



Standard Practice for Collection of Airborne Particulate Lead During Abatement and Construction Activities¹

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1. Scope

1.1 This practice covers the collection of airborne particulate lead during abatement and construction activities. The practice is intended for use in protecting workers from exposures to high concentrations of airborne particulate lead. This practice is not intended for the measurement of ambient lead concentrations in air.

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:

- D 1356 Terminology Relating to Sampling and Analysis of Atmospheres²
- D 1605 Practice for Sampling Atmospheres for Analysis of Gases and Vapors³
- D 3195 Practice for Rotameter Calibration²

2.2 Federal Regulations:

- 29CFR Part 1910.1025, Lead, Occupational Safety and Health Standards⁴
- Code of Federal Regulations, Title 40, Chapter I—Environmental Protection Agency, Appendix G (EPA Method for Ambient Lead in Air)⁴

3. Terminology

3.1 *Definitions*—For definitions of terms relating to atmospheric sampling and analysis that are not given here, refer to Terminology D 1356.

3.1.1 *air sampling pump*—a portable, battery-powered air pump that may be attached to a belt on a worker or to a stationary object. The pump is used to draw air through a filter holder that is placed within the personal breathing zone of a

worker. Alternatively, the pump may be attached to a stationary object in order that it may be used for area sampling.

3.1.2 *area samples*—air samples that are collected at various stationary sites, but not for a person; area samples are therefore to be distinguished from personal air samples.

3.1.3 *batch*—a group of samples ($n > 2$) that are obtained in a similar environment (for example, a set of area or personal samples) and are processed together using the same reagents and equipment.

3.1.4 *field blank*—a sample that is handled in exactly the same way that field samples are handled, except that no air is drawn through it.

3.1.5 *filter holder*—a plastic holder that supports the filter medium upon which airborne particulate matter is collected.

3.1.6 *personal air samples*—air samples that are collected within the personal breathing zone (PBZ) of a person.

3.1.7 *personal breathing zone (PBZ)*—an area within approximately 6 in. of a person's face.

3.1.8 *sampling device*—a filter holder and air sampling pump assembly used to collect airborne particulate lead on a filter. The filter holder houses a cellulose ester membrane filter, through which air is drawn by using an air sampling pump; the filter holder is connected to the pump by tubing.

4. Summary of Practice

4.1 Particulate matter containing lead is collected from air on a cellulose ester membrane filter. The sample is then to be prepared for shipment (and ultimate digestion and laboratory analysis).

5. Significance and Use

5.1 Human exposure to lead-containing particulates has been demonstrated to cause a variety of physiological disorders, for example, neurological, hematological, etc. This practice is to be used for the collection of airborne lead during various construction and renovation activities associated with lead paint abatement and removal in and around buildings and related structures. It may also be used with other work practices such as battery recycling, smelting, law enforcement (firing ranges), etc. Determination of lead concentration in air is used to assess the potential of human exposure to airborne particulate lead.

¹ This practice is under the jurisdiction of ASTM Committee E-6 on Performance of Buildings and is the direct responsibility of Subcommittee E06.23 on Lead Paint Abatement.

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² Annual Book of ASTM Standards, Vol 11.03.

³ Discontinued—See 1991 Annual Book of ASTM Standards, Vol 11.03.

⁴ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

5.2 The practice involves the use of personal sampling pumps to collect airborne particulate lead and is intended for use by qualified industrial hygienists.⁵

5.3 The practice can also be used by regulatory agencies such as OSHA for monitoring airborne lead levels at worksites and to ensure that lead concentrations in workplace air do not exceed the permissible exposure limit (PEL). See 29 CFR 1910.1025.

5.4 This practice does not involve the use of high-volume samplers that are used to measure ambient airborne lead concentrations. See EPA Method for Ambient Lead in Air.

6. Apparatus

6.1 *Air Sampling Equipment*—The sampling unit for the collection of personal air samples has the following components:

6.1.1 *Cellulose Ester Membrane Filters*, 0.8 μm pore size, 37 mm diameter.

6.1.2 *Filter Holder* for 37 mm diameter filters, either two- or three-piece.

6.1.3 *Portable, Battery-powered Air Sampling Pump*, capable of 0 to 5 L/min flow rate and of sufficient capacity to maintain a face velocity of 2.6 cm/sec. The pump must be calibrated with a representative filter unit so that the volume of air sampled can be measured to an accuracy of $\pm 5\%$.

6.1.4 *Assorted Clips, Tubing, Spring Connectors, and Belt*—for connecting the air sampling apparatus to a person or object.

6.2 *Ancillary Supplies*:

6.2.1 *Laboratory Thermometer*, accurate to the nearest 0.1°C.

6.2.2 *Manometer*, accurate to nearest ± 4 mm Hg.

6.2.3 *Stopwatch*, accurate to nearest 0.1 sec.

6.2.4 *Powderless Plastic Gloves*.

6.2.5 *Tweezers*.

7. Sampling

7.1 Assemble the filter in a two- or three-piece filter holder, with the filter supported on a stainless steel screen or cellulose backup pad. Close the filter holder cartridge firmly to prevent sample leakage around the filter. Seal the filter holder with plastic tape or a shrinkable cellulose band, and label the filter holder. To prevent contamination of the filter and filter holder, wear powderless gloves and handle the filter with tweezers during assembly.

7.2 Using a soap bubble meter or an equivalent calibration device (see Terminology D 1356, Practices D 1605 and D 3195, and footnote 6), set the flow rate (in L/min) of each sampling pump with a filter holder (plus filter) in the line, per manufacturer's instructions. Air sampling pumps must be calibrated each day prior to and following use. Calibration records should be kept in either a laboratory notebook or a data sampling sheet for each pump that is used.

7.3 Remove the filter holder plugs and attach the filter holder to the air sampling pump with a piece of flexible tubing,

length ca. 2.5 ft. For personal air monitoring, clip the filter holder to the person's clothing so that the filter cassette is placed within the PBZ. For area samples, attach the filter holder, which is connected to an air sampling pump, in the desired location. For both personal and area sampling, ensure that the inlet end of the filter cassette is pointed downwards. Air that is being drawn through the filter should not be passed through any hose or tubing before entering the filter holder.

7.4 Obtain an air sample at a known flow rate between 1 and 4 L/min for up to 8 h for time-weighted averaged (TWA) measurements, until the recommended sample volume is reached.

7.5 Avoid excessive overloading of the filter; this problem can be identified by a $>10\%$ drop in the measured face velocity. A subjective indicator of possible overloading is excessive darkening of the filter. If overloading of samples becomes evident, reduce the sampling time to prevent filter overloading.

7.6 Prepare field blanks at about the same time that sampling has been initiated; these should represent 5 % of the total number of samples or at least one per batch minimum. Field blanks shall be handled in the same fashion as the personal or area air samples, or both, but no air shall be drawn through the filters.

7.7 After sampling area or personal samples, or both, for a prescribed period of time, disconnect the filter holder from the air sampling pump. Cap the inlet and outlet of the cassette with plugs, and label the sample.

7.8 Record pertinent sampling data for each sample, that is, times of beginning and end of sampling, initial and final air temperatures, and atmospheric pressure. Record the type of personal sampling pump and location of sampling device during sampling. Record the initial and final flow rates (L/min) for each air sampling pump.

7.9 Once collected, samples shall be placed in airtight containers, such as zip-lock plastic bags.

7.10 Samples are to be transported so that the filter holders and filters containing airborne particulate are neither disturbed nor contaminated. Samples are to be transported to the laboratory for sample preparation and analysis, and filters are not to be removed from the filter holders before or during transport.

7.11 For general information on sampling, refer to Practices D 1356 and D 1605.

8. Report

8.1 Parameters such as flow rate, number of samples, number of blanks, air sampling pump used, pump settings, calibration data (before and after pump use), length of time each sample was pumped, etc. are to be reported. Also, report the date and site where samples are obtained. Other information that should be recorded includes weather conditions, number of workers, type of work practice, and any other information deemed important. All of this information should be recorded in a laboratory notebook or data sampling form, or both.

⁵ Eller, P. M., Ed., *NIOSH Manual of Analytical Methods*, 3rd ed., Methods 7082, 7105, and 7300, National Institute for Occupational Safety & Health, Cincinnati, OH, 1984, Supplement 1990.