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# Standard Practice for Evaluation of Metallic Weapons Detectors for Controlled Access Search and Screening[1]

This standard is issued under the fixed designation F1468; 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 methods for the evaluation of walk-through metal weapons detectors and criteria for testing metal detection performance.

1.2 This practice specifies certain health, safety, and human factors criteria pertaining to the usage of the detection equipment.

1.3 This practice requires the use of non-standardized (user-supplied) test objects and test equipment. Evaluations made using the procedures outlined in this practice can be used for comparative evaluations only if the tests are made with the same equipment and test objects.

1.4 This practice is intended for use by manufacturers and evaluators of electromagnetic field devices used for screening persons entering into controlled access areas. It is not intended to set performance nor limit or constrain operating technologies, nor is it a document for use by individual operators or users of such equipment at specific access control points.

1.5 The values stated in SI units are to be regarded as the standard. Other units given in parentheses are for information only.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For a specific hazards statement, see warning note in 12.2.5.

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ANSI/IEEE Standard:*

C62.41 IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits[2]

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *clean tester*—person who does not carry any objects which would significantly alter the signal produced when the person carries a test object; smaller test objects require more complete elimination of metallic objects. By example but not limitation, such significant objects may include: metallic belt buckles, metal buttons, cardiac pacemakers, coins, metal-frame eye glasses, hearing aids, jewelry, keys, mechanical pens and pencils, shoes with metal shanks or arch supports, metallic surgical implants, undergarment support metal, and metal zippers. A clean tester passing through a metal detector shall not cause a disturbance signal greater than 10 % of that produced when carrying the critical test object through the detector. The tester shall have a mass between 50 and 100 kg (110 and 220 lb) and a height between 1.50 and 1.90 m (59 and 75 in.). If the detector is designed to be sensitive to body size because of design or desired sensitivity, the physical size of testers should be smaller and within a narrower range.

3.1.2 *critical orientation*—orientation of a test object which produces the smallest detection signal or weakest detection.

3.1.3 *critical sensitivity setting*—sensitivity setting of a detector at which the critical test object in its critical orientation is detected at a 90 % or greater rate at the weakest or critical test point for the detector.

3.1.4 *critical test object*—test object out of a given group of objects which, in its worst-case or critical orientation, produces the worst-case or critical sensitivity setting for a specific detector. The group shall comprise one or more objects which are to be detected under the same detector settings.

3.1.5 *critical test point*—location within the passage opening of a detector portal which produces the weakest signal response (the critical sensitivity) for the critical test object at its critical orientation.

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

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[2] Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., P.O. Box 1331, Piscataway, NJ 08854-1331, http://www.ieee.org.

3.1.6 *detector*—synonym (used in this practice for brevity) for a walk-through device for detecting weapons such as defined in 3.1.14.

3.1.7 *discrimination ratio*—expression of a detector's ability to discriminate between a weapon and innocent personal possessions; it is the ratio of the signal generated by a critical test object to the signal generated by an assortment of innocent personal possessions (see Section 8).

3.1.8 *electrical influence test probe*—air-core coil for creating electromagnetic fields that could influence detector capability (see 15.3).

3.1.9 *induced electromagnetic field test probe*—air-core coil for measuring the strength of the electromagnetic fields generated by a detector (see 15.2).

3.1.10 *outside influence*—site-related situation or occurrence of a mechanical or electrical nature which alters the normal operation of the detector.

3.1.11 *test object*—any metallic object used to evaluate the detection capability of a detector. See 7.2 for specific requirements.

3.1.12 *test probe*—testing devices as specified in 15.2 – 15.4, utilized in the simulation of outside influences.

3.1.13 *testing laboratory site*—area suitable for proper testing and evaluation of detectors (see Section 6).

3.1.14 *walk-through weapons detection device (detector)*—freestanding screening device, utilizing an electromagnetic field within its portal structure, for detecting metallic weapons concealed on persons walking through the structure.

3.1.15 *weapon*—device intended to do damage to personnel or equipment without intentionally harming the attacker, but requiring the attacker to physically activate the device. Examples include guns, knives, and hand grenades.

## 4. Significance and Use

4.1 The significant attributes of this practice are the methods for determining the detection capabilities of metal detectors, the methods for determining the effects of outside influences on detectors, and certain safety requirements for detectors.

4.2 While this practice was originated for walk-through metal weapons detectors, it is equally applicable to detectors of other metal objects. The innocent objects set (15.1.2) would require modification commensurate with the size of the other object to be tested; some tests may not be applicable and other specific and different tests may be necessary.

4.3 This practice includes testing site requirements (Section 6) to minimize data variations. These methods may be used at nonconforming sites if site-related disturbances are considered and accounted for.

4.4 This practice is not meant to constrain designs but it is applicable only to detectors which are designed for individual walk-through. The portal structure shall be deemed to meet this criterion if it provides a minimum vertical clearance of 1.96 m (77 in.) and a minimum horizontal width clearance of 0.66 m (26 in.).

4.5 This practice recognizes that the complex movements of a test object when carried by a person walking through a detector limits the precision and repeatability of the resultant observed signals. Averaged results from repeated tests under identical controlled conditions are recommended to obtain a better approximation of the underlying hypothetical true value for that set of conditions.

4.6 Where the term "significant" is used, it refers to phenomena which, in accordance with accepted engineering practices, exceed the normal variation of data.

## 5. Safety Requirements

5.1 *Personal Health and Safety*—The health and safety of searchees, operators, and other persons using or coming in contact with the equipment shall have been considered in the equipment design. In addition to the tip-over tests in 5.4 and 5.5, any hazards concerning factors in 5.2 and 5.3 shall be included in the evaluation report.

5.2 *Mechanical*—The equipment shall be free of sharp corners of protrusions that can puncture the skin or clothing or injure persons moving normally within the immediate area. Any potential tripping hazards, such as wires, cables, anti-tilt devices, ramps, etc. shall also be noted on the report.

5.3 *Electrical*—The detector shall be free of potential electrical shock hazards during operation.

5.4 *Portal Tip-Over*—With a stop at the base of the detector to prevent sliding, a force shall be applied at or near the top of the detector in the direction of search passage until the detector starts to tip. The tipping moment, calculated as the height above the floor times the maximum force required, shall be recorded in the evaluation report. If anti-tilt fixtures or accessories are provided or recommended by the detector manufacturer, tests shall be conducted with and without such devices and recorded in the report.

5.5 *Accessory Table or Pedestal Tip-Over*—Test as in 5.4 except apply the force at the point and in the direction for easiest tipping. Record the resultant moment.

5.6 Tip-over testing is not required if a detector must be anchored for proper operation.

## 6. Testing Laboratory Site and General Requirements

6.1 *Distancing Requirements*—Sites in which detectors are tested and evaluated shall be free of significant extraneous influences.

6.1.1 Walls, furniture, lighting, electrical power lines, etc. of metallic content or of electrically influencing nature (except for lines supplying power to the detector and interconnecting its components) shall be at least 3 m (10 ft) distant.

6.1.2 Overhead structures, such as ceilings or lights, shall be at least 1 m (40 in.) distant from the nearest surface of the detector and free of electrical lines within 3 m (10 ft).

6.2 *Floor Requirements*—The floor shall be solid and not capable of transferring vibration or shake to the detector of an amplitude discernible in the detector signal output when a clean tester walks through. It shall be free of steel except for nails or reinforcing bars. No electrical lines shall run in or