Designation: E1728 – 16

Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination[1]

This standard is issued under the fixed designation E1728; 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 lead-containing dust on surfaces using the wipe sampling method. These samples are collected in a manner that will permit subsequent extraction and determination of lead using laboratory analysis techniques such as atomic spectrometry or electroanalysis. For collection of settled dust samples for determination of lead and other metals, use Practice D6966.

1.2 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, lead 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.

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

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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

E1605 Terminology Relating to Lead in Buildings

E1613 Test Method for Determination of Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), or Graphite Furnace Atomic Absorption Spectrometry (GFAAS) Techniques

E1644 Practice for Hot Plate Digestion of Dust Wipe Samples for the Determination of Lead

E1792 Specification for Wipe Sampling Materials for Lead in Surface Dust

E1979 Practice for Ultrasonic Extraction of Paint, Dust, Soil, and Air Samples for Subsequent Determination of Lead

E2051 Practice for the Determination of Lead in Paint, Settled Dust, Soil and Air Particulate by Field-Portable Electroanalysis (Withdrawn 2010)[3]

2.2 *Federal Regulations:*[4]

40 CFR 745.63 U.S. Environmental Protection Agency Federal Register, Vol 66, No. 4, 5 Jan. 2001, p. 1206

3. Terminology

3.1 For definitions of terms not listed here, see Terminology E1605.

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 *sampling location, n*—a specific area within a sampling site that is subjected to sample collection.

3.2.2.1 *Discussion*—Multiple sampling locations are commonly designated for a single sampling site (see 3.2.3).

3.2.3 *sampling site, n*—a local geographic area that contains the sampling locations (see 3.2.2).

3.2.3.1 *Discussion*—A sampling site is generally limited to an area that is easily covered by walking.

[1] This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.23 on Lead Hazards Associated with Buildings.

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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.

[4] Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460, http://www.epa.org.

3.2.4 *wipe, n*—a disposable towellette that is moistened with a wetting agent. E1792

3.2.4.1 *Discussion*—These towellettes are used to collect a sample of settled dust on a surface for subsequent lead analysis.

3.3 *Definitions of Terms Specific to This Standard:*

3.3.1 *field blank, n*—a wipe (see 3.2.4) 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 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 wipes meeting Specification E1792, using a specified pattern of wiping.

4.2 The collected wipes are then ready for subsequent sample preparation and analysis by procedures such as Practice E1644, Practice E1979, Practice E2051, and Test Method E1613.

5. Significance and Use

5.1 This practice is intended for the collection of settled dust samples in and around buildings and related structures for the subsequent determination of lead content in a manner consistent with that described in the HUD Guidelines[5] and 40 CFR 745.63. The practice is meant for use in the collection of settled dust samples that are of interest in clearance, hazard assessment, risk assessment, and other purposes.

5.2 Use of different pressures applied to the sampled surface along with the use of different wiping patterns contribute to collection variability. Thus, the sampling result can vary between operators performing collection from identical surfaces as a result of collection variables. Collection for any group of sampling locations at a given sampling site is best when limited to a single operator.

5.3 This practice is recommended for the collection of settled dust samples from hard, relatively smooth, nonporous surfaces. 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.

6. Apparatus and Materials

6.1 *Sampling Templates*—One or more of the following: A 30 by 30 cm (approximately 1 ft^2) reusable aluminum or plastic, or disposable cardboard or plastic template, (full-square, rectangular, square "U-shaped," rectangular "U-shaped," and "L-shaped") or templates of alternative areas having accurately known dimensions (see Notes 1 and 2).

NOTE 1—For most surfaces, it is recommended to collect settled dust from a minimum of a 100 cm^2 area to provide sufficient material for laboratory analysis.[6] However, areas larger than 30 by 30 cm may be appropriate for surfaces having little or no visible settled dust, and a smaller sampling area may be appropriate for surfaces with very high levels of visible settled dust.

NOTE 2—Templates should be capable of lying flat on a surface.

6.2 *Wipes,* meeting the specifications of Specification E1792; see 3.2.4 for definition.

6.3 *Sample Containers,* resealable, rigid-walled, 50-mL minimum volume.

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

NOTE 4—Use of a resealable plastic bag for holding and transporting the settled dust wipe sample is not recommended due to the potential losses of settled dust within the plastic bag 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 resealable rigid-walled containers.

6.4 *Measuring Tool,* tape or ruler, capable of measuring to the nearest ±1 mm.

6.5 *Plastic Gloves,* powderless

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

NOTE 5—Wipes used for dust sampling (see 6.2) can be used for cleaning templates and other sampling equipment, but other cleaning cloths or wipes not meeting the specifications of Specification E1792 may 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 where templates cannot be used.

NOTE 6—Duct or masking tape, for example, function 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, use the template-assisted sampling procedure (see 7.1.1). For small locations (for example, a window sill or door jamb), use the confined-area sampling procedure (see 7.1.2).

NOTE 7—Lead contamination problems during field sampling can be severe and may affect settled dust 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 buildings and removal of them prior to entering vehicles can be helpful to minimize inadvertent transfer of settled dust from one location to another.

7.1.1 *Template-Assisted Sampling Procedure:*

7.1.1.1 Don a pair of clean, powderless, plastic gloves (see 6.5 and Note 7).

7.1.1.2 Carefully place a clean template on the surface to be sampled in a manner that minimizes disturbance of settled dust at the sampling location. Tape the outside edge of the template to prevent the template from moving during sample collection.

[5] *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, U.S. Department of Housing and Urban Development (HUD), Washington, DC, 1995.

[6] Sussell, A., Hart, C., Wild, D, and Ashley, K., "An Evaluation of Worker Lead Exposures and Cleaning Effectiveness During Removal of Deteriorated Lead-Based Paint," *Applied Occupational and Environmental Hygiene*, Vol 14, 1999, pp. 177–185.

7.1.1.3 Obtain a packaged wipe (see 6.2) and, if there is a possibility for the package to be contaminated with dust, clean the package with a cleaning cloth (see 6.6).

7.1.1.4 Remove the wipe from its package, and inspect the wipe to ensure that it is fully wetted and not contaminated with fungus, dust, or other material. Discard the wipe if it is found to be too dry or contaminated, or both.

7.1.1.5 Using an open flat hand with the fingers together, place the wipe on the surface to be sampled. Wipe the selected surface area, side to side, in an overlapping "S" or "Z" pattern while applying pressure to the fingertips (see Fig. 1 and Fig. 2). Wipe the surface so that the entire selected surface area is covered. Perform the wiping procedure using the fingers and not the palm of the hand. The front leading edge of the wipe shall always be pushed forward.

7.1.1.6 Repeat 7.1.1.5 using a different brand of wipe if the wipe curls up or significantly changes shape (wrinkles, crumples, kinks, and so forth) during the wipe process.

NOTE 8—Some surfaces may cause some specific brands of wipes to curl up or otherwise significantly change shape during the wiping process, but may not affect other wipes. A type of wipe that essentially maintains it shape must be selected for each surface sampled.

7.1.1.7 Fold the wipe in half with the collected dust side folded inward, and repeat the preceding wiping procedure (7.1.1.6) within the selected sampling area using an up and down overlapping "S" or "Z" pattern (see Fig. 1 and Fig. 2 and Note 9).

NOTE 9—Wipes are folded to envelop the collected dust within the wipe, to avoid collected dust loss, and to expose a clean wipe surface for further dust collection. For areas containing large amounts of settled dust, care must be taken during wiping to capture all the dust within the wipe.

7.1.1.8 Fold the wipe in half again with the collected dust side folded inward, and repeat the wiping procedure one more time, concentrating on collecting settled dust from all corners within the selected surface area (see Note 9).

7.1.1.9 Fold the wipe again with the collected dust side folded inward and insert the folded wipe into a sample container (see 6.3).

7.1.1.10 Label the sample container with sufficient information to uniquely and indelibly identify the sample, and record the dimensions (in centimetres) of the selected sampling area (the internal template dimensions). Discard the gloves.

7.1.2 *Confined Area Sampling Procedure:*

7.1.2.1 Don a pair of clean, powderless, plastic gloves (see 6.5 and Note 7).

7.1.2.2 Mark the defined area to be sampled with adhesive tape (see 6.7) being careful not to disturb the settled dust, and measure the area to be sampled using the measuring tool (see 6.4).

7.1.2.3 Obtain a packaged wipe (see 6.2) and, if there is a possibility for the package to be contaminated with dust, clean the package with a cleaning cloth (see 6.6).

7.1.2.4 Remove the wipe from its package, and inspect the wipe to ensure that it is fully wetted and not contaminated with fungus, dust, or other material. Discard the wipe if it is found to be too dry or contaminated, or both.

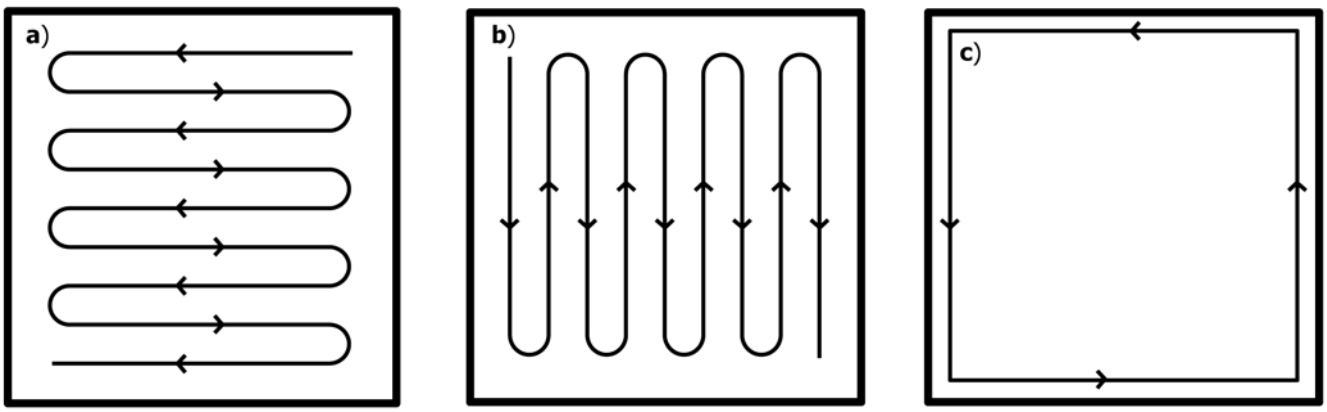
7.1.2.5 Holding the fingers together and flat against the selected surface area, place the wipe on the surface to be sampled. Wipe the measured surface in one direction. Apply pressure to the fingers while wiping the surface. Perform the wiping procedure using the fingers and not the palm of the hand. The front leading edge of the wipe shall always be pushed forward.

7.1.2.6 Fold the wipe in half with the collected dust side folded inward. Repeat the preceding wiping procedure (7.1.2.5) in the reverse direction within the selected sampling area on one side of the folded wipe (see Note 9).

7.1.2.7 Fold the wipe in half with the collected dust side folded inward and repeat the preceding wiping procedure (7.1.2.6) one more time, concentrating on collecting settled dust from all corners within the selected sampling area (see Note 9).

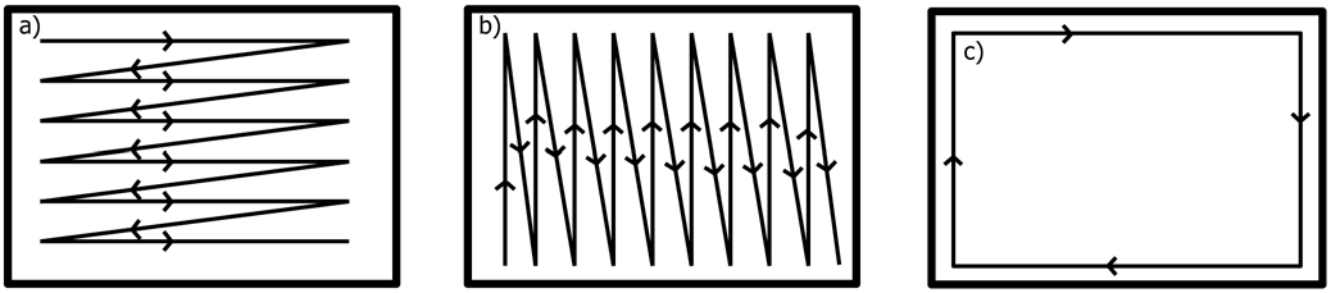
7.1.2.8 Fold the wipe again with the sample side folded inward and insert the folded wipe into a sample container.

7.1.2.9 Label the sample container with sufficient information to uniquely and indelibly identify the sample. Measure and record the dimensions (in centimetres) of the selected sampling area (that is, the area actually wiped during sample collection). Discard the gloves.



NOTE 1—Only the center of the wipe path is shown, not the entire wiping width. Fig. 1(a) shows the first "S" wipe pattern; Fig. 1(b), the second "S" wipe pattern; and Fig. 1(c), the final pattern that is concentrated on the edges and corners.

FIG. 1 Schematic of a side-to-side overlapping "S" wiping pattern



NOTE 1—Only the center of the wipe path is shown, not the entire wiping width. Fig. 2(a) shows the first "Z" wipe pattern; Fig. 2(b), the second "Z" wipe pattern; and Fig. 2(c), the final pattern that is concentrated on the edges and corners.

FIG. 2 Schematic of a side-to-side overlapping "Z" wiping pattern

7.2 Collect field blanks at a minimum frequency of 5 % (or 1 for every 20 field wipe samples collected). The minimum number of field blanks to collect for each batch of wipe samples used is three. Place field blanks in sample containers and label these samples in the same fashion as the collected surface dust samples (as in accordance with 7.1.1.10 or 7.1.2.9).

7.3 Follow sampling chain of custody procedures to ensure sample traceability. Ensure that the documentation which accompanies the samples is suitable for a chain of custody to be established in accordance with Guide D4840.

8. Records

8.1 Field data related to sample collection shall be documented in a sample log form or field notebook (see Note 10). If field notebooks are used, then they shall be bound with prenumbered pages. All entries on sample data forms and field notebooks shall be made using ink with the signature and date of entry. Any entry errors shall be corrected by using only a single line through the incorrect entry (no scratch outs) accompanied by the initials of the person making the correction, and the date of the correction (see Note 11).

NOTE 10—Field notebooks are useful for recording field data even when preprinted sample data forms are used.

NOTE 11—These procedures are important to properly document and trace field data.

8.2 At a minimum, the following information shall be documented:

8.2.1 Project or client name, address, and city/state location.

8.2.2 General sampling site description.

8.2.3 Information as to what specific collection protocol was used.

8.2.4 Information as to what specific type or brand of wipes was used, including manufacturer and lot number.

8.2.5 Information on quality control (QC) samples: which samples are associated with what group of field blanks.

8.2.6 For each sample collected (including field blanks): an individual and unique sample identifier, dimensions of the area sampled (in centimetres), the calculated area sampled (in square centimetres), and date of collection. This information shall be recorded on the sample container in addition to the field documentation.

8.2.7 For each sample collected: name of person collecting the sample and specific sampling location information from which the sample was removed.

9. Keywords

9.1 lead; sample collection; settled dust; wipe