Designation: ~~E1583 – 17~~ E1583 – 21

Standard Practice for Evaluating Laboratories Engaged in Determination of Lead in Paint, Dust, Airborne Particulates, and Soil Taken From and Around Buildings and Related Structures[1]

This standard is issued under the fixed designation E1583; 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 qualifications, including minimum requirements for personnel and equipment, duties, responsibilities, and services of laboratories engaged in the determination of lead in paint, or settled dust, or airborne particulates, ~~and soil~~ or soil, or any combination thereof, taken from and around buildings and related structures.

1.2 This practice has been developed consistent with Guides E548 and E994, to supplement ISO/IEC 17025.

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

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1356 Terminology Relating to Sampling and Analysis of Atmospheres
D3335 Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
D4185 Test Method for Measurement of Metals in Workplace Atmospheres by Flame Atomic Absorption Spectrophotometry
D6785 Test Method for Determination of Lead in Workplace Air Using Flame or Graphite Furnace Atomic Absorption Spectrometry
D7035 Test Method for Determination of Metals and Metalloids in Airborne Particulate Matter by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)
D7439 Test Method for Determination of Elements in Airborne Particulate Matter by Inductively Coupled Plasma–Mass Spectrometry
E548 Guide for General Criteria Used for Evaluating Laboratory Competence (Withdrawn 2002)[3]

[1] This practice is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.12 on Sampling and ~~Analysis,~~Analysis of ~~Lead,~~Lead for Exposure and Risk Assessment.

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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.

E631 Terminology of Building Constructions
E994 Guide for Calibration and Testing Laboratory Accreditation Systems General Requirements for Operation and Recognition (Withdrawn 2003)[3]
E1187 Terminology Relating to Conformity Assessment (Withdrawn 2006)[3]
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 (Withdrawn 2021)[3]
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
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]~~
E2708 Terminology for Accreditation and Certification
~~E2913~~E2913/E2913M Practice for Hotplate Digestion of Lead from Composited Wipe Samples
E2914/E2914M Practice for Ultrasonic Extraction of Lead from Composited Wipe Samples
E3193 Test Method for Measurement of Lead (Pb) in Dust by Wipe, Paint, and Soil by Flame Atomic Absorption Spectrophotometry (FAAS)
E3203 Test Method for Determination of Lead in Dried Paint, Soil, and Wipe Samples by Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES)

2.2 *ISO Standards:*[4]
ISO 8518 Workplace air -- Determination of particulate lead and lead compounds -- Flame or electrothermal atomic absorption spectrometric method
ISO 9000 Quality management systems — Fundamentals and vocabulary
ISO 15202-2 Workplace air -- Determination of metals and metalloids in airborne particulate matter by inductively coupled plasma atomic emission spectrometry -- Part 2: Sample preparation
ISO 15202-3 Workplace air -- Determination of metals and metalloids in airborne particulate matter by inductively coupled plasma atomic emission spectrometry -- Part 3: Analysis
ISO/IEC 17011 Conformity assessment -- General requirements for accreditation bodies accrediting conformity assessment bodies
ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
ISO 30011 Workplace air -- Determination of metals and metalloids in airborne particulate matter by inductively coupled plasma mass spectrometry

2.3 *EPA Documents:*
EPA SW-846 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods[5]
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

2.4 *Other Documents:*
NIOSH Manual of Analytical Methods (NMAM), 5th Edition[6]
AOAC Official Methods of Analysis of AOAC International, 19th Edition (2012)[7]

3. Terminology

3.1 ~~*Definitions:*~~*Definitions* ~~For~~ For definitions of terms used in this practice, refer to Terminology D1356, or Terminology E631, or Terminology E1187, or Terminology E1605, or Terminology E2708.

3.1.1 *accreditation body*—authoritative body that performs accreditation. **(ISO/IEC 17011)**

3.1.1.1 *Discussion*—
For example, an accreditation body may be an organization that has demonstrated competency to ISO/IEC 17011 and successfully completed the peer evaluation process through the International Laboratory Accreditation Cooperation (ILAC) recognition process

[4] 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~~ https://www.iso.org.
[5] Available from ~~US EPA~~ United States Environmental Protection Agency (EPA) / Office of Resource Conservation and Recovery, 1200 Pennsylvania Ave., NW (5305P), Washington DC 20460, https://www.epa.gov/hw-sw846.
[6] Available from National Institute for Occupational Safety and Health (NIOSH), Patriots Plaza 1, 395 E Street, SW, Suite 9200, Washington, DC 20201, https://www.cdc.gov/niosh/nmam.
[7] Available from AOAC International, 2275 Research Blvd., Suite 300, Rockville, MD 20850-3250, http://www.aoac.org.

or through an ILAC regional cooperation such as the Inter-American Accreditation Cooperation (IACC) ~~and/or~~or Asia Pacific Laboratory Accreditation Cooperation ~~(APLAC).~~(APLAC), or both.

3.1.2 *management system*—~~the quality, administrative, and technical systems that govern the operations of a laboratory.~~set of interrelated or interacting elements of an organization to establish policies and objectives, and processes to achieve those objectives. ~~**(ISO/IEC 17025)**~~ **(ISO 9000)**

4. Significance and Use

4.1 This practice provides the basic criteria to be used by accreditation bodies and others in evaluating the qualifications of laboratories engaged in the testing of lead in paint, or settled dust, or airborne particulates, ~~and soil~~ or soil, or combination thereof, taken from and around buildings and related structures. The criteria in this practice shall be supplemented by additional specific criteria and requirements, when appropriate; for example, when necessary to be in accordance with federal, state, or local government regulations.

4.2 The accreditation is for organizations and not individuals.

4.3 The practice is intended to provide objective information on the capabilities needed by laboratories to determine lead in paint, dust, airborne particulates, and soil taken from and around buildings and related structures. It is not intended to be used to compare one laboratory with another.

4.4 This practice is also intended for use by laboratories in the development and implementation of their management systems and for use to request or perform an evaluation of in-house facilities in accordance with this practice.

5. Organization

5.1 The laboratory shall be legally identifiable. The laboratory shall be organized and shall operate in such a way that its facilities meet the requirements of this practice.

5.2 The laboratory shall meet the following requirements:

5.2.1 Have an organizational structure, including a quality assurance program within ~~their~~its management system, that enables it to maintain the capability to satisfactorily perform tests for the determination of lead in paint, dust, airborne particulates, and soil taken from and around buildings and related structures;

5.2.2 Be able to demonstrate, on request from the persons or organizations evaluating the laboratory's competence, that the laboratory is capable of performing the tests for which the laboratory is being evaluated;

5.2.3 Be organized so that staff members are not subject to undue pressure or inducement that might influence their judgment or the results of their work;

5.2.4 Be organized in such a way that confidence in its independence of judgment and integrity is maintained at all times;

5.2.5 Be organized in such a way that each staff member is aware of both the extent and limitations of their responsibility;

5.2.6 Have a technical manager (however named) who is an employee of the laboratory, has overall responsibility for the technical operations of the laboratory, and has demonstrated competence in lead analyses through education or professional experience, or both, in order to be able to design and implement the management system and enable that individual to identify the occurrence of departures from the implemented management system or test procedures, and to initiate actions to prevent or minimize departures; and

5.2.7 Have a quality manager (however named) who has responsibility for the quality assurance program within the management system and its implementation, and who shall be free of any conflict of interest and have direct access to the top management of the laboratory.

NOTE 1—In the case of a laboratory with only one employee (the technical manager), the position of quality manager may be contracted out.

6. Quality Assurance Program

6.1 The laboratory shall operate under an internal quality assurance program within the management system appropriate to the determination of lead taken from paint, dust, airborne particulates, and soil taken from and around buildings and related structures. The quality assurance program shall be designed to ensure the required degree of precision and accuracy (or bias) of the laboratory's work and should include key elements of document control, sample control, data validation, and corrective/preventative action. The quality assurance program shall be documented in a quality manual (however titled) that shall be available for use by laboratory staff.

NOTE 2—The quality manual may consist of more than one document.

6.2 The quality manual shall contain information regarding the following:

6.2.1 The organizational structure of the laboratory which may be portrayed by organizational charts;

6.2.2 The operational and functional duties and services pertaining to quality so that concerned persons will know the extent and limitations of their responsibility;

6.2.3 General quality procedures, including staff training;

6.2.4 Specific quality procedures for each test, as appropriate;

6.2.5 Proficiency testing, use of reference materials for the determination of lead, and analytical quality control;

6.2.6 Arrangement for feedback and for documentation of corrective action whenever testing discrepancies are detected;

6.2.7 Procedures for dealing with technical complaints;

6.2.8 Arrangements for permitting departures from documented policies or standard test procedures; and

6.2.9 Procedures for correcting or amending original reports and other related documentation.

6.2.9.1 These procedures shall include that corrections to electronic or hard-copy records, or both, be dated, that all entries to ~~hard copy~~ hard-copy laboratory records shall be made using indelible ink, and that no correction fluid may be used on hard-copy original laboratory data records.

6.3 The laboratory shall arrange for audits of its activities at appropriate intervals to verify that its operations continue to comply with the requirements of the quality management system. Such audits shall be performed by trained and qualified staff who are, wherever possible, independent of the activity to be audited. Where the audit findings cast doubt on the correctness or validity of the laboratory's calibration or test results, the laboratory shall take immediate corrective action and shall immediately notify, in writing, any client whose work may have been affected.

6.4 The management system adopted to satisfy the requirements of this practice shall be reviewed ~~periodically~~ by laboratory management periodically and whenever significant changes occur to ensure its continuing suitability and effectiveness, and to introduce any necessary changes or improvements.

6.5 All audit and review findings and any corrective actions that arise from them shall be documented. The quality manager shall ensure that these actions are discharged within the agreed-upon time scale.

6.6 The laboratory shall normally perform the lead testing that it contracts to undertake. If the laboratory subcontracts any part of the testing, the work shall be placed with another laboratory that has been shown to meet the requirements of this ~~practice for the determination of lead in paint, dust, airborne particulates, and soil taken from and around buildings and related structures.~~ practice. The laboratory shall be able to demonstrate that its subcontractors are competent to perform the lead-determination services and comply with the same criteria of competence and, where applicable, the same regulations as the laboratory with respect to the work being subcontracted. The laboratory shall document and retain details of its investigation of the competence and compliance of its subcontractors.

7. Staff

7.1 The laboratory shall have sufficient personnel, having the necessary education, training, technical knowledge, and experience for their assigned ~~functions regarding the determination of lead in paint, dust, airborne particulates, and soil taken from and around buildings and related structures.~~functions.

7.2 The laboratory shall ensure that the training of its personnel is kept up-to-date.

7.3 Records of relevant education, experience, training, qualifications, analytical proficiencies, and authorizations to perform work of technical personnel shall be maintained by the laboratory.

8. Facilities and Equipment

8.1 *Measurements and Methods:*

8.1.1 The laboratory shall be furnished with all items of facilities and equipment for the correct performance of the tests for the determination of lead in paint, dust, airborne particulates, and soil taken from and around buildings and related structures. The laboratory shall have adequate space, lighting, environmental control, and monitoring to ensure compliance with prescribed testing conditions.

8.1.2 Laboratory methods typically performed for the determination of lead in paint, dust, airborne particulates, and soil taken from and around buildings and related structures are given in Table 1.

TABLE 1 Some Reference Methods Typically Cited for the Determination of Lead

Method	Method Designation	
~~Sample preparation~~	~~1. Test Method D3335, Practices E1644, E1645, E1979, and E2913~~	
	Sample preparation	1. Test Method D3335, Practice E1644, E1645, E1726, E1979, E2913/E2913M, and E
~~2. EPA SW-846, Method 3050 and EPA 600/R-93/200~~		
2. EPA SW-846, Method 3050 and EPA 600/R-93/200		
3. ISO 15202-2		
4. NIOSH 7082, 7105, 7300, and 7701		
Flame atomic absorption spectrometry (FAAS)	1. AOAC 5.009	
	~~2. Test Methods D3335, D4185, D6785, E1613, and Practice E2913~~	
	2. Test Methods D3335, D4185, D6785, E1613, and E3193	
	3. EPA SW-846, Method 7420	
	4. ISO 8518	
5. NIOSH 7082 and 9100		
Graphite furnace atomic absorption spectrophotometry (GFAAS)	1. Test Method D6785	
	~~2. EPA SW-846, Methods 7010 and 7421~~	
	2. EPA SW-846, Methods 7010 and 7421	
3. NIOSH 7105 and 9100		
~~Inductively coupled plasma emission spectrometry (ICP-ES)~~	~~1. Test Methods D7035 and D7439~~	
	Inductively coupled plasma emission spectrometry (ICP-ES)	1. Test Methods D7035, D7439, and E3203
2. EPA SW-846, Method 6010C		
3. ISO 15202-3		
~~4. NIOSH 7300, 7302, 7303, 7304, 9100, and 9102~~		
4. NIOSH 7300, 7302, 7303, 7304, 9100, and 9102		
Inductively coupled plasma mass spectrometry (ICP-MS)	1. Test Method D7439	
	2. EPA SW-846, Method 6020B	
	3. ISO 30011	
~~Anodic stripping voltammetry (ASV)~~	~~1. Practice E2051~~	
	~~2. NIOSH 7701~~	