



Designation: E 1936 – 97

Standard Reference Radiograph for Evaluating the Performance of Radiographic Digitization Systems¹

This standard is issued under the fixed designation E 1936; 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 reference radiograph covers a series of test targets suitable for evaluating, quantifying, and documenting performance parameters of the radiographic digitization process or the electronic image reconstruction process, or both. This reference radiograph can be used for visual and electronic analysis of digitization systems. This is the first of three related standards. Subsequent standards will provide guidance on the use of the test targets and recommended system performance levels.

1.2 This reference radiograph provides a series of test targets to provide a vehicle for the evaluation of spatial resolution, density contrast sensitivity, dynamic range, and spatial linearity as well as other aspects of a digitization system. The test targets are suitable for evaluating a digitization system with a spatial resolution down to $\sim 1/1000$ in [25 micrometers (μ)] a density contrast sensitivity down to 0.02 optical density (OD), a density range of 0.5 to 4.5 OD, and a film size capacity of 14 in. (355 mm) wide by 17 in. (431 mm) long.

1.3 The values stated in inch-pound units are to be regarded as the standard, with the exception of the spatial resolution targets (6.2 and 6.6) which are stated in SI units.

1.4 *This standard does not purport to address 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:

E 1079 Practice for Calibration of Transmission Densitometers²

E 1254 Guide for Storage of Radiographs and Unexposed Industrial Radiographic Films²

E 1316 Terminology for Nondestructive Examinations²

E 1411 Practice for Qualification of Radioscopic Systems²

2.2 ASME Standard:

Section V, Article 2, Mandatory Appendix VI, Digital Image Acquisition, Display, Interpretation and Storage for Nuclear Applications³

2.3 ASTM Adjuncts:

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3. Terminology

3.1 Definitions:

3.1.1 Refer to Terminology E 1316 for definitions of terms used in this guide.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *converging line pairs*—the targets located on the reference radiograph that are used to determine the spatial resolution of the digitization system.

3.2.2 *dynamic range*—the range of optical densities over which a predetermined density contrast sensitivity can be maintained in a single image.

3.2.3 *image*—the digital representation of the target on the reference radiograph. The image of the target is used to evaluate both the digitization and display aspects of the radiographic film digitization system.

3.2.4 *parallel line pairs*—the targets located on the reference radiograph that are used in conjunction with the converging line pairs to determine the spatial resolution of the digitization system.

3.2.5 *reference radiograph*—the single piece of industrial radiographic film containing all of the reference targets described in this document.

3.2.6 *scan line*—it is a path that is one pixel high (vertical) by the number of pixels wide (horizontal), that is captured by the digitization system. The scan lines are added, one on top of the other, to electronically reproduce the physical (analog) data in the horizontal (film width) and vertical (film length) directions on the display monitor.

3.2.7 *spatial linearity*—the accuracy to which a digitization system reproduces the physical dimension. It is assessed within

¹ This reference radiograph is under the jurisdiction of ASTM Committee E-07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.02 on Reference Radiological Images.

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² *Annual Book of ASTM Standards*, Vol 03.03.

³ Available from American Society of Mechanical Engineers, 345 E. 47th Street, New York, NY 10017.

⁴ Available from EPRI NDE Center, NDE Division, 1300 Harris Blvd., Charlotte, NC 28262.