

American National Standard for Training for the Radiological/Nuclear Detection Mission

Accredited by the American National Standards Institute

Sponsored by the
National Committee on Radiation Instrumentation, N42

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USA

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American National Standard Training for the Radiological/Nuclear Detection Mission

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Institute of Electrical and Electronics Engineers, Inc.

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Abstract: Training requirements for the radiological/nuclear detection mission are described.

Keywords: alarm adjudication, ANSI N42.37, backpack-based radiation detection systems, Global Nuclear Detection Architecture (GNDA), human-portable detectors, instruments, levels of training, National-Level Reachback, personal radiation detector, prevention, Primary Screener, protection, radiation portal monitor, radiological/nuclear detection, radionuclide identifier, reachback, Secondary Screener

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Introduction

This introduction is not part of ANSI N42.37-2016, American National Standard Training for the Radiological/Nuclear Detection Mission.

This standard is the responsibility of the Accredited American Standards Committee on Radiation Instrumentation, N42. The standard was approved on N42 letter ballot.

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American National Standard Training for the Radiological/Nuclear Detection Mission

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1. Overview

1.1 Scope

This standard provides training requirements for four levels of training as part of the domestic capabilities of public safety agencies to detect, analyze, and report on nuclear and other radioactive materials that are out of regulatory control. This standard describes training requirements applying to these training levels across the range of federal, state, tribal, territorial, and local governments, and the private sector conducting the preventive radiological/nuclear detection (RND) mission to reduce the risk of terrorists or covert state-sponsored attacks on the United States using radiological or nuclear weapons of mass destruction (WMDs). Of the preparedness capabilities described in Presidential Policy Directive 8: National Preparedness (PPD-8), the scope of this standard includes the capabilities for Prevention and Protection mission areas, but not those for Mitigation, Response, and Recovery mission areas. Within the Prevention and Protection mission area capabilities explained in the U.S. Department of Homeland Security (USDHS) *National Preparedness Goal*, the scope includes core capability for Screening, Search, and Detection.

In particular, the scope of this standard describes requirements for training on the operation and deployment of the following radiation detection instrumentation as used in the RND mission:

- Alarming personal radiation detectors (PRDs), reference ANSI N42.32¹
- Portable radiation detection instrumentation, reference ANSI N42.33
- Handheld instruments for the detection and identification of radionuclides, i.e., radionuclide identifiers, radioisotope identification devices (RIIDs), references ANSI N42.34 and USDHS 500-DNDO-117250
- Radiation portal monitors (RPMs) and spectroscopy-based portal monitors (SRPMs), references ANSI N42.35 and ANSI N42.38
- Vehicle-mounted mobile systems and transportable radiation monitors, references ANSI N42.43 and USDHS 500-DNDO-119430
- Spectroscopic personal radiation detectors (SPRDs), reference ANSI N42.48
- Backpack-based radiation detection systems (BRDs) and human-portable detectors (HPDs), references ANSI N42.53 and USDHS 500-DNDO-119420

Training scope includes safety-related instruments used by RND personnel, such as:

- Alarming electronic personal emergency radiation detectors (PERDs), reference ANSI N42.49A
- Non-alarming PERDs, reference ANSI N42.49B

The scope does not include the capabilities specific to nuclear safeguards, security of nuclear facilities, nuclear forensics, or technical reachback analysis. Although they are not the focus of this standard, radiation detection instruments used primarily for other missions and capabilities (e.g., Response and Recovery mission areas) may have some applications for RND mission areas and capabilities. Training requirements from this standard should be considered for all radiation detection instrumentation used for any RND mission areas.

1.2 Purpose

This standard establishes minimum requirements and provides recommendations and guidelines for organizations that develop individual courses and training programs, deliver training courses, and administer training programs in the RND mission areas described in the scope (1.1). The standard describes the skills specific to the RND mission that are necessary for the core capability of RND Screening, Search, and Detection. This training is intended primarily for organizations involved in detection efforts.

1.3 Background

This standard is a strategic document outlining requirements for pre-event (prevention and protection) training. The details of post-event training of specific individuals for specific purposes are located in related documents developed, and being developed, by ASTM International and the NFPA (National Fire Protection Association), as referenced by ANSI N42.

The intention of the Basic (first) level of training is to provide a limited understanding of radiation without creating a sense of fear or overloading the student with extensive details traditionally presented with radiation training sessions. The overview should describe radioactivity in the context of detecting the presence of nuclear and other radioactive material out of regulatory control, and nuclear/radiological WMDs. The natural radioactivity discussion should help the student understand that radiation is

¹ For information on references, see Clause 2.

omnipresent and encountered in daily life. The discussion of radiation protection principles shall focus on the basic operation of radiation detectors and how radiation exposures can be minimized.

The objectives of the Intermediate (second) level of training are to present additional tasks in radiation detection, assessment, and identification, and to present instrument training for use in prevention and protection missions.

The objective of the Advanced (third) level of training is to present skills for managers who must analyze, evaluate, and execute plans for RND missions.

The objective of the Executive (fourth) level of training is to present the requirement of knowledge of Presidential Policy Directive 25 (PPD-25) needed by executive managers for integration into a federally led Radiological/Nuclear Search Operations (RNSO) mission. Those objectives are outlined in Clause 5.

The instruments addressed in this standard are intended for use in radiation detection, rather than for use as traditional health physics instrumentation for radiation protection or radiation dosimetry. However, some of these instruments may also be used to evaluate radiation hazards.

Many of the core training competencies addressed in this standard may be currently included in existing training programs. This standard emphasizes the additional specialized knowledge and training needed for use of these instruments for RND mission applications. The precise definition of “appropriate actions” to be taken in a given situation is the responsibility of the authority having jurisdiction (AHJ), and is outside the scope of this standard.

This standard includes the following:

- Informative Annex B with illustrations of potential training level and job category relationships for responder organizations
- Informative Annex C with information related to the general types of instruments covered by USDHS standards
- Informative Annex D with examples of common problems and errors associated with the use of radiation detection instrumentation that can be avoided by adequate training
- Informative Annex E with examples of instructor qualifications
- Informative Annex F with information on radiological/nuclear detection operations
- Informative Annex G with information on radiation alarms in the radiological/nuclear detection mission
- Informative Annex H on triggers for National-Level Reachback for alarm resolution
- Informative Annex I on privacy rights and data collection/reporting
- Informative Annex J on training periodicities and refresher training

1.4 Special word usage

In this document, the word *shall* is used to indicate a mandatory requirement. The word *should* is used to indicate a recommendation. The word *may* is used to indicate a permissible action. The word *can* is used for statements of possibility and capability.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ANSI N42.32, American National Standard Performance Criteria for Alarming Personal Radiation Detectors for Homeland Security.²

ANSI N42.33, American National Standard for Portable Radiation Detection Instrumentation for Homeland Security.

ANSI N42.34, American National Standard Performance Criteria for Handheld Instruments for the Detection and Identification of Radionuclides.

ANSI N42.35, American National Standard Evaluation and Performance of Radiation Detection Portal Monitors for Use in Homeland Security.

ANSI N42.38, American National Standard Performance Criteria for Spectroscopy-Based Portal Monitors Used for Homeland Security.

ANSI N42.41, American National Standard Minimum Performance Criteria for Active Interrogation Systems Used for Homeland Security.

ANSI N42.43, American National Standard Performance Criteria for Mobile and Transportable Radiation Monitors Used for Homeland Security.

ANSI N42.48, American National Standard Performance Requirements for Spectroscopic Personal Detectors (SPRDs) for Homeland Security.

ANSI N42.49A, American National Standard for Performance Criteria for Alarming Electronic Personal Emergency Radiation Detectors (PERDs) for Exposure Control.

ANSI N42.49B, American National Standard for Performance Criteria for Non-alarming Personal Emergency Radiation Detectors (PERDs) for Exposure Control.

ANSI N42.53, American National Standard Performance Criteria for Backpack-Based Radiation-Detection Systems Used for Homeland Security.

ASTM E2601-15, Standard Practice for Radiological Emergency Response, 2015.³

CTOS, WMD Definitions for Use in the DHS Course Materials Developed by CTOS, 2014.⁴

IAEA, Code of Conduct on the Safety and Security of Radioactive Sources, Table 1, 2004.⁵

IAEA, International Nuclear Verification Series No. 3, IAEA Safeguards Glossary, 2001 Edition.

² The ANSI N42 publications included in this clause are available from the Institute of Electrical and Electronics Engineers (<http://standards.ieee.org/>).

³ ASTM International publications are available from ASTM Headquarters, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, USA (<http://www.astm.org/>).

⁴ The CTOS document is available from U.S. Department of Energy, CTOS—Center for Radiological/Nuclear Training, Nevada National Security Site, P.O. Box 98521, M/S NLV 126, Las Vegas, NV 89193-8521, USA (www.ctosnnsa.org).

⁵ IAEA publications are available from the International Atomic Energy Agency, P.O. Box 100, Wagner Strasse 5, A-1400 Vienna, Austria (<http://www.iaea.org>).

IAEA, Nuclear Security Series No. 21, Nuclear Security Systems and Measures for the Detection of Nuclear and Other Radioactive Material out of Regulatory Control, 2013.

IAEA, Nuclear Security Series No. 22–G, Radiological Crime Scene Management, 2014.

IAEA, Safety Guide No. RS-G-1.9, Categorization of Radioactive Sources, 2005.

IEC 60050-395: 2014, International Electrotechnical Vocabulary—Chapter 395: Nuclear Instrumentation: Physical Phenomena, Basic Concepts, Instruments, Systems, Equipment and Detectors.⁶

NFPA 472-2013, Standard for Professional Competence of Responders to Hazardous Materials Incidents.⁷

NFPA 473-2013, Standard for Competencies for EMS Personnel Responding to Hazardous Materials/Weapons of Mass Destruction Incidents.

OSHA, 29 CFR 1910.1200, Hazard Communication.

OSHA, 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response.

OSHA, OSH Act of 1970, Section 5, General Duty Clause.

Presidential Policy Directive 8: National Preparedness (PPD-8), 2011.⁸

U.S. Department of Health, Education and Welfare, *Radiological Health Handbook*, 1970.

U.S. Department of Homeland Security (USDHS), Department of Homeland Security Training Glossary, Version 2.1, 2015.⁹

U.S. Department of Homeland Security (USDHS), Domestic Nuclear Detection Office (DNDO), National Incident Management System (NIMS) Resource Type Definitions: Radiological Nuclear Detection Position Qualifications-FINAL, 2014.^{10, 11}

U.S. Department of Homeland Security (USDHS), Domestic Nuclear Detection Office (DNDO), Technical Capability Standard for Backpack-Based Radiation Detection Systems, 500-DNDO-119420v0.00, 2013.

U.S. Department of Homeland Security (USDHS), Domestic Nuclear Detection Office (DNDO), Technical Capability Standard for Vehicle Mounted Mobile Systems, 500-DNDO-119430v0.00, 2013.

U.S. Department of Homeland Security (USDHS), Domestic Nuclear Detection Office (DNDO), Technical Compatibility Standard for Handheld Instruments Used for the Detection and Identification of Radionuclides, 500-DNDO-117250v0.00, 2011.

U.S. Department of Homeland Security (USDHS), *National Preparedness Goal*, 2nd. Edition, 2015.

U.S. Department of Homeland Security (USDHS), National Prevention Framework, 2013.

U.S. Department of Homeland Security (USDHS), National Protection Framework, 2014.

⁶ IEC publications are available from the International Electrotechnical Commission (<http://www.iec.ch/>). IEC publications are also available in the United States from the American National Standards Institute (www.ansi.org).

⁷ NFPA publications are published by the National Fire Protection Association (<http://www.nfpa.org/>).

⁸ USDHS publications and PPD-8 are available from the U.S. Department of Homeland Security (www.dhs.gov and www.fema.gov).

⁹ See footnote 8.

¹⁰ Available at <http://www.dhs.gov/sites/default/files/publications/FY%2016%20Radiological%20and%20Nuclear%20Detection%20Guidance%20for%20FEMA%20Preparedness%20Grants.pdf>.

¹¹ See footnote 9.

3. Definitions and acronyms

3.1 Definitions

The following definitions apply for this standard. These definitions include some of those for ANSI N42.32, ANSI N42.33, ANSI N42.34, ANSI N42.35, ANSI N42.38, ANSI N42.43, ANSI N42.48, ANSI N42.49A, ANSI N42.49B, and ANSI N42.53 that have been developed at the request of the USDHS for instruments to be used by USDHS agencies. Some new definitions have been added specifically for this standard.

ABHP Certification: Certification by the American Board of Health Physics in the comprehensive practice of health physics or radiation safety and radiation protection.

accuracy: The degree of agreement between the observed value and the known value of the quantity being measured.

active interrogation system: A form of detector system intended for non-intrusive inspection of closed containers, vehicles, and packages that uses a radiation source as a means of determining the contents of the interrogated target.

alarm: An audible, visual, or other signal that is activated when the instrument reading or response exceeds a preset value or falls outside of a preset range. *See also:* **detection** and **alarm**.

NOTE 1—Some agencies also use the term *detection alarm*, *alert*, or *detection event* to mean what this standard calls an alarm.¹²

NOTE 2—A **verified alarm** is an alarm that can be repeated, either by the same instrument or when two or more instruments can reproduce the alarm.

NOTE 3—An **unverified alarm** is an alarm that has not been repeated.

NOTE 4—*See* Informative Annex G.

alarm adjudication: The process of identifying, with reasonable certainty, the type or nature of material or device that set off an alarm and assessing the potential threat that the material might pose with corresponding implications for the need to take further action.

NOTE 1—In cases where an alarm remains indeterminate or unknown after initial adjudication efforts, resolution may involve further action to complete the adjudication process—i.e., to identify the material and determine that it poses no threat—or may involve operational response activities.

NOTE 2—Final alarm adjudication results in one of two dispensations: Threat or No Threat.

alarm categories: Verified or unverified.

alarm resolution: The process of taking the necessary action to eliminate any threat posed by the material that set off the alarm or taking measures to address an indeterminate alarm.

NOTE—In this context, indeterminate refers to an alarm for which the cause has not been determined.

¹² Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

alert: Intelligence and information on potential nuclear and other radioactive threat materials, terrorists, smugglers, or other adversaries and the sharing of that information and/or the proper tactics, tools, techniques, and procedures (including technical reachback) to increase the possibility of an operational encounter, detection, or interdiction.

NOTE—Some agencies use the term *alert* to mean what this standard calls an *alarm*.

alternate nuclear material (ANM): Materials that are potentially weapon usable nuclear materials (WUNM), but are not defined as special nuclear materials (SNM). Americium-241, americium-242m, and neptunium-237 are ANM. *See also:* **nuclear material**; **special nuclear material (SNM)**; **weapons usable nuclear material (WUNM)**.

NOTE 1—Americium and neptunium-237 are protected, controlled, and accounted for by the U.S. Department of Energy (USDOE) as if they were SNM.

NOTE 2—Alternate nuclear material (ANM) are also called *alternative nuclear materials (ANM)* (e.g., by the International Atomic Energy Agency [IAEA]).

authority having jurisdiction (AHJ): An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, installation, or a procedure.

NOTE—This standard uses the phrase authority having jurisdiction in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. The AHJ may be a federal-, state-, tribal-, territorial-, or local-level department or individual.

backpack-based radiation detection systems (BRDs): Instruments carried by an operator, usually in a backpack or shoulder bag, to detect the presence of nuclear and other radioactive material in a wide area around the operator. BRDs are designed to detect gamma radiation and may include neutron detection and/or the identification of gamma-ray emitting radionuclides.

NOTE 1—These systems are typically worn by the user during operation but may also be used as temporary stationary area monitors or placed in vehicles or vessels as mobile ad hoc vehicle-mounted systems.

NOTE 2—These systems are also called human-portable detectors (HPDs).

calibration: A set of operations under specified conditions that establishes the relationship between values indicated by a measuring instrument or measuring system, and the known values of the quantity or variable being measured.

check source: A radioactive source that is used to verify the proper functionality of an instrument.

competency level: For this standard, a competency level is one of four training levels described by the Federal Emergency Management Agency (FEMA) National Training and Education System (NTES) to distinguish between the levels of course objectives and/or the target audiences.

NOTE—The four levels of training as described by the NTES are as follows, with the prior (legacy level) names shown in parentheses:

- First-level training: **Basic (Awareness):** This introductory level of training is appropriate for radiological/nuclear detection (RND) mission personnel who require the skills necessary to recognize and report a potential radiological/nuclear (R/N) incident or who are likely to witness or investigate an event involving the illicit use of nuclear and other radioactive materials during the course of their workday while in Steady State Operations.

NOTE—Individuals trained at the first level are expected to recognize indicators of the possible presence of radioactive materials, protect themselves, call for more highly trained personnel (Level II trained) for control and/or mitigation, and secure the area.

- Second-level training: **Intermediate (Operational Performance):** This level of training is designed for RND field operators who perform National Prevention Framework tasks during Steady State Operations, Enhanced Steady State (ESS) Operations, and Radiological/Nuclear Search Operations (RNSO).

- Third-level training: **Advanced (Management, Planning, and Technical Performance)**: This level of training is designed for RND mission managers and leaders who build plans and coordinate the critical National Prevention Framework tasks in advance of and during Steady State Operations and Enhanced Steady State Operations and who understand their roles and responsibilities during an FBI-led RNSO.
- Fourth-level training: **Executive (Executive Management)**: This level of training is appropriate for individuals who are senior-level managers and leaders, responsible for strategic planning and decision making for one or multiple agencies and jurisdictions.

criminal activities: For this standard, criminal activities related to nuclear and other radioactive materials, meaning subversive activities, such as breaches of proliferation controls (as they are subversive to international will) and/or state/federal laws that regulate nuclear and other radioactive materials.

NOTE—These may also include the following:

- Other actual or potential malevolent acts intended to cause harm to people or the environment
- Illegal gain, such as profits from the sale of the nuclear or other radioactive material
- Avoiding prescribed costs of disposal, or relevant taxes
- Violation of transport regulations

detection: All technical and non-technical methods that could contribute to discovering an radiological/nuclear (R/N) threat.

NOTE—In this standard, the term *detection* is used more broadly than radiation detection by instruments. The principal methods of detection are discussed in the informative Annex F on radiological/nuclear detection (RND) operations.

detection limit: The maximum level at which the instrument meets the required accuracy.

detection range: All values between the detection threshold and the detection limit.

NOTE—*Range* does not refer to distance.

Detection Response Protocol: This document provides guidance for state, tribal, territorial, and local (STTL) authorities and agencies operating radiation detection equipment and/or responding to radiological detection events or incidents.

NOTE—In some usage, state, tribal, territorial, and local (STTL) has also been referred to as state, local, territorial, and tribal (SLTT).

detection threshold: The minimum statistically quantifiable instrument response or reading.

detector: A device or component designed to produce a quantifiable response to ionizing radiation normally measured electronically.

deployment: Radiological/nuclear detection (RND) programs and activities that are conducted and capabilities that are implemented as part of the Global Nuclear Detection Architecture (GNDA), to achieve the maximum detection coverage and awareness on the movement of nuclear and other radioactive materials that are out of regulatory control. *See also:* **phases of deployment**.

NOTE—Assets are deployed in multiple modes of operation or phases of deployment.

DHS-approved training course: A course that has successfully passed the U.S. Department of Homeland Security (USDHS) process that 1) utilizes third-party subject matter experts to validate the content of training course materials and to ensure that the lessons are meeting industry standards and regulations, 2) is developed, delivered, and managed by state and federal agencies, and 3) is *not* funded by the National Training and Education Division (NTED) of Federal Emergency Management Agency (FEMA).

NOTE—DHS-approved training courses are listed in the Federal Emergency Management Agency, National Preparedness Directorate, National Training and Education Division, Course Catalog, which is available at the following location: <https://www.firstrespondertraining.gov/content.do>.

DHS-certified training course: A course that has successfully passed the U.S. Department of Homeland Security (USDHS) process that 1) utilizes third-party subject matter experts to validate the content of training course materials and to ensure that the lessons are meeting industry standards and regulations, and 2) is developed and delivered with funding from the Federal Emergency Management Agency (FEMA) National Training and Education Division (NTED).

NOTE—DHS-certified training courses are listed in the FEMA National Preparedness Directorate, National Training and Education Division, Course Catalog, which is available at the following location: <https://www.firstrespondertraining.gov/content.do>.

Domestic Nuclear Detection Office (DNDO): A jointly staffed office within the U.S. Department of Homeland Security (USDHS), and the primary entity in the U.S. government for implementing domestic nuclear detection efforts for a managed and coordinated response to radiological and nuclear threats, as well as integration of federal nuclear forensics programs.

NOTE—DNDO is also charged with coordinating the development of the Global Nuclear Detection Architecture (GNDA), with partners from federal, state, tribal, territorial, local and international governments and the private sector.

dose: The total amount of absorbed radiation resulting from an exposure.

Enhanced Steady State (ESS) Operations: Augmented operations in response to a heightened threat environment or in support of planned security-related activities. *See also:* **Steady State Operations; Radiological/Nuclear Search Operations (RNSO).**

exposure: A measure of ionization produced in air by gamma radiation or x-rays.

NOTE—The magnitude of exposure is the sum of electrical charges of all ions of either sign produced in air when all electrons liberated by gamma radiation or x-rays in a volume element of air are completely stopped in air, divided by the mass of the air in the volume element. The special unit of exposure is the Roentgen, abbreviated in this standard as R. The exposure rate is the Roentgen per hour (R/h).

extreme conditions: Environmental conditions beyond those specified in this standard.

fissile material: A heavy isotope such as uranium-233, uranium-235, or plutonium-239 capable of undergoing fission by neutrons of any energy. *See also:* **fissionable material; nuclear material; special nuclear material (SNM).**

fissionable material: A heavy radionuclide capable of undergoing fission only by high-energy (fast) neutrons. In a weapon context, the term *fissionable* material applies to materials such as uranium-238 that have a fission threshold above 1 MeV for neutrons. *See also:* **fissile material; nuclear material; special nuclear material (SNM).**

NOTE—Some fissionable materials are capable of fission only by sufficiently fast neutrons. Isotopes that undergo fission by neutrons of all energies, including slow (thermal) neutrons, are usually referred to as *fissile* materials. For example, isotopes uranium-235, uranium-233, plutonium-239, and plutonium-241 are referred to as both fissionable and fissile, while uranium-238, neptunium-237, and plutonium-240 are fissionable but not fissile.

functional check: A frequently used qualitative check to determine that an instrument is operational.

NOTE—Such checks may include, for example, battery check, zero setting, or check source response to determine the instrument's capability to perform its intended function.

gamma radiation: Ionizing radiation consisting of photons emitted from the nucleus of an atom through nuclear transition or particle annihilation.

Global Nuclear Detection Architecture (GNDA): A framework for detecting (through technical and non-technical means), analyzing, and reporting on nuclear and other radioactive materials that are out of regulatory control.

NOTE 1—The phrase *out of regulatory control* refers to materials that are being imported, possessed, stored, transported, developed, or used without authorization by the appropriate regulatory authority, either inadvertently or deliberately.

NOTE 2—Detection of nuclear or other radioactive material out of regulatory control may be accomplished through multiple methods.

- **Technical detection** refers to an alarm caused by the use of technology such as a radiation detection system.
- **Non-technical detection** refers to an alert caused by law enforcement or intelligence efforts and collected by GNDA partners under their statutory authorities and consistent with national policy.

Health Insurance Portability and Accountability Act (HIPAA): The HIPAA Privacy Rule provides federal protections for individually identifiable health information held by covered entities and their business associates and gives patients an array of rights with respect to that information.

NOTE 1—The Privacy Rule is balanced so that it permits the disclosure of health information needed for patient care and other important purposes.

NOTE 2—See Annex I for more information on privacy rights and this rule.

human-portable detector (backpack): *See* **backpack-based radiation detection systems (BRDs).**

NOTE—Also known as a portable backpack R/N (radiological/nuclear) detection unit.

illicit radioactive material: Nuclear or other radioactive material out of regulatory control.

NOTE—That is, radiological or nuclear material imported, possessed, stored, transported, developed, or used without authorization by the appropriate regulatory authority, inadvertently or deliberately.

improvised nuclear device (IND): A device, including adversary-modified nuclear weapons, incorporating nuclear materials that was designed, modified, or constructed outside an official U.S. government or other nuclear weapon state program and which has, appears to have, or is claimed to have the capability to produce a nuclear explosion.

inadvertent movement: Any unintentional, unauthorized receipt, possession, use, or transfer of nuclear or other radioactive materials.

indication: A displayed signal from the instrument to the user conveying information such as scale or decade, status, malfunction, or other critical information.

instructor: A qualified person who delivers training according to approved lesson plans and organizational procedures.

instrument: A complete system consisting of one or more assemblies designed to quantify one or more characteristics of ionizing radiation or radioactive material.

interdiction: Actions to stop the unauthorized transit of nuclear and other radioactive materials, associated technologies, and expertise between states, and between state and non-state actors of proliferation concern in any environment; constitutes interrupting or disrupting a terrorist attack prior to the initiation of the attack or disrupting weapons proliferation.

NOTE—The radiological/nuclear detection (RND) skills specified in this standard are taught with the intention of supporting the process of interdiction.

isotopes: Nuclides having the same number of protons in their nuclei, and hence the same atomic number, but differing in the number of neutrons, and therefore in the mass number. Most isotopes are not radioactive. *See also:* **nuclide; radioisotope; radionuclide.**

knowledge, skills, and ability (KSA): The phrase and acronym used in the human resource community to describe knowledge, skills, and ability.

- **Knowledge:** Facts or information essential to performing a job or task.
- **Skills:** The ability to perform a psychomotor or intellectual activity that contributes to the effective performance of a job task.

NOTE 1—The psychomotor domain is a major area of learning which deals with acquiring the ability to perform discrete physical skills requiring dexterity, coordination, and muscular activity.

- **Ability:** The capacity to perform an act, either innately or as the result of learning and practice.

NOTE 2—The acronym KSA is also used in the learning and development field to refer to knowledge, skills, and attitude.

legitimate shipment: A shipment where it has been determined that shipper and receiver are licensed (if required) for material being shipped and shipment is being conveyed in accordance with U.S. Department of Transportation (USDOT) regulations for shipping hazardous materials.

localization: The act of attempting to pinpoint nuclear or other radioactive materials by using detection systems or other screening tools.

mobile radiation monitor: Mobile radiation monitors are designed to be transported to a location and used for a specific task or for a specified period of time; they do not require permanent mounting platforms.

NOTE—Mobile radiation monitors may be mounted to a vehicle such as a trailer. The radiation detection and alarm performance should be in compliance with ANSI N42.43.

monitoring: Means provided to continuously indicate the state or condition of a system or assembly.

NOTE—For purposes of this standard the real-time measurement of radioactivity or radiation level.

National-Level Reachback: The process by which the nation's most skilled technical experts in nuclear spectroscopy, nuclear/radiological weapons, and nuclear threat analysis are used in concert to adjudicate and resolve alarms.

NOTE—National-Level Reachback includes the full resources of U.S. Department of Energy (USDOE) Triage, the U.S. Department of Homeland Security (USDHS) Joint Analysis Center, and other experts as appropriate from the federal government.

National Prevention Framework: The U.S. Department of Homeland Security (USDHS) document that provides context for how prevention is an essential part of preparedness.

NOTE—The National Prevention Framework is contained in the suite of documents known as the National Planning Frameworks. Each Framework covers one preparedness mission area: Prevention, Protection, Mitigation, Response, or Recovery.

neutron: An elementary nuclear particle with no charge.

naturally occurring radioactive materials (NORM): Materials that contain primordial radionuclides (e.g., uranium, thorium, and potassium and any of their decay products, such as radium and radon) which are present naturally in rocks, soils, water, and minerals and that are not regulated by the U.S. Nuclear Regulatory Commission (USNRC). NORM includes radioactive materials that are undisturbed in nature, as well as radioactive materials that, as a result of human activities, are no longer in their natural state. *See also:* **nuclear material; radioactive material; source material; special nuclear material (SNM); technologically enhanced naturally occurring radioactive material (TENORM).**

NOTE—Technologically enhanced naturally occurring radioactive material (TENORM) is considered to be a subset of NORM.

nuclear material: All materials so designated by the U.S. Secretary of Energy. *See also:* **alternate nuclear material (ANM); Fissile material; naturally occurring radioactive material (NORM); radioactive material; source material; special nuclear material (SNM); technologically enhanced naturally occurring radioactive material (TENORM); weapons usable nuclear materials (WUNM).**

NOTE 1—The term *nuclear material* is often used to refer to a subset of nuclear materials consisting of either special nuclear materials (SNM) or weapon usable nuclear materials (WUNM).

NOTE 2—Nuclear material includes special nuclear material (SNM), byproduct material, or source material as defined in 42 U.S.C. 2014 (aa), (e), and (z) [Sections 11(aa), (e), and (z), respectively, of the Atomic Energy Act of 1954], or any other material used in the production, testing, use, or assembly of nuclear weapons or components of nuclear weapons that the U.S. Secretary of Energy determines to be nuclear material in accordance with 10 CFR 1017.10(a). Nuclear materials include depleted uranium (DU), enriched uranium, americium, curium, berkelium, californium-252, plutonium-238 to plutonium-242, lithium-6, uranium-233, natural uranium (normal uranium), neptunium-237, deuterium (hydrogen-2), tritium (hydrogen-3), and thorium.

NOTE 3—The list of materials fitting the definition of *nuclear material* used by the IAEA does not include all of those in the definition used in this standard, which is based on the U.S. Department of Energy (USDOE) definition.

nuclear threat device: Any of a full spectrum of potential nuclear designs, from non-state group (such as a terrorist organization) constructed improvised nuclear devices (INDs) to much more complex nuclear weapons developed by one of the established nuclear weapon states that has been lost or stolen. *See also:* **improvised nuclear device (IND); threat device; weapon of mass destruction (WMD); weapon usable nuclear material (WUNM).**

nuclide: An atom characterized by the number of protons and the number of neutrons that constitute its nucleus. *See also:* **isotope; radioisotope; radionuclide.**

NRRT registration: Registration by the National Registry of Radiation Protection Technologists.

obligated possession: The obligation to report and safeguard found radioactive sources.

onsite operator/first responder: Initial law enforcement officer or other personnel who discover and react to a radiation incident or event.