerospace Industries Association of America, Inc. 1250 Eye Street N.W., Washington, DC 20005.

[5] Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, http://www.iso.org.

3. Terminology

3.1 *Definitions*—Definitions of terms applicable to this practice may be found in Terminology E1316.

4. Significance and Use

4.1 The requirements in this practice are intended to control the quality of the radioscopic images to produce satisfactory and consistent results. This practice is not intended for controlling the acceptability of the casting. The radioscopic method may be used for detecting volumetric discontinuities and density variations that are within the sensitivity range of this practice. The dynamic aspects of radioscopy are useful for maximizing defect response.

5. Basis of Application

5.1 The following items shall be agreed upon between the purchaser and the supplier:

5.1.1 *Nondestructive Testing Agency Evaluation*—If specified in the contractual agreement, nondestructive testing (NDT) agencies shall be qualified and evaluated as described in Practice E543. The applicable edition of Practice E543 shall be specified in the contractual agreement.

5.1.2 *Personnel Qualification*—If specified in the contractual agreement, personnel performing examinations to this standard shall be qualified in accordance with a nationally or internationally recognized NDT personnel qualification practice or standard such as ANSI/ANST-CP-189, SNT-TC-1A, NAS-410, ISO 9712, or similar document and certified by the employer or certifying agency, as applicable. The practice or standard used and its applicable revision shall be identified in the contractual agreement between the using parties.

5.1.3 *Recording Media*—If required, the recording media to be used shall be specified in accordance with the requirements of Section 6.

5.1.4 *Performance Measurements*—Performance measurement shall be specified in accordance with the requirements of Section 7.

5.1.5 *Procedure*—Procedural requirements shall be specified in the contractual agreement.

5.1.6 *Records*—Records shall be specified in the contractual agreement.

6. Apparatus

6.1 Success of the radioscopic process depends on the overall system configuration and the selection of appropriate subsystem components. Guidance on the selection of subsystem components and the overall system configuration is provided in Guide E1000 and Practice E1255. Initial qualification and periodic re-qualification of the radioscopic system is required (see Section 7). The suitability of the radioscopic system shall be demonstrated by attainment of the required image quality and compliance with all other requirements stipulated herein.

6.2 *Equipment:*

6.2.1 *Radiation Source (X-Ray or Gamma-Ray)*—Selection of the appropriate source is dependent on variables regarding the casting being examined, such as material composition and thickness. Guidance on selection of the radiation source may be found in Practice E1255 or Guides E94 and E1000.

6.2.2 *Manipulation Subsystem*—Selection of the appropriate manipulation system (where applicable) is dependent on variables such as the size and orientation of the object being examined and the range of motions, speed of travel, and smoothness of motion. Guidance on selection of the manipulation subsystem may be found in Practice E1255.

6.2.3 *Detector Subsystem*—Selection of the appropriate detection system is dependent on variables such as the material and size of the object being examined and the energy and intensity of the radiation used for the examination. Guidance on selection of the detector subsystem may be found in Guide E1000 or Practice E1255.

6.2.4 *Image Processing Subsystem*—Where agreed upon between the purchaser and the supplier, image processing systems may be used for noise reduction through image integration or averaging, contrast enhancement, and other image processing operations. Users of digital image processing are cautioned to test image processing parameters thoroughly before use. For example, some spatial filter functions produce directional results and may suppress desired image information. Other spatial filters can introduce artifacts into the image.

6.2.5 *Image Display Subsystem*—Selection of the appropriate image display is critical to the transfer of image information from the radioscopic system to the person making the accept-reject decision. The image display should be suitably sized and placed in a controlled environment with subdued lighting to maximize the transfer of image information to the radioscopic system operator.

6.2.6 *Collimation*—Selection of appropriate collimation is dependent on the geometry of the object being examined. It is generally useful to select collimation to limit the primary radiation beam to the detector area or region of interest, whichever is smaller, thereby limiting scatter radiation in order to improve radioscopic image quality.

6.2.7 *Filters and Masking*—Filters and masking may be used to improve image quality by alleviating contrast reductions caused by low-energy scattered radiation. Guidance on the use of filters and masking is provided in Guide E94.

6.3 *Location and Identification Markers*—Lead numbers and letters may be used to designate the part number and location number, as needed, provided they do not mask regions of interest on the casting. On-part identification is not required where the manipulator is programmable or manipulator coordinates are provided as a means of ensuring that all regions of interest are covered. A video typewriter or similar device may be used to display location and identification information electronically. When identification is not provided on the part, the method of identification shall be documented in the records in accordance with Section 11.

6.4 Areas that are considered impractical or very difficult to view (see 9.2), shall be marked in the Radioscopic Shooting Sketch.

6.5 *Recording Media*—Recording media for storage of analog or digital images shall be agreed upon between the purchaser and the supplier. Guidance on selection and usage of recording media may be found in Practice E1255.