



Standard Practice for Detection Sensitivity Mapping of In-Plant Walk-Through Metal Detectors¹

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INTRODUCTION

Nuclear regulatory authorities require personnel entering designated security areas to be screened for concealed weapons. Additionally, in security areas containing specified quantities of special nuclear materials, exiting personnel are required to be screened for metallic nuclear shielding material. Walk-through metal detectors are widely used to implement these requirements.

A number of environmental conditions, architectural and electrical arrangements near the detector, and detector characteristics affect the detection of metallic objects passing through the walk-through metal detector. These external effects and detector characteristics are discussed in Practices [F1468](#) and [C1269](#), and Guide [C1238](#). This practice is intended to minimize the effects of these variables on detector operation by providing the operator with baseline information on the metal detection sensitivity within the portal aperture, particularly the location of any weak areas of detection. The data is obtained by mapping the detection zone (volume within the portal) of each detector at its field location, under normal operating conditions, and using the target test object. The maps, when applied to detector operation, ensure that the effects of the fixed environmental conditions, architectural and electrical arrangements, and detector characteristics are taken into account during operational sensitivity adjustment, performance evaluation, and general operation of detectors.

1. Scope

1.1 This standard practice covers a procedure for determining the weakest detection path through the portal aperture and the worst-case orthogonal orientation of metallic test objects. It results in detection sensitivity maps, which model the detection zone in terms related to detection sensitivity and identify the weakest detection paths. Detection sensitivity maps support sensitivity adjustment and performance evaluation procedures (see Practices [C1269](#) and [C1309](#)).

NOTE 1—Unsymmetrical metal objects possessing a primary longitudinal component, such as handguns and knives, usually have one particular orientation that produces the weakest detection signal. The orientation and the path through the detector aperture where the weakest response is produced may not be the same for all test objects, even those with very similar appearance.

NOTE 2—In the case of multiple specified test objects or for test objects that are orientation sensitive, it may be necessary to map each object several times to determine the worst-case test object or orientation, or both.

1.2 This practice is one of several developed to assist operators of walk-through metal detectors with meeting the metal detection performance requirements of the responsible regulatory authority. (See [Appendix X2](#))

1.3 This practice is neither intended to set performance levels, nor limit or constrain operational technologies.

1.4 This practice does not address safety or operational issues associated with the use of walk-through metal detectors.

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

2. Referenced Documents

2.1 *ASTM Standards*:²

[C1238](#) Guide for Installation of Walk-Through Metal Detectors

[C1269](#) Practice for Adjusting the Operational Sensitivity Setting of In-Plant Walk-Through Metal Detectors

¹ This practice is under the jurisdiction of ASTM Committee [C26](#) on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee [C26.12](#) on Safeguard Applications.

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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.