



Standard Practice for Evaluating the Imaging Performance of Security X-Ray Systems¹

This standard is issued under the fixed designation F792; 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 applies to all X-ray based screening systems, with tunnel apertures up to 1 m wide × 1 m high, whether it is a conventional X-ray system or an explosives detection system (EDS) that provides a projection or projection/scatter image for an operator to interpret.

1.2 This practice applies to X-ray systems used for the screening for prohibited items such as weapons, explosives, and explosive devices in baggage, packages, cargo, or mail.

1.3 This practice establishes quantitative and qualitative methods for evaluating the systems. This practice does not establish minimum performance requirements for any particular application.

1.4 This practice relies upon the use of a standard test object (ASTM X-ray Test Object) to determine the applicable performance levels of the systems. The specific test object is subsequently described and referred to in this document as the “Test Object.”

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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

¹ This practice is under the jurisdiction of ASTM Committee F12 on Security Systems and Equipment and is the direct responsibility of Subcommittee F12.60 on Controlled Access Security, Search, and Screening Equipment.

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² Examples are Part 21 Code of Federal Regulations, Section 1020.40 in the United States and Health & Safety Regulation 1333 in the United Kingdom.

If film safety, defined as $<2.58 \times 10^{-7}$ C/kg (<1 mR) per screening, is of importance, refer to Test Method F1039.

2. Referenced Documents

2.1 ASTM Standards:³

B258 Specification for Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors

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

E1316 Terminology for Nondestructive Examinations

E1647 Practice for Determining Contrast Sensitivity in Radiology

F1039 Test Method for Measurement of Low Level X-Radiation Used in X-Ray Security Screening Systems (Withdrawn 2002)⁴

2.2 ASTM Adjuncts:

30 Autocad Drawings⁵

2.3 Other Documents:

Part 21 Code of Federal Regulations, Section 1020.40 Cabinet X-ray Systems (United States)⁶

Health & Safety Regulation 1333 (United Kingdom)

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *contrast sensitivity*—a measure of the minimum change in an object that produces a perceptible brightness change in the radiological image on a monitor.

3.1.2 *effective atomic number (Z_{eff})*—the effective atomic number of a chemical compound or mixture of compounds is

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 The last approved version of this historical standard is referenced on www.astm.org.

⁵ Available from ASTM International Headquarters. Order Adjunct No. ADJF0792.

⁶ Available from the United States Government Printing Office, 732 North Capitol St. NW, Washington, DC 20401.