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Standard Practice for Performance Evaluation of In-Plant Walk-Through Metal Detectors[1]

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INTRODUCTION

Nuclear regulatory authorities require personnel entering designated security areas to be screened for concealed weapons and personnel exiting areas containing specified quantities of special nuclear material to be screened for metallic nuclear shielding materials. Portal-type walk-through metal detectors are widely used to implement these requirements. This practice provides guidelines for evaluating the in-plant performance of walk-through metal detectors.

1. Scope

1.1 This practice is one of several (see Appendix X1) developed to assist operators of nuclear facilities with meeting the metal detection performance requirements set by regulatory authorities.

1.2 This practice consists of four procedures useful for evaluating the in-plant performance of walk-through metal detectors (see Fig. 1).

1.2.1 Two of the procedures provide data for evaluating probability of detection. These procedures use binomial data (alarm/not alarm).

1.2.1.1 The detection sensitivity test (DST)[2] is the initial procedure in the detection probability evaluation series. It is used to establish the probability of detection immediately after the detector has been adjusted to its operational sensitivity setting.

1.2.1.2 The detection sensitivity verification test (DSVT)[2] procedure periodically provides data for evaluation of continuing detection performance.

1.2.2 The third procedure is a "functional test." It is used routinely to verify that a metal detector is operating and responds with the correct audio and visual signals when subjected to a condition that should cause an alarm.

1.2.3 The fourth procedure is used to verify that alarms generated during detection sensitivity testing were likely the result of the detection of metal and not caused by outside interferences or the perturbation of the detection field by the tester's body mass.

1.2.3.1 This procedure also can be used to establish a probability of occurrence for false alarms, for example, 20 test passes by a clean-tester resulting in no alarms indicates a false alarm probability of less than 0.15 at 95 % confidence. This procedure is optional unless required by the regulatory authority.

1.3 This practice does not set test object specifications. The specifications should be issued by the regulatory authority.

1.4 This practice is intended neither to set performance levels nor to limit or constrain technologies.

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

2. Referenced Documents

2.1 *ASTM Standards:*

C 1238 Guide for Installation of Walk-Through Metal Detectors[3]

C 1269 Practice for Adjusting the Operational Sensitivity Setting of In-Plant Walk-Through Metal Detectors[3]

C 1270 Practice for Detection Sensitivity Mapping of In-Plant Walk-Through Metal Detectors[3]

F 1468 Practice for Evaluation of Metallic Weapons Detectors for Controlled Access Search and Screening[4]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *clean-tester*, *n*—a person who does not carry any extraneous metallic objects that would significantly alter the signal produced when the person carries a test object.

[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] The DST is one of two procedures used to evaluate detection rate. The Detection Sensitivity Verification Test (DSVT) is the other. In the evaluation test strategy, the DST is used to initially determine and document the detection rate and then the DSVT is used to periodically check that the detection rate continues to meet the requirements.

[3] *Annual Book of ASTM Standards*, Vol 12.01.

[4] *Annual Book of ASTM Standards*, Vol 15.07.

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