Designation: D8568 – 24

Standard Test Method for Determination of Lead by Graphite Furnace Atomic Absorption Spectrometry (GFAAS) Techniques[1]

This standard is issued under the fixed designation D8568; 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 test method covers the determination of lead (Pb) in airborne particulate, dust by wipe and micro-vacuuming, paint, and soil collected in and around buildings and related structures using graphite furnace atomic absorption spectrometry (GFAAS).

1.2 This test method contains directions for sample analysis, as well as quality assurance (QA) and quality control (QC), and may be used for purposes of laboratory accreditation and certification.

1.3 No detailed operating instructions are provided because of differences among various makes and models of suitable GFAAS instruments. Instead, the analyst shall follow the instructions provided by the manufacturer of the particular instrument.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4.1 *Exception*—The SI and inch-pound units shown for wipe and micro-vacuuming sampling data are to be individually regarded as standard for wipe and micro-vacuuming sampling data.

1.5 This test method contains notes which are explanatory and not part of the mandatory requirements of this standard.

1.6 *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.*

1.7 *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]

D1193 Specification for Reagent Water

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

D3919 Practice for Measuring Trace Elements in Water by Graphite Furnace Atomic Absorption Spectrophotometry

D4210 Practice for Intralaboratory Quality Control Procedures and a Discussion on Reporting Low-Level Data (Withdrawn 2002)[3]

D4532 Test Method for Respirable Dust in Workplace Atmospheres Using Cyclone Samplers

D4697 Guide for Maintaining Test Methods in the User's Laboratory (Withdrawn 2009)[3]

D4840 Guide for Sample Chain-of-Custody Procedures

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 Microvacuum Sampling for Subsequent Determination of Metals and Metalloids

D8358 Guide for Assessment and Inclusion of Wall Deposits in the Analysis of Single-Stage Samplers for Airborne Particulate Matter

E456 Terminology Relating to Quality and Statistics

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E1188 Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator

[1] This test method is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.12 on Sampling and Analysis of 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.

E1583 Practice for Evaluating Laboratories Engaged in Determination of Lead in Paint, Dust, Airborne Particulates, and Soil Taken From and Around Buildings and Related Structures
E1605 Terminology Relating to Lead in Buildings
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
E1728 Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination
E1729 Practice for Field Collection of Dried Paint Samples for Subsequent Lead Determination
E1741 Practice for Preparation of Airborne Particulate Lead Samples Collected During Abatement and Construction Activities for Subsequent Analysis by Atomic Spectrometry (Withdrawn 2009)[3]
E1775 Guide for Evaluating Performance of On-Site Extraction and Field-Portable Electrochemical or Spectrophotometric Analysis for Lead
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)[3]
E1908 Practice for Sample Selection of Debris Waste from a Building Renovation or Lead Abatement Project for Toxicity Characteristic Leaching Procedure (TCLP) Testing for Leachable Lead (Pb)
E1979 Practice for Ultrasonic Extraction of Paint, Dust, Soil, and Air Samples for Subsequent Determination of Lead
E2115 Guide for Conducting Lead Hazard Assessments of Dwellings and of Other Child-Occupied Facilities
E2239 Practice for Record Keeping and Record Preservation for Lead Hazard Activities
E2271/E2271M Practice for Clearance Examinations Following Lead Hazard Reduction Activities in Multifamily Dwellings
E2913/E2913M Practice for Hotplate Digestion of Lead from Composited Wipe Samples
E2914/E2914M Practice for Ultrasonic Extraction of Lead from Composited Wipe Samples
E3074/E3074M Practice for Clearance Examinations Following Lead Hazard Reduction Activities in Single Family Dwellings, in Individual Units of Multifamily Dwellings, and in Other Child-Occupied Facilities

2.2 *ISO/IEC Standard:*[4]
ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories

3. Terminology

3.1 *Definitions*—For definitions of terms not appearing here, see Terminologies D1356, E456, and E1605.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *analysis run, n*—a period of measurement time on a given analytical instrument during which data are calculated from a single calibration curve (or single set of such curves).

3.2.1.1 *Discussion*—Recalibration of a given GFAAS instrument produces a new analysis run.

3.2.2 *calibration standards, n*—solutions of known analyte (Pb) concentrations used to calibrate instruments.

3.2.2.1 *Discussion*—Calibration standards are matrix matched to the acid content present in sample digestates or extracts and are measured prior to analyzing samples.

3.2.3 *initial calibration blank (ICB), n*—a standard containing no analyte (Pb) that is used for the initial calibration and zeroing of the instrument response.

3.2.3.1 *Discussion*—The ICB is matrix matched to the acid content of sample extracts and digestates. The ICB is measured during and after calibration. The measured Pb value is to be (at maximum) less than five times the IDL (see 3.2.7).

3.2.4 *initial calibration verification (ICV), n*—a solution (or set of solutions) of known analyte (Pb) concentration used to verify calibration standard levels; the concentration of analyte is to be near the mid-range of the linear curve that is made from a stock solution having a different manufacturer or manufacturer lot identification than the calibration standards.

3.2.4.1 *Discussion*—The ICV is matrix matched to the acid content of sample extracts or digestates. The ICV is measured after calibration and before measuring any sample digestates or extracts. The measured Pb value is to fall within ±10 % of the known value.

3.2.5 *instrumental detection limit (IDL), n*—the lowest concentration at which the instrumentation can distinguish analyte (Pb) content from the background generated by a minimal matrix.

3.2.5.1 *Discussion*—The IDL is usually determined by the instrument manufacturer. The IDL can be determined from blank, acidified, deionized, or ultrapure water as the matrix and from the same calculation methods used to determine a method detection limit (MDL) (see 3.2.10). Typical lead (Pb) IDLs for GFAAS are near 0.002 µg Pb/mL.

3.2.6 *method blank, n*—a digestate or extract that reflects the maximum treatment given to any one sample within a sample batch, except that no sample is placed into the digestion or extraction vessel.

3.2.6.1 *Discussion*—The same reagents and processing conditions that are applied to field samples within a batch are also

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.