INTERNATIONAL

Designation: ~~D5928 – 18~~ D5928 – 18a

Standard Practice for Screening of Waste for Radioactivity[1]

This standard is issued under the fixed designation D5928; 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 the screening for α–, β–, and γ radiation above ambient background levels or user-defined criteria, or both, in liquid, sludge, or solid waste materials.

1.2 This practice is intended to be a gross screening method for determining the presence or absence of radioactive materials in liquid, sludge, or solid waste materials. It is not intended to replace more sophisticated quantitative analytical techniques, but to provide a method for rapidly screening samples for radioactivity above ambient background levels or user-defined criteria, or both, for facilities prohibited from handling radioactive waste.

1.3 This practice may not be suitable for applications such as site assessments and remediation activities.

1.4 The values stated in SI units are to be regarded as the standard.

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

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C859 Terminology Relating to Nuclear Materials

3. Terminology

3.1 For terminology related to radioactive materials, see Terminology C859.

4. Summary of Practice

4.1 A sample is held within 6 mm of the detector window of a radiation survey meter, and the visible or audible reaction of the meter, or both, is noted. The user defines an application/project-specific "negative" and "positive" result criteria. A "negative" test result indicates radiation levels are below the user-established criteria; a "positive" test result indicates the radiation levels are above the user-established criteria.

5. Significance and Use

5.1 Most facilities disposing or utilizing waste materials are prohibited from handling wastes that contain radioactive materials. This practice provides the user a rapid method for screening waste material samples in the field or laboratory for the presence or absence of radioactivity at user-established criteria. It is important to these facilities to be able to verify generator-supplied information that radioactive or mixed wastes have not been included in shipments of waste materials.

6. Interferences

6.1 Needle deflections or audible clicks of the survey meter, or both, occur due to naturally occurring omni-directional background radiation. This level of ambient background radiation should be periodically assessed. See Section 10.

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[1] This practice is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.01.05 on Screening Methods.

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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.

6.2 Possible sources of interference include pacemakers, X-ray-generating equipment, radium-based luminescent dials, polonium-based static eliminators, and smoke detectors containing a radioactive isotope-sensing mechanism. Such interferences can usually be traced to their source using the portable instrument specified in this practice.

6.3 A large amount of potassium in the waste sample may produce a positive result due to the natural presence of the radioactive isotope, potassium-40.

6.4 The sensitivity of this practice to beta and gamma radiation may be dependent on sample volume. A small sample volume with readings near background levels may give a false negative result.

6.5 Some radioactive isotopes, such as ~~^{3}H~~tritium/hydrogen-3 and ~~^{14}C,~~carbon-14, may not emit radiation of sufficient energy to be detected. If suspected to be present in the waste, another procedure should be used that is appropriate to their determination.

6.6 Liquid samples, as well as moisture in solid samples, are good attenuators of radiation and will hinder detection of many radionuclides unless they emit high-energy gamma radiation. The possible inability to detect alpha particles and low-level beta emissions that may be attenuated, in many cases, should not be a serious shortcoming in this practice because these emissions are often accompanied by higher-energy gamma emissions.

6.6.1 Moisture-laden, americium-241-bearing waste would be a case where there is a high probability of non-detection due to attenuation.

6.7 Survey meter contamination can cause artificially low or high results when reading standard sources or ambient background. If this occurs, the survey meter performance shall be considered unreliable and should be appropriately decontaminated by qualified personnel, or disposed of in accordance with applicable regulations.

6.8 The radiation monitor should be operated in accordance with the manufacturer's instructions.

7. Apparatus

7.1 *Radiation Survey Meter,* with a halogen-quenched uncompensated Geiger-Mueller tube with thin mica end window. It is advisable to choose an instrument model that has an internal counter (cpm) or is capable of operating in a scaler mode.[3]

~~NOTE 1—The meter used in the development of this practice was the Monitor 4.[3] A number of other survey meters[4] are suitable for this practice. Through the end window, this unit is capable of detecting and indicating alpha radiation (down to 2.5 MeV with a typical detection efficiency of 80 % at 3.6 MeV), beta radiation (down to 150 KeV with a typical 75 % detection efficiency), gamma radiation, and X-rays (down to 10 KeV), with the survey meter set on its lowest energy range of 0.1 µSv/h.~~

8. Reagents and Materials

8.1 The check sources used in the development of this practice ~~were manufactured by Oxford Instruments, Inc.~~may be U.S. ~~Other suitable check sources are available from a number of suppliers. The check sources used in the development of this practice are~~ federally exempt and ~~do~~may not require licensing. Sources other than the following (that is, ~~cesium 137)~~ cesium-137) are appropriate for this practice. The sources, types of activity, levels of activity, and half-lives used in the development of this practice are as follows:

~~Source~~ Source	~~Type~~ Type	~~Activity~~ Activity	~~Half-Life ($t_{1/2}$)~~ Half-Life ($t_{1/2}$)
~~Polonium 210~~	~~alpha~~	~~0.037 G Bq~~	~~138.4 days~~
polonium-210	alpha	3.7 kBq	138.4 days
~~Strontium 90~~	~~beta~~	~~0.037 G Bq~~	~~28.6 years~~
strontium-90	beta	3.7 kBq	28.6 years
~~Cobalt 60~~	~~gamma~~	~~3.7 G Bq~~	~~5.3 years~~
cobalt-60	gamma	37 kBq	5.3 years

8.2 Check sources should be replaced at least every three half-lives.

9. Sample

9.1 Because stratification of liquid samples is possible, thoroughly mix the sample by shaking or stirring prior to testing. Strongly multiphasic samples should have each layer tested separately. Solid samples should be thoroughly mixed by a method appropriate to their size and physical characteristics.

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[3] ~~Manufactured~~ The meter used in the development of this practice was the Monitor 4 manufactured by SE International, Inc., Summertown, TN. Through the end window, this unit is capable of detecting and indicating alpha radiation (down to 2.5 MeV with a typical detection efficiency of 80 % at 3.6 MeV), beta radiation (down to 150 keV with a typical 75 % detection efficiency), gamma radiation, and X-rays (down to 10 keV), with the survey meter set on its lowest energy range of 0.1 µSv/h. A number of vendors produce survey meters that are suitable for this practice.

~~[4] For example, Five Level Portable Meter, manufactured by Harshaw-Bicron, Inc., Solon, OH; Ludlum Measurements, Inc., Sweetwater, TX; and Eberline Instrument Corp., Santa Fe, NM.~~

~~[5] Oxford Instruments, Inc., Oak Ridge, TN.~~

~~[6] For example, The Source, Inc., Santa Fe, NM; Ludlum Measurements, Inc., Sweetwater, TX; and Eberline Instrument Corp., Santa Fe, NM.~~