



Designation: E1828 – 01

Standard Practice for Evaluating the Performance Characteristics of Qualitative Chemical Spot Test Kits for Lead in Paint¹

This standard is issued under the fixed designation E1828; 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 describes an evaluation procedure for the determination of performance characteristics of qualitative chemical spot test kits for lead, as applied to dry paint films, for a given dry paint film matrix on a given substrate.

1.2 This practice may be used to determine the performance characteristics of a given lead spot test kit for a given synthetic or field dry paint film matrix, independent of substrate effects.

1.3 To allow for comparisons of different spot test kits on an identical matrix, this practice covers the determination of test kit performance characteristics on a synthetically prepared standard white lead-containing paint film. The ingredients for the preparation of a standard synthetic leaded paint film based on basic lead carbonate are described.

1.4 This practice is not intended for the evaluation of performance parameters of chemical spot test kits on all types of paint or paint conditions that may be encountered during field use (as described in E1753). Rather, this practice addresses the evaluation of the response of a chemical spot test kit for lead as a function of lead concentration for a limited set of paint films. Evaluating the performance of a chemical spot test kit for a given application requires tests on a representative sample of paints and substrates found at the location(s) to be tested.

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

- D81 Specification for Basic Carbonate White Lead Pigment
- D823 Practices for Producing Films of Uniform Thickness

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 Paint Abatement.

Current edition approved Dec. 10, 2001. Published March 2002. Originally published as E1828–96. Last previous edition E1828–96. DOI: 10.1520/E1828-01.

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.

- of Paint, Varnish, and Related Products on Test Panels
- D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers
- 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
- E1645 Practice for Preparation of Dried Paint Samples by Hotplate or Microwave Digestion for Subsequent Lead Analysis
- E1729 Practice for Field Collection of Dried Paint Samples for Subsequent Lead Determination
- E1753 Practice for Use of Qualitative Chemical Spot Test Kits for Detection of Lead in Dry Paint Films

2.2 Federal Specifications:

- Federal Specification TTP 19 Paint, Latex (Acrylic Emulsion, Exterior Wood, and Masonry)³
- Federal Specification TTP 102 Paint, Oil (Alkyd Modified, Exterior, White, and Tints)³

3. Terminology

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

3.2 *identification limit, n*—for a qualitative chemical spot test kit, this is the lead content that yields a 50 % chance of either a positive or negative test result for a given sample matrix (1).⁴

3.3 *performance curve, n*—for a qualitative chemical spot test kit, this is a plot of the test kit response (positive or negative) versus the lead content in a given sample matrix as determined by quantitative analysis (2).

3.3.1 *Discussion*—The performance curve may be statistically modeled to yield qualitative test kit performance parameters for lead detection.

3.4 *performance parameter*—for a particular spot test kit and a particular sample matrix, this is the lead content that yields a known degree of confidence in detecting lead.

³ Available from U.S. Government Printing Office, Washington, DC.

⁴ The boldface numbers in parentheses refer to the list of references at the end of this practice.

3.4.1 *Discussion*—Examples of qualitative test kit performance parameters include the identification limit and the amounts of lead in a given sample matrix that yield a desired confidence (for example, 95 %) of a negative and positive test result, respectively.

4. Summary of Practice

4.1 Samples of paint are collected using an ASTM practice. Alternatively, samples may consist of referenced materials (or mixtures thereof) or may be prepared artificially in the laboratory (3). Synthetic standard paint films may be prepared using basic white lead carbonate over an applicable range of lead concentrations.

NOTE 1—Other types of paint films may be prepared from other materials to yield data that are supplemental to this practice. For example, chromate paints of varied lead concentration could be fabricated to investigate performance curves of chemical spot test kits.

4.2 Paint samples are tested with a qualitative chemical spot test kit for lead according to Practice E1753, and test kit results are recorded as positive or negative for lead detection.

4.3 Tested paint samples are prepared and analyzed for quantitative lead content using ASTM standards.

4.4 The quantitative lead content data from chemical analysis are compared to the qualitative lead spot test kit results.

4.5 The comparative data are statistically modeled in order to determine the performance parameters of a particular spot test kit for a particular paint matrix.

5. Significance and Use

5.1 This practice is to be used to evaluate the performance of commercially available or laboratory prepared qualitative chemical spot test kits for lead in dry paint films.

5.2 This practice is generic in the respect that the protocol is applicable to any desired combination of spot test kit and paint sample matrix.

5.3 Performance parameters of interest in the evaluation include the identification limit of a particular test kit for a particular paint matrix, and the lead content in paint that gives a known degree of confidence for a negative or positive test result.

6. Apparatus

6.1 *Qualitative Chemical Spot Test Kit*, for lead detection, either commercially available or prepared in the laboratory.

NOTE 2—Most spot test kits for lead are based on the use of rhodizonate or sulfide (1,4). Spot test kits for lead based on each of these chemistries are commercially available. Laboratory procedures describing the preparation of lead spot test kits are outside the scope of this standard. However, these protocols are given in Refs (1) and (4).

6.2 *Sealable Hard-Walled Sample Containers*, plastic or glass, for containment of dry paint samples following spot testing but prior to laboratory analysis.

6.3 *Laboratory and Field Supplies and Equipment*, as needed for sample collection, sample preparation, and analysis. Necessary laboratory and field supplies for particular sample matrices of concern are described in the pertinent ASTM standards listed in 2.1.

6.3.1 *Sample Collection*—Supplies and equipment for sample collection are described in Practice E1729.

6.3.2 *Sample Preparation*—Supplies and equipment for sample preparation are described in Practice E1645.

6.3.3 *Analysis*—Supplies and equipment for laboratory analysis of extracted lead samples are described in Test Method E1613.

7. Procedure

7.1 *Sample Collection or Artificial Sample Preparation*—Field dry paint samples may be collected using Practice E1729. Alternatively, samples may consist of Certified Reference Materials (CRMs) or mixtures thereof, or may be prepared artificially in the laboratory.

7.1.1 *Field Samples—Dry Paint Film Sample Collection*—Collect paint samples in accordance with Practice E1729.

7.1.2 *Concentration Range of Field Samples*—It is necessary to collect or prepare samples of a particular matrix over a wide range of lead concentrations (at least two, preferably three or more orders of magnitude).

7.1.2.1 The lead content in the sample matrix of interest must extend from a concentration of at least one order of magnitude below the anticipated identification limit of the spot test kit to a lead content at least five times above the expected identification limit.

NOTE 3—In general, until samples are analyzed quantitatively (especially field samples), it will not be possible to know exactly the range of sample lead concentrations.

7.2 Synthetic Samples:

7.2.1 Preparation of Standard Synthetic Dry Paint Films:

7.2.1.1 *Leaded Paint Components*—The paste-in-oil form of basic white lead carbonate, meeting the requirements described in Specification D81, shall be used in the preparation of standard leaded paint films for spot testing. This paste is to be dispersed and diluted in white alkyd paint that meets the requirements of Fed. Spec. TTP 102.

NOTE 4—Paint drying procedures are covered in Fed. Spec. TTP 102. General requirements are for the paint film to be dried for two weeks at room temperature, with the film being dry to the touch.

7.2.1.2 *Substrate*—Prepared synthetic paints shall be spread uniformly on an unleaded glass, poly(methylmethacrylate) (PMMA or lucite), or polyester (mylar) surface. The film may consist of one or more coats of lead-containing paint.

NOTE 5—For assistance in preparing films of uniform thickness, see Practices D823.

7.2.1.3 *Overlayer*—A nonleaded overlayer consisting of two coats of latex paint, meeting the requirements of Fed. Spec. TTP 19, shall be spread atop the leaded paint layer(s).

7.2.1.4 *Thickness*—The thickness of each paint layer within the films shall be 35 to 80 μm .

NOTE 6—For assistance in measuring film thickness, see Test Method D1005.

7.2.2 Concentration Ranges of Synthetic Paint Samples:

7.2.2.1 The range of lead concentrations in synthetically prepared leaded paint films shall extend from ≤ 0.001 % Pb to approximately 5 % Pb by mass, or ≤ 0.01 mg/cm² to approximately 2 mg/cm² by surface area.

7.3 *Number of Samples*—The number of samples required for the evaluation may differ for different matrices. However,