



Standard Specification for Wipe Sampling Materials for Lead in Surface Dust¹

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1. Scope

1.1 This specification covers requirements for wipes that are used to collect settled dusts on 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:²

- E 105 Practice for Probability Sampling of Materials
- E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
- E 1605 Terminology Relating to Lead in Buildings
- E 1613 Test Method for Analysis for Determination of Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption (FAAS), or Graphite Furnace Atomic Absorption (GFAAS) Techniques
- E 1644 Practice for Hot Plate Digestion of Dust Wipe Samples for Determination of Lead
- E 1728 Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination
- E 2239 Standard Practice for Record Keeping and Record Preservation for Lead Hazard Activities
- F 141 Standard Terminology Relating to Resilient Floor Coverings

3. Terminology

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

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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.

3.2 Definitions:

3.2.1 *lot, n*—a finite quantity of a given product manufactured under production conditions that are considered uniform.

3.2.2 *shelf life, n*—for dust-wiping sampling, the maximum time interval during which a wipe can be stored in an unopened package and remain suitable for sampling of settled dust.

3.2.3 *vinyl-composite tile, n*—a resilient floor covering composed of binder, fillers, and pigments. The binder consists of one or more resins of poly (vinyl chloride) or vinyl chloride copolymers, or both, compounded with suitable plasticizers and stabilizers. Other polymeric resins may be incorporated as part of the binder (See Terminology F 141).

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

3.2.4.1 *Discussion*—The towellette is used to collect a sample of settled dust on a surface for subsequent lead analysis.

4. Significance and Use

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

4.2 This specification may also be employed by users of wipes to compare the performance of candidate wipes for the sampling of lead in surface dust.

5. Manufacture

5.1 The wipes shall be made from materials using methods that ensure compliance with the requirements of Sections 6 and 8, and shall be clean and free of imperfections that would affect their performance.

6. General Requirements

6.1 Wipes shall conform to the requirements in Paragraphs 6.1.1 to 6.1.8. Test procedures for each requirement are found in Section 8.

6.1.1 *Background Lead*—The mean background lead content per un-spiked wipes tested shall be less than 1.0 μg .

6.1.2 *Lead Recoveries*—The mean lead recoveries from wipes spiked with Certified Reference Materials (CRMs) having 20 μg , 100 μg , and 500 μg ($\pm 10\%$) of lead per sample shall be 100 % ± 20 % of the mean lead recovery from the CRM alone, that is, without a wipe included in the analysis

(1)³. The coefficient of variation of the recoveries of samples with lead levels of 20 µg shall not exceed 25 percent. The coefficients of variation of the recoveries of samples with lead levels of 100 µg and 500 µg shall not exceed 10 percent.

6.1.3 *Collection Efficiency*—The minimum collection efficiency of at least 95% of the wipes tested shall be 75 %.

6.1.4 *Ruggedness*—Wipes shall be sufficiently rugged so as to be used on a smooth surface of a vinyl-composite floor tile such that a minimum of 95 % of wipes tested shall reveal no holes or tears.

6.1.5 *Moisture Content*—Each wipe, when examined, must be wet both visibly and to the touch upon removal from the package. The coefficient of variation of moisture content of wipes tested shall be no greater than 25 %.

6.1.6 *Mass*—The coefficient of variation in mass shall not exceed 10 %.

6.1.7 *Sizes*—The mean area of wipes shall not be less than 200 cm² and shall not be greater than 625 cm². The mean length of either side shall not be less than 10 cm or larger than 25 cm.

6.1.8 *Thickness*—The mean thickness of wipes shall be at least 0.05 mm but no greater than 0.5 mm.

7. Selection and Handling of Wipes for Testing

7.1 Wipes to be tested shall be from a single lot and be selected in accordance with Practice E 105.

7.2 Wipes shall not be removed from their packages until immediately prior to testing.

8. Procedure

8.1 *Background and Recovery*—Background lead (6.1.1) of un-spiked wipes and recoverability of lead from spiked wipes (6.1.2) shall be measured in accordance with Practice E 1644 and Test Method E 1613. Recovery of lead from CRM(s) alone, that is without a wipe included in the analysis, shall also be measured in accordance with the same procedure. A minimum of 7 samples per each level (unspiked, 20 ± 2 µg, 100 ± 10 µg, and 500 ± 50 µg) shall be tested. See Ref (2) for additional guidelines on the spiking, digestion, and analysis procedure.

8.1.1 Compute the mean and coefficient of variation for each set of samples. See Practice E 691 for details regarding statistical computations. Compare with the requirements of 6.1.1 and 6.1.2.

8.2 *Collection Efficiency*—Collection efficiency (6.1.3) shall be measured in accordance with either 8.2.1 or 8.2.2. A minimum of seven wipes shall be tested using a smooth-surface vinyl-composite floor tile as a test surface.

8.2.1 Load a delineated area of the test surface (minimum area 900 cm²) with a known mass (0.5 ± 0.05 g) of aerosolized particles or dust (e.g., lead oxide as described in (3)) and then wipe the test surface in accordance with Practice E 1728.

8.2.2 Alternatively, manually distribute (4) a known mass of lead-containing CRM uniformly onto the test surface, of 900 cm² minimum area, and then wipe the surface in accordance with E 1728.

8.2.3 In determining collection efficiency, the wipes shall be extracted and the lead content determined in accordance with Practice E 1644 and Test Method E 1613. Calculate the percent collection efficiency (CE) for each wipe as follows:

$$CE = 100 \times (\text{lead determination in wipe}) / (\text{lead deposited on test surface}).$$

8.3 *Ruggedness*—to determine ruggedness (6.1.4), use butted vinyl-composite floor tiles as a test surface (1800 cm² minimum area). Subject a minimum of seven wipes to the wipe test procedures described in Practice E 1728. Examine each wipe for the presence of holes or tears.

8.4 *Moisture Content*—Determine the mass of each wipe tested before and after quantitative drying (to the nearest 0.01 g). Calculate the percent moisture content (MC) (6.1.5) for each wipe as follows:

$$MC = 100 \times (\text{mass before drying} - \text{mass after drying}) / \text{mass before drying}.$$

8.5 *Mass*—To determine mass (6.1.7), use the data for dried wipes from 8.4. Calculate the mean mass and the coefficient of variation of all dry wipes.

8.6 *Size*—Determine the linear dimensions (6.1.7) of a minimum of seven wipes to the nearest 1 mm. Calculate the mean area of the wipes and the mean lengths of the shorter and longer sides.

8.7 *Thickness*—Determine the thickness (6.1.8) of a minimum of seven individual dry wipes using a micrometer capable of reading to the nearest 0.01 mm. Calculate the mean thickness.

9. Retesting

9.1 In cases where wipes fail to pass one or more requirements of this specification, retesting shall be permitted. Both the original data and the retesting data for each requirement for which retesting was conducted shall be used in determining whether the requirement is met.

10. Packaging and Package Marking

10.1 Wipes shall be wrapped individually. Wipes shall be wrapped and packaged according to trade custom.

10.2 Each package shall be marked with the supplier's name, date of manufacture, lot number, and recommended shelf life.

10.3 The statement "meets ASTM E 1792" shall be marked on individual packaging. Also, on general packaging, it shall be stated that the material meets the specifications delineated in this specification, and that supporting performance data are available upon request.

11. Recordkeeping

11.1 All supporting data from tests conducted for each lot shall be kept by the supplier in accordance with Practice E 2239.

12. Keywords

12.1 lead; surface dust; wipe

³ The boldface numbers in parentheses refer to the list of references at the end of this standard.

REFERENCES

- (1) NIOSH Method 7105, "Lead by HGAAS," *NIOSH Manual of Analytical Methods*, 4th Ed., Cassinelli, M.E. and O'Connor, P.F., 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.
- (3) Chavalitnitikul, C., and Levin, L., "A Laboratory Evaluation of Wipe Testing Based on Lead Oxide Surface Contamination," *American Industrial Hygiene Association Journal*, Vol 45, 1984, pp. 311–317.
- (4) Binstock, D.A., et al, "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.

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