



Standard Specification for Wipe Sampling Materials for Lead in Surface Dust¹

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1. Scope

1.1 This specification covers requirements for wipe materials that are used to collect settled dusts on hard surfaces for the subsequent determination of lead.

1.2 *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:

E 105 Practice for Probability Sampling of Materials²

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method^{2,3}

E 1613 Test Method for Analysis of Digested Samples for Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption (FAAS), or Graphite Furnace Atomic Absorption (GFAAS) Techniques⁴

E 1644 Practice for Hot Plate Digestion of Dust Wipe Samples for Determination of Lead by Atomic Spectrometry⁴

E 1728 Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques⁴

3. Terminology

3.1 Definitions:

3.1.1 *wipe, n*—a disposable, porous paper (cellulosic) tow-lette that is moistened with a wetting agent.

3.1.1.1 *Discussion*—The tow-lette is used to collect a sample of settled dust on a smooth, hard surface for subsequent lead analysis.

4. Manufacture

4.1 The wipes shall be made from materials using methods

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² *Annual Book of ASTM Standards*, Vol 14.02.

³ *ASTM Standards on Precision and Bias for Various Applications*, 3rd Ed., ASTM, Philadelphia, PA, 1988.

⁴ *Annual Book of ASTM Standards*, Vol 04.11.

that ensure compliance with the requirements of Sections 5 and 7, and shall be clean and free of imperfections that would affect their performance.

5. General Requirements

5.1 Test data must be provided to assure compliance with the following requirements. Unless otherwise specified, test data are to be provided by the wipe producer. Users of wipes may also conduct prescribed tests.

5.1.1 Each wipe shall contain less than 5.0 μg of background lead, as determined by Practice E 1644 and Test Method E 1613, or NIOSH Method 7105 (1),⁵ or an equivalent analytical procedure (2).

5.1.2 Wipes shall be sufficiently rugged to be used on a 1000 cm^2 surface area of a smooth surface, such as tile, plastic, metal, wood, or glass, without tearing. A smooth surface for purposes here is defined as having a roughness factor of ≤ 10 (3), where a roughness factor of unity represents an ideally flat surface.

5.1.3 Wipes shall have a moisture content such that the coefficient of variation for a random sampling of the lot of wipes be no greater than 25 %. A minimum of 15 samples of the lot shall be tested.

5.1.4 Wipe dimensions shall be between 10 by 10 cm and 20 by 20 cm.

5.1.5 The dry wipe thickness shall be measured for at least 15 randomly selected samples of a lot. Wipes so measured shall have an average thickness of at least 0.005 cm but no greater than 0.10 cm.

5.1.6 The coefficient of variation in mass of dry wipes in a lot shall not exceed 5 %. A minimum of 15 samples of the lot shall be tested.

5.1.7 Lead recoveries from wipes spiked with National Institute of Standards and Technology (NIST) Standard Reference Materials (SRM) shall be 100 ± 10 %, 95 % confidence level, of the lead recovery from the SRM alone, that is, *sans* wipe material, as determined by Practice E 1644 and Test Method E 1613, or NIOSH Method 7105, or equivalent procedure.

NOTE 1—It is not imperative that the wipe be completely dissolved when digested in accordance with Practice E 1644 or an equivalent procedure to meet the recovery criterion. However, the solution that is to

⁵ The boldface numbers in parentheses refer to the list of references at the end of this standard.

be analyzed (after digestion) should be free of suspended particulates and gelatinous material. Reference (2) describes a specific procedure and criteria for the evaluation of the digestibility of wipe materials.

5.1.8 Collection efficiency of an individual wipe, using an initial wipe on a given smooth nonporous test surface, shall be determined using aerosolized lead oxide as per Ref (4), or lead-containing NIST SRM as per Ref (5). The maximum mass of lead-containing material (particulate or dust) loaded per surface area unit to be sampled shall be 0.5 g. The minimum collection efficiency of an individual wipe shall be 75 %, as measured against the known mass of lead loaded on the test surface prior to wiping. Relative collection efficiency of lead from wipes shall be at least 75 %, as measured against the amount of lead determined from a second wiping of the same location (100 cm² minimum surface area). That is, the lead content determined from a wipe used for the initial wiping shall be at least three times the lead content determined from the second wiping of the same location.

6. Significance and Use

6.1 This specification is intended for use by manufacturers to evaluate the performance of wipe sampling materials for lead in surface dust.

6.2 This specification may also be employed by users of wipe materials in order to compare the performances of candidate wipes for the sampling of lead in surface dust.

7. Procedure

7.1 Unless otherwise specified, the manufacturer is responsible for ensuring that all test procedures described in this section are conducted. Users of wipes may also conduct prescribed tests. Described tests are to be conducted on wipes selected in accordance with the random sampling procedure described in Practice E 105, using wipes sampled after packaging, and representative of the batch.

7.2 Recoverability of lead from spiked wipes shall be measured in accordance with Practice E 1644 and Test Method E 1613, or NIOSH Method 7105, or an equivalent procedure. Background lead in unspiked wipes shall be measured in accordance with the same procedure. A minimum of 60 wipes (30 spiked, 30 unspiked) shall be tested in this manner. See Ref (2) for additional guidelines on the spiking, digestion, and analysis procedure.

7.3 Collection efficiency of lead shall be measured in the following manner (4, 5):

7.3.1 First, a delineated area of a hard smooth surface (minimum area 100 cm²) is loaded with a known mass (≤ 1 g) of particulate or dust and then wiped in accordance with Practice E 1728, NIOSH Method 9100 (6), or an equivalent procedure. Use the procedures described in Ref (4) or (5) to determine the collection efficiency of the first (individual) wipe (see 5.1.8).

7.3.1.1 The same surface location is then wiped in the identical manner with a second wipe, and the lead content determined using the procedure described in Ref (2).

7.3.1.2 An equivalent procedure to that described in Ref (4) may consist of manually distributing a known amount (mass)

of NIST SRM uniformly onto a hard smooth surface, of 100 to 1000 cm² area, and then wiping the surface with two successive (separate) wipes (5). The collection efficiency of a first wiping is determined by comparing the amount of lead collected in the first wipe (determined using dust sampling and analytical procedures described in Refs (2), (4), and (5) against the total amount of lead loaded onto the area of interest on the test surface.

7.3.1.3 The relative collection efficiency is then determined by comparison of the amount of lead collected in the first wipe to the amount of lead collected in the second wiping (see 5.1.8).

7.3.2 The procedure described in 7.3.1 is to be repeated for at least five different locations of the surface or surfaces to be tested. Hence, a total of 60 wipes are to be tested: 30 first wiping and 30 second wiping.

7.3.3 The wipes are to be digested and the lead content determined in accordance with Practice E 1644 and Test Method E 1613, or NIOSH Method 7105, or an equivalent procedure as described in Ref (2).

7.4 *Calculation*—Average the results from lead determinations for each of the four sets of 30 wipes tested in 5.1.1 and 5.1.2, and compute the coefficient of variation for each set. See Practice E 691 for details regarding statistical computations. Wetness of wipes is determined by weighing the wipe before and after quantitative drying, and calculating the difference.

8. Packaging and Package Marking

8.1 Wipes shall be wrapped individually or in multiples per package. Wipes shall be wrapped and packaged according to trade custom.

8.2 Each unit or package shall be marked with the manufacturer's name, size of wipe, date of manufacture, and lot number.

8.3 Each package shall be marked with principal ingredients of the wipe material.

8.4 If the ASTM designation is used in marking and packaging, it shall be stated that the material meets the specifications delineated in this specification, and that supporting performance data are available upon request.

9. Quality Assurance

9.1 *Responsibility for Inspection and Tests*—Unless otherwise specified, the manufacturer is responsible for ensuring that all inspection and test requirements specified herein are conducted.

10. Recordkeeping

10.1 All supporting data from tests conducted for each lot shall be kept by the manufacturer for a minimum of ten years. All of this information shall be recorded in bound notebooks (with numbered pages) or on data sampling forms, or both. All test information shall be available for release to users of wipe materials upon request.

11. Keywords

11.1 lead; surface dust; wipe

REFERENCES

- (1) NIOSH Method 7105, "Lead by HGAAS," *NIOSH Manual of Analytical Methods*, 4th Ed., P. M. Eller and M. E. Cassinelli, eds., National Institute for Occupational Safety and Health, Cincinnati, OH, 1994.
- (2) Millson, M., Eller, P. M., and Ashley, K., "Evaluation of Wipe Sampling Materials for Lead in Surface Dust," *American Industrial Hygiene Association Journal*, Vol 55, 1994, pp. 339–342.
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- (5) Binstock, D. A., Estes, E. D., Neefus, J. D., Williams, E. E., Gutknecht, W. F., Harper, S. L., and Beard, M. E., "Preparation and Evaluation of Lead-Contaminated Dust Method Evaluation Materials," in *Lead in Paint, Soil and Dust, ASTM STP 1226*, M. E. Beard and S. D. A. Iske, eds., ASTM, Philadelphia, PA, 1995.
- (6) NIOSH Method 9100, "Lead in Surface Wipe Samples," *NIOSH Manual of Analytical Methods*, 4th Ed., P. M. Eller and M. E. Cassinelli, eds., National Institute for Occupational Safety and Health, Cincinnati, OH, 1994.

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