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Standard Guide for Acquisition, Maintenance, Storage, and Use of Hazardous Material Detection Instrumentation¹

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INTRODUCTION

In today's environment there exists a serious, potential threat to the public and the safety personnel that protect them. This threat comes from chemicals, gases, biological agents, radiation, and explosive materials. In order for Safety officials to mitigate this threat, instrumentation designed to detect and measure their potential to inflict harm must be acquired, maintained, and used in a pre-defined manner.

1. Scope

1.1 This guide provides techniques that can be used to ensure the proper operation and use of Hazardous Material detection equipment. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances.

1.2 This guide is not intended to represent or replace any accreditation or certification documents by which the adequacy of a given professional service must be judged.

1.3 This guide 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 guide to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1.4 When using HAZMAT equipment follow the manufacturer's guidance and appropriate safety practices for the expected or suspected threat.

1.5 *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.*

1.6 *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 Recom-*

mendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

E2411 [Specification for Chemical Warfare Vapor Detector \(CWVD\)](#) (Withdrawn 2014)³

E2458 [Practices for Bulk Sample Collection and Swab Sample Collection of Visible Powders Suspected of Being Biological Agents and Toxins from Nonporous Surfaces](#)

E2770 [Guide for Operational Guidelines for Initial Response to Suspected Biological Agents and Toxins](#)

2.2 Other Documents:

ANSI N42.42-2006 [American National Standard Data Format Standard for Radiation Detectors Used for Homeland Security](#)

DHS Guide 101-04 [The Guide for the Selection of Biological Agent Detection Equipment for Emergency First Responders, Volume I, March 2005](#)

DHS Guide 101-04 [The Guide for the Selection of Biological Agent Detection Equipment for Emergency First Responders, Volume II, March 2005](#)

Guide 100-06 [Guide for the Selection of Chemical Detection Equipment for Emergency First Responders, 3rd Edition, January 2007, Dept. of Homeland Security](#)

Guide 101-06 [Guide for the Selection of Biological Agent Detection Equipment for Emergency First Responders, 2nd Edition, March 2007](#)

¹ This guide is under the jurisdiction of ASTM Committee E54 on Homeland Security Applications and is the direct responsibility of Subcommittee E54.01 on CBRNE Detection and Decontamination.

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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.

³ The last approved version of this historical standard is referenced on www.astm.org.

MIL Standard 810 Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests

NCSL RP-7 Recommended Practices, Laboratory Design

NFPA 472 Standard for Competence of Responders of Hazardous Materials/Weapons of Mass Destruction Incidents

NIJ Guide 100-99 Guide for the Selection of Commercial Explosives Detection Systems for Law Enforcement Applications, Sept. 1999

NIJ Guide 101-00 An Introduction to Biological Agent Detection Equipment for Emergency First Responders, December 2001

UL-913 Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations

Calibration, Philosophy in Practice, Second Edition, Fluke Corp.

A Directory of Standards Laboratories, NCSL annual publication

3. Terminology

3.1 Definitions:

3.1.1 Definitions are from NFPA Glossary of Terms, when possible.

3.1.2 *calibrate*—to correlate the reading of an instrument or system of measurement with a standard (NFPA).

3.1.3 *counts per minute (cpm)*—the number of radiological transformations detected by a radiation instrument in one minute.

3.1.4 *detect*—to discover or determine the existence of a material or item of interest.

3.1.5 *dose rate*—the radiation dose delivered per unit of time; measured for example, in “rem per hour.”

3.1.6 *dosimeter*—a portable device used to measure and record the total accumulated exposure to ionizing radiation by an individual.

3.1.7 *flux*—a term referring to the amount of some type of radiation crossing a certain area per unit time.

3.1.8 *functional tests*—tests performed to verify the ability of an element or component of an element to continue to be used for its intended purpose. (NFPA modified).

3.1.9 *jig*—device used to position a test source and/or the instrument such that calibration or functional checks are repeatable.

3.1.10 *quality control*—a system of actions that keep the quality of goods or services at the level expected by their users.

3.1.11 *radionuclide (nuclide)*—radioactive form of an element.

3.1.12 *survey instrument*—a handheld device used to measure the amount and locate hazardous material, hazardous material contamination, and hazardous conditions.

3.1.13 *traceable*—in reference to a calibration standard, the properties of which can be related back to a national standard.

3.2 Acronyms:

3.2.1 *BA*—biological agent

3.2.2 *CAD*—chemical agent detector

3.2.3 *CWAs*—chemical warfare agents

3.2.4 *FEMA*—Federal Emergency Management Agency

3.2.5 *HAZMAT*—hazardous materials

3.2.6 *HSEEP*—Homeland Security Exercise and Evaluation Program

3.2.7 *LEL*—low explosive level

3.2.8 *NIOSH*—National Institute for Occupational Safety and Health

3.2.9 *ppm*—parts per million

3.2.10 *TICs*—toxic industrial chemicals

3.2.11 *TIMs*—toxic industrial materials

3.2.12 *TLV*—threshold limit value

3.2.13 *TWA*—time waited average (refers to a time weighted average concentration for a normal 8 h day in a 40 h work week in which MOST workers can be exposed REPEATEDLY without adverse effect)

4. Summary of Guide

4.1 Acquisition:

4.1.1 A review of applicable equipment should be performed to determine which device will be best suited for the identified application and to meet the needs of the organization that will use the equipment. The review should take into consideration potential hazards and the importance of detecting them both as a precautionary measure and once they are discovered. Different equipment may be used before and after a hazard is discovered. For example, a personal radiation detector may be routinely carried to detect the presence of radioactive material. Once radioactive material is detected, other equipment may be used to further analyze the material.

4.1.2 Prior to purchase, a review of testing should be conducted with highest consideration given to those devices that have had independent testing done. If possible other users should be contacted to obtain additional information as to performance, reliability, and ease of maintenance. Appropriate spare parts and reference/calibration sources should be purchased with the chosen instrument.

4.2 Training:

4.2.1 Prior to field use, formal training for the designated users should be conducted. This training should be developed based on manufacturer’s information and the user organization protocol. Retraining/continuing training should be performed periodically (refer to NFPA 472).

4.3 Equipment Storage:

4.3.1 Equipment are typically susceptible to extremes of hot and cold temperatures, humidity, moisture, vibration, and/or shock. All of these factors must be taken into consideration to mitigate their effect on the equipment while in storage.

4.4 Maintenance/Calibration:

4.4.1 Repair and calibration requires highly qualified personnel in order to assure that the equipment will function correctly and provide accurate and reliable information to the