



Designation: D7296 – 18

Standard Practice for Collection of Settled Dust Samples Using Dry Wipe Sampling Methods for Subsequent Determination of Beryllium and Compounds¹

This standard is issued under the fixed designation D7296; 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 collection of settled dust containing beryllium and beryllium compounds on surfaces using the dry wipe sampling method, or both. These samples are collected in a manner that will permit subsequent extraction and determination of beryllium and compounds in the wipes using laboratory analysis techniques such as atomic spectrometry or fluorescence detection.

1.2 This practice is limited in its scope to applications where wetted wipe sampling (using Practice D6966) or vacuum sampling (using Practice D7144) is not physically feasible (for example, if the surface to be wiped would be compromised by use of wetted wipes).

1.3 This practice does not address the sampling design criteria (that is, sampling plan which includes the number and location of samples) that are used for clearance, hazard evaluation, risk assessment, and other purposes. To provide for valid conclusions, sufficient numbers of samples should be obtained as directed by a sampling plan. Additional guidance is provided in Guide D7659.

1.4 This practice contains notes that are explanatory and are not part of the mandatory requirements of this practice.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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.*

1.7 *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

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

D4840 Guide for Sample Chain-of-Custody Procedures

D6966 Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Determination of Metals

D7144 Practice for Collection of Surface Dust by Microvacuum Sampling for Subsequent Metals Determination

D7659 Guide for Strategies for Surface Sampling of Metals and Metalloids for Worker Protection

D7707 Specification for Wipe Sampling Materials for Beryllium in Surface Dust

3. Terminology

3.1 For definitions of terms not listed here, see Terminology

D1356. <https://www.astm.org/catalog/standards/sist/6517b7a-c1296-18>

3.2 Definitions:

3.2.1 *batch, n*—a group of field or quality control (QC) samples that are collected or processed together at the same time using the same reagents and equipment.

3.2.2 *dry wipe, n*—a suitable non-wetted wiping medium.

3.2.2.1 *Discussion*—These are to be distinguished from wipes as defined in Practice D6966 and Specification D7707, which are wet wipes.

3.3 Definitions of Terms Specific to This Standard:

3.3.1 *field blank, n*—a dry wipe (see 3.2.2) that is exposed to the same handling as field samples except that no sample is collected (no surface is actually wiped).

3.3.1.1 *Discussion*—Analysis results from field blanks provide information on the analyte background level in the dry

¹ This practice is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.04 on Workplace Air Quality.

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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.

wipe, combined with the potential contamination experienced by samples collected within the batch (see 3.2.1) resulting from handling.

4. Summary of Practice

4.1 Wipe samples of settled dust are collected on surfaces from areas of known dimensions with dry wipes satisfying certain requirements, using a specified pattern of wiping.

4.2 The collected dry wipes are then ready for subsequent sample preparation and analysis for the measurement of beryllium and compounds.

5. Significance and Use

5.1 This practice is intended for the collection of settled dust samples for the subsequent measurement of beryllium and compounds. The practice is meant for use in the collection of settled dust samples that are of interest in clearance, hazard evaluation, risk assessment, and other purposes.

5.2 This practice is intended solely for the collection of settled dust samples from hard, relatively smooth nonporous surfaces that may be compromised by water or other wetting agents and that are therefore not suitable for wet wipe sampling using Practice D6966 or micro-vacuum sampling using Practice D7144. Use of this practice for any purpose other than the intended purpose is discouraged due to the limited collection efficiency and high variability of dry wipe sampling as compared to wetted wipe or micro-vacuum sampling.³

5.3 This practice is less effective for collecting settled dust samples from surfaces with substantial texture such as rough concrete, brickwork, textured ceilings, and soft fibrous surfaces such as upholstery and carpeting. Micro-vacuum sampling using Practice D7144 may be more suitable for these surfaces.

6. Apparatus

6.1 *Sampling Templates*—One or more of the following: 10 cm by 10 cm (minimum dimensions) reusable or disposable aluminum or plastic template(s), or disposable cardboard templates, (full-square, rectangular, square “U-shaped,” rectangular “U-shaped,” or “L-shaped,” or both); or templates of alternative areas having accurately known dimensions (see Note 1). Templates shall be capable of lying flat on a surface.

NOTE 1—For most surfaces, it is recommended to collect settled dust from a minimum surface area of 100 cm² to provide sufficient material for subsequent laboratory analysis. However, larger areas (for example, 30 cm by 30 cm) may be appropriate for surfaces having little or no visible settled dust, while a smaller sampling area (for example, 10 cm by 10 cm) may be appropriate for surfaces with high levels of visible settled dust. It is recommended to have a suite of templates with various sampling dimensions.

6.2 *Dry wipes*, for collection of settled dust samples from surfaces. The background metal(s) content of the dry wipes should be as low as possible. At a maximum, the background level of beryllium shall be no more than one-tenth the target

concentration to be measured. Variability of background levels of beryllium shall not exceed ten times the standard deviation of the mean background level. Dry wipe materials shall be compatible with the anticipated sample preparation and analysis methods.

NOTE 2—Characteristics of dry wipe materials, such as hardness, porosity, and thickness, may affect collection efficiency. Quantitative laboratory filter paper, or wipe media with demonstrated equivalent or superior performance, should be used. Consistent use of a single material is recommended because use of multiple materials may produce widely varying results.³ For analysis by ICP-AES or ICP-MS, dry wipes should be either wholly soluble or wholly insoluble when using the selected sample preparation method. This is because partially dissolved wipes can make subsequent handling of sample solutions difficult, or they can cause analytical errors due to matrix mismatches between sample solutions and calibration solutions, or both. Partially dissolved wipes may be acceptable as long as the undissolved remnant leaves an intact skeleton (that is, of woven fabric) that does not adversely affect the sample solution. If the sample preparation method selected involves quantitative transfer of the sample solution to volumetric glassware prior to analysis, the wipes used for sampling should be completely soluble when using the chosen sample preparation method.

6.3 *Sample containers*, sealable, rigid-walled, 15-mL minimum volume.

NOTE 3—Screw-top plastic centrifuge tubes are an example of a suitable rigid-walled sample container.

NOTE 4—Use of sealable plastic bags for holding and transporting the settled dust wipe samples is not recommended due to the potential loss of collected dust within the plastic bags during transportation and laboratory handling. Quantitative removal and processing of the settled dust wipe sample by the laboratory is significantly improved through the use of sealable rigid-walled containers.

6.4 *Measuring tool*, tape or ruler, capable of measuring to the nearest ± 0.1 cm.

6.5 *Plastic gloves*, powderless.

6.6 *Cleaning cloths*, for cleaning of templates and other equipment.

NOTE 5—Wet wipes that comply with Specification D7707 may be used for cleaning templates and other sampling equipment as long as they are allowed to dry thoroughly before use. Other cleaning cloths or wipes not meeting those requirements may also be suitable for this purpose.

6.7 *Adhesive tape*, suitable for securing the template(s) to the surface(s) to be sampled, and for demarcating sampling areas if templates are not used.

NOTE 6—Masking tape, for example, functions well for these purposes.

6.8 *Disposable shoe covers*, optional.

7. Procedure

7.1 Use one of the following two procedures for collecting settled dust samples from each sampling location. For wide, flat locations, it is recommended to use the template-assisted sampling procedure (see 7.1.1.2 (1)). For small locations (for example, window sill, section of a piece of equipment, or portion of a vehicle interior), it will ordinarily be necessary to use the confined-area sampling procedure (see 7.1.1.2 (2)).

NOTE 7—Metal contamination problems during field sampling can be severe and may affect subsequent wipe sample analysis results. Contamination can be minimized through frequent changing of gloves, use of shoe covers (see 6.8), and regular cleaning of sampling equipment with cleaning cloths (see 6.6). Use of disposable shoe covers between different

³ Dufay, S. K., and Archuleta, M., “Comparison of Collection Efficiency of Sampling Methods for Removable Beryllium Surface Contamination,” *Journal of Environmental Monitoring*, Vol 8, No. 6, 2006, pp. 630–633. DOI 10.1039/b601526n.