



Designation: **E1775–07 (Reapproved 2016) E1775 – 16**

## Standard Guide for Evaluating Performance of On-Site Extraction and Field-Portable Electrochemical or Spectrophotometric Analysis for Lead<sup>1</sup>

This standard is issued under the fixed designation E1775; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

- 1.1 This guide provides guidelines for determining the performance of field-portable quantitative lead analysis instruments.
- 1.2 This guide applies to field-portable electroanalytical and spectrophotometric (including reflectance and colorimetric) analyzers.
- 1.3 Sample matrices of concern herein include paint, dust, soil, and airborne particles.
- 1.4 This guide addresses the desired performance characteristics of field-based sample extraction procedures for lead, as well as on-site extraction followed by field-portable analysis.
- 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:<sup>2</sup>

- D5438 Practice for Collection of Floor Dust for Chemical Analysis
- D6785 Test Method for Determination of Lead in Workplace Air Using Flame or Graphite Furnace Atomic Absorption Spectrometry
- D6966 Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Determination of Metals
- D7035 Test Method for Determination of Metals and Metalloids in Airborne Particulate Matter by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)
- D7144 Practice for Collection of Surface Dust by Micro-vacuum Sampling for Subsequent Metals Determination
- D7439 Test Method for Determination of Elements in Airborne Particulate Matter by Inductively Coupled Plasma–Mass Spectrometry
- 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
- E1645 Practice for Preparation of Dried Paint Samples by Hotplate or Microwave Digestion for Subsequent Lead Analysis
- E1726 Practice for Preparation of Soil Samples by Hotplate Digestion for Subsequent Lead Analysis
- E1727 Practice for Field Collection of Soil Samples for Subsequent Lead Determination
- E1729 Practice for Field Collection of Dried Paint Samples for Subsequent Lead Determination
- E1792 Specification for Wipe Sampling Materials for Lead in Surface Dust
- E1864 Practice for Evaluating Quality Systems of Organizations Conducting Facility and Hazard Assessments for Lead in Paint, Dust, Airborne Particulate, and Soil in and around Buildings and Related Structures (Withdrawn 2011)<sup>3</sup>

<sup>1</sup> This guide 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.

Current edition approved Jan. 1, 2016/March 1, 2016. Published January 2016/April 2016. Originally approved in 1996. Last previous edition approved in 2007/2016 as E1775–07-E1775–07 (2016). DOI: 10.1520/E1775-07R16-10.1520/E1775-16.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

## 2.2 U.S. EPA Documents:<sup>4</sup>

[EPA 600/R-93/200 Standard Operating Procedure for the Field Analysis of Lead in Paint, Bulk Dust, and Soil by Ultrasonic, Acid Digestion and Colorimetric Measurement \(1993\)](#)

[EPA 747-R-92-001 Laboratory Accreditation Guidelines: Measurement of Lead in Paint, Dust, and Soil \(1992\)](#)

## 2.3 ISO Document:<sup>5</sup>

[ISO Guide 30 Reference materials -- Selected terms and definitions](#)

### 3. Terminology

3.1 For definitions of terms not listed here, see Terminology [E1605](#).

3.2 *anodic stripping voltammetry*—an electroanalytical technique in which the concentration of analyte metal species dissolved in solution is determined in the following manner: The analyte is first deposited (preconcentrated) electrochemically by reducing the dissolved ion in solution to immobilized metal species at an electrode surface (such as mercury or bismuth). The metal is deposited at an applied potential (voltage) which is negative of the standard oxidation potential for the metal/ion redox couple. After deposition, the preconcentrated metal species is then stripped from the electrode by applying a positive potential sweep, which causes anodic oxidation of the analyte metal species to dissolved ion. The current associated with this reoxidation is measured. The peak current is proportional to the original concentration of dissolved analyte species over a wide range of concentrations determined.

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

<sup>5</sup> Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

#### 3.2.1 Discussion—

The analyte is first deposited (preconcentrated) electrochemically by reducing the dissolved ion in solution to immobilized metal species at an electrode surface (such as mercury or bismuth). The metal is deposited at an applied potential (voltage) which is negative of the standard oxidation potential for the metal/ion redox couple. After deposition, the preconcentrated metal species is then stripped from the electrode by applying a positive potential sweep, which causes anodic oxidation of the analyte metal species to dissolved ion. The current associated with this reoxidation is measured. The peak current is proportional to the original concentration of dissolved analyte species over a wide range of concentrations.

3.3 *colorimetry*—an analytical technique that is similar to spectrophotometry (see in which [3.5](#)), except that ultraviolet-visible light of a single, narrow wavelength range is passed through a sample cell containing dissolved analyte, and the absorption measured. [//standards.iteh.ai/catalog/standards/sist/712325b4-6270-47c3-a409-117730f42bed/astm-e1775-16](http://standards.iteh.ai/catalog/standards/sist/712325b4-6270-47c3-a409-117730f42bed/astm-e1775-16)

3.4 *reflectance*—a measurement technique (subset of spectrophotometry; see [3.5](#)) in which light is reflected off of a reflecting surface and measured by a detector. The amount of reflected light may be a function of analyte concentration. surface containing the analyte of interest is measured by a detector.

3.5 *spectrophotometry*—an analytical technique in which a spectrum of analyte species a sample containing the analyte of interest is obtained and used to determine the analyte concentration in the following manner. Light is directed onto or through analyte species, and the absorption of this light across a range of wavelengths is measured by a detector. The amount of absorbed light is a function of the concentration of analyte species.

#### 3.5.1 Discussion—

Light is directed onto or through analyte species, and the absorption of this light across a range of wavelengths is measured by a detector. The amount of absorbed light is a function of the concentration of analyte species.

### 4. Significance and Use

4.1 This guide is intended for use in evaluating the performance of field-portable electroanalytical or spectrophotometric devices for lead determination, or both.

4.2 Desired performance criteria for field-based extraction procedures are provided.

4.3 Performance parameters of concern may be determined using protocols that are referenced in this guide.

4.4 Example reference materials to be used in assessing the performance of field-portable lead analyzers are listed.

4.5 Exhaustive details regarding quality assurance issues are outside the scope of this guide. Applicable quality assurance aspects are dealt with extensively in references that are cited in this guide.