Appendix 14.1: Laboratory Analytical Procedures

Methods used for analysis of samples for lead should be the methods used by the EPA Recognized Laboratory to analyze Environmental Lead Proficiency Analytical Testing (ELPAT) Program samples. ELPAT samples are distributed by the American Industrial Hygiene Association (703-849-8888). These methods are part of the laboratory accreditation process, and are standard operating procedures for analysis of samples.


The following are methods which can potentially be used to analyze some types of lead samples. None of the methods listed below have been developed to analyze paint chips specifically. It is the laboratory’s responsibility to demonstrate the use of any specific technique or reference materials of the same matrix and mass range of the samples being submitted for analysis. Only laboratories accredited through EPA’s National Lead Laboratory Accreditation program should be used.

1. Standard Operating Procedures for Lead in Paint by Hotplate- or Microwave-Based Acid Digestions and Atomic Absorption or Inductively Coupled Plasma Emission Spectrometry, September 1991, NTIS Publication PB92-114172 (EPA 600/8-91/231)


Appendix 14.1


8. EPA Method 3015, Microwave Assisted Acid Digestion of Aqueous Samples and Extracts

9. EPA Method 3051, Microwave Assisted Digestion of Sediments, Sludges, Soils, and Oils

10. EPA Method 3050, Acid Digestion of Sediments, Sludges, and Soils

The EPA Office of Pollution Prevention and Toxics has established and oversees the National Lead Laboratory Accreditation Program.

The EPA recognizes a laboratory accrediting organization for the National Lead Laboratory Accreditation Program based on the requirements and conditions set forth in a memorandum of understanding on collaboration between the organization and the National Lead Laboratory Accreditation Program. Laboratories accredited by the organization for the National Lead Laboratory Accreditation Program are recognized by EPA as capable of analyzing lead in dry paint, dust, or soil samples during the period of their accreditation.

A list of recognized laboratories is available from:

1. EPA Lead Hotline: 1-800-424-LEAD

2. National Institute for Occupational Safety and Health (NIOSH)
   1-800-35-NIOSH

Lists of recognized laboratories are also available from the accrediting organizations. Organizations currently offering recognized laboratory accreditation programs are:

· American Association for Laboratory Accreditation (A2LA)
  656 Quince Orchard Road #300
  Gaithersburg, MD  20878
  (301) 670-1377

· American Industrial Hygiene Association (AIHA)
  2700 Prosperity Ave., Suite 250
  Fairfax, VA  22031
  (703) 849-8888

Additional organizations may be added at a later date.

All NLLAP accredited laboratories must participate successfully in the Environmental Lead Proficiency Analytical Testing (ELPAT) program, administered by the American Industrial Hygiene Association under a cooperative research and development agreement with the National Institute for Occupational Safety and Health.
Appendix 14.2: Procedure for the Digestion of Wipe Samples Using Diaper Wipes

Note: Other digestion methods may also produce suitable recovery rates (80%-120% of the "true value" for spiked wipe samples using a known amount of leaded dust).

I. Digestion of Single Surface Samples

Remove and unfold the wipe from the shipment container. Cut the wipe into small pieces and place in a 125 ml Phillips beaker. Quantitatively rinse the shipment container into the Phillips beaker. Cover the wipe with 10 ml of distilled water. Add 2 ml of concentrated HNO₃ and 2 ml of HCl. Gently heat for 20-30 minutes under reflux. Cool and transfer both the liquid and the bulk material left to a 50 ml volumetric flask. If there is too much bulk material left over, rinse with distilled water and squeeze with a glass rod. Add distilled water to make up to final volume. Prior to analysis by AA or ICP, an aliquot is filtered through ashless filter paper, then centrifuged at 9K rpm for 20 minutes. The supernatant liquid is drawn off and analyzed by AA, ICP, or other equivalent method.

II. Digestion of Composite Wipe Samples

The following method can be used to analyze composite dust wipe samples for lead when no more than four single surface samples are combined into a single surface composite sample (i.e., each sample container holds no more than four wipes).

The four wipe samples from each container are cut into smaller pieces and placed into a 250 ml Phillips beaker. Following the addition of 40 mL water, 8 mL concentrated HNO₃, and 8 mL concentrated HCl, the entire sample is refluxed at approximately 100°C for 50 minutes. Upon cooling, the contents in the flask are transferred quantitatively into a 100 mL volumetric flask and brought up to volume using distilled water. To ensure quantitative transfer, the wipes should be squeezed using a glass rod. Prior to analysis, an aliquot is filtered through ashless filter paper, then centrifuged at 9K rpm for 20 minutes. The supernatant liquid is drawn off and analyzed by AA, ICP, or other equivalent method.
Appendix 14.3: Procedure for the Preparation of Field Spiked Wipe Samples

There is currently no analytical grade wipe media suitable for wipe sampling in residences. A variety of commercial media are being used instead (see Appendix 13.1). Because laboratory accreditation programs do not currently provide spiked wipe samples using wipe sampling media commonly used in the field, it is necessary to prepare spiked wipe samples using the specific brand of wet wipes that will actually be used in order to determine if the laboratory digestion procedure is capable of achieving recovery rates between 80 - 120% for the specific brand of diaper wipe used in the field. Some reports indicate that recovery rates can be as low as 40% using certain types of wipes.

These field spiked samples are in addition to those the laboratory prepares for its own internal QA/QC program. The samples are not actually prepared in the field, but are manufactured under laboratory conditions. They are then relabelled in the field and inserted into the sample stream in a random and blind fashion. The spikes should be prepared using the same lot as that used in the field, since recoveries can vary by lot. The lot should be analyzed before use to ensure that there is not background contamination.

The following procedure may be used to prepare spiked wipe samples.

1. Obtain a Standard Reference Material containing a certified concentration of lead, such as NIST Standard 1579a (Powdered Lead-Based Paint) or Standard 1648 (Urban Particulate), or a traceable secondary standard with a known amount of lead.

2. Weigh out between 50 - 500 µg of lead (not total dust) to the nearest microgram.

3. Don a new disposable glove to handle each new wipe sample.

4. If tared weighing boats are used, quantitatively transfer all of the material from the boat to the wipe by wiping the boat thoroughly.

5. If glassine paper is used, be certain that the dust transfer was complete.

6. Do not let the wipe touch any other surface. Fold the wipe with the spiked side inward and carefully insert it into a non-sterilized 50 ml centrifuge tube or other hard-shelled container that is identical to the containers that will hold the field samples. The containers holding the spiked samples should be indistinguishable from those holding the field samples so that the analysis can be performed blindly. This means the same container or tube should be used to hold field samples and wipe samples.

7. Have the spiked sample inserted into the sample stream randomly, with at least one spiked sample for each 50 field samples analyzed and one blank for each sample batch.
OSHA INTERIM FINAL
LEAD IN CONSTRUCTION STANDARD
FACT SHEET

The OSHA Interim Final Lead in Construction Standard (1926.62) went into effect June 3, 1993. It applies to all workers doing construction work who may be exposed to lead on the job.

OSHA has developed a compliance document that will clarify the standard. You can order the compliance document by using the OSHA order form. Contact your state or regional OSHA office for an interpretation of the Construction Standard if necessary. (See the Resources Section for a listing.)

The sections of the standard which apply to the different parts of this fact sheet are listed in parentheses ( ).

1. Airborne lead exposure

How much lead am I allowed to breathe?

There are 2 legal limits for the amount of lead you are allowed to breathe:

Action Level—If you work in an area at or above 30 micrograms per cubic meter of air, your employer must give you medical surveillance and training in the hazards of working with lead. The limit of 30 ug/m³ is called the Action Level (AL).

Permissible Exposure Limit—Your employer is not allowed to let you breathe in more than 50 micrograms of lead per cubic meter of air. This limit is for the average amount of lead in the air over an 8-hour day. It is called the Permissible Exposure Limit (PEL). If you work in an area with more lead in the air than the PEL, your employer must reduce your exposure.

If you are exposed to lead for more than 8 hours a day, the PEL must be adjusted. Divide 400 by the hours worked to get the new exposure limit.
How does my employer know how much lead is in the air?

Your employer must do an exposure assessment to determine the amount of lead in the air you are breathing. Exposure assessment can be “air sampling,” past exposure data from the same job or a similar job, or objective data (Section (d)(3) Basis of initial determination). Examples of objective data are product information and insurance information. Objective data are not often used. Conditions for each job, each day, and even each hour, are constantly changing. When conditions change, you cannot rely on objective data.

Your employer must determine how much lead is in the air for each job type. For example, your employer may do exposure assessment on one scraper, one cleaner, and one person using a heat gun. When your employer does air sampling, your employer must do air sampling on each shift or the shift with the highest exposure. Your employer must also sample the air if any of the employees on the job think they are getting sick because of exposure to lead on the job.

How often does my employer need to sample the air?

Your employer must determine if you are breathing air at or above the Action Level (30 ug/m³). If your exposure to lead is below the Action Level, your employer does not need to sample again unless the conditions of your job change. If your exposure to lead is at or above the Action Level but below the PEL (50 ug/m³), then sampling must be done every 6 months. If the amount is above the PEL, then sampling must be done every 3 months.

Your employer must also sample every time the conditions of your job change. For example, your employer needs to sample each time you do an abatement job on a different type of building (Section (d)(6) Frequency and (d)(7) Additional exposure assessments).

How can I find out the results of air sampling?

Your employer is required to give you the results of air sampling within 5 working days after receiving the results. (Section (d)(8) Employee notification)
Am I protected before air sampling is done?

YES! Certain tasks on construction jobs where lead-based paint is present are known to cause large amounts of lead in the air. These tasks are called “lead related tasks.” The OSHA Standard splits these lead-related task into three different classes. (Section (d)(2) Protection of employees during exposure assessment)

Class 1 tasks
- Manual demolition of structures (for example, dry wall)
- Manual scraping (includes chemical stripping) or sanding
- Using a heat gun
- Power tool cleaning with dust collection systems
- Spray painting with lead-based paint

Your employer must protect you when you do Class 1 tasks as if your lead exposure is above the PEL (50 ug/m³). Your employer must give you this protection until exposure assessment shows the exposure is less than the PEL. Even when the exposure is lower than 50 ug/m³, you can request a respirator. Your employer must give you one.

Class 2 tasks
- Using lead-based mortar
- Burning lead
- Rivet busting
- Power tool cleaning without dust collection systems
- Cleanup activities where dry expendable abrasives are used
- Moving or tearing down the enclosure used for abrasive blasting

Your employer must protect you when you do Class 2 tasks as if your lead exposure is above 10 times the PEL (500 ug/m³). He or she must give you higher protection until exposure assessment shows that your exposure is less than 500 ug/m³. Even if your exposure is lower, you must still be protected. You can use the chart on the next page and the exposure assessment to find the right respirator for the job.
Class 3 tasks
- Abrasive blasting
- Welding
- Cutting
- Torch burning

Your employer must protect you when you do Class 3 tasks as if your lead exposure is above 50 times the PEL (2,500 ug/m³). Your employer must give you this higher protection until exposure assessment show that your exposure is below this level. Even if your exposure is lower, you must still be protected. You can use the chart below to find the right respirator for the job.

<table>
<thead>
<tr>
<th>Task Class</th>
<th>MUL</th>
<th>Respirator Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td>500 ug/m³</td>
<td>- Half-mask, air-purifying</td>
</tr>
<tr>
<td>Class 2</td>
<td>1250 ug/m³</td>
<td>- Loose-fitting hood or helmet PAPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Hood or helmet with supplied air continuous flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Type CE continuous flow</td>
</tr>
<tr>
<td>Class 2</td>
<td>2500 ug/m³</td>
<td>- Full-face, air-purifying</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Tight-fitting PAPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Full-face, supplied air, pressure demand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Half-mask or full-face, supplied air, continuous flow</td>
</tr>
<tr>
<td>Class 3</td>
<td>50,000 ug/m³</td>
<td>- Half-mask, supplied air, pressure demand</td>
</tr>
<tr>
<td>Class 3</td>
<td>100,000 ug/m³</td>
<td>- Full-face, supplied air, pressure demand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Type CE pressure demand</td>
</tr>
<tr>
<td>Class 3</td>
<td>100,000+ ug/m³</td>
<td>- Full-face, SCBA, pressure demand</td>
</tr>
</tbody>
</table>
What does my employer have to do?

If you will be exposed above the PEL or you will do any of the lead-related tasks in Classes 1, 2, or 3, your employer must provide the following for workers. (Section (d)(2)(v)(A)-(F))

- Right respirator (See the table on page 13- 8.)
- Personal protective clothing and equipment
- Area to change into and out of your work clothes
- Facilities for hand and face washing
- Place where you can shower at the end of the day, if feasible
- Blood tests reviewed by a doctor
- Training on the hazards of working with lead
- A lead-safe area for eating and drinking
- Warning signs around the work area

Does my employer have to reduce my exposure to the lead in the air?

YES! Your employer must do everything possible to reduce your exposure.

- Use materials or tools which make less lead dust or fumes.
- Change the way you do a job so you create less dust and fumes.
- Rotate schedules so worker exposure to lead is less than a few hours a day.
- Provide you with a respirator.

Your employer must list in writing all the ways he or she is trying to reduce your exposure to lead. This is called a compliance program (Section (e)(2) Compliance Program).
2. Respirators and protective clothing

When must I wear a respirator?

According to the OSHA Standard, you are only required to wear a respirator if you are doing a Class 1, 2, or 3 task or air sampling shows you are exposed above the PEL (50 ug/m³). But if you are exposed to any amount of lead, the regulations say you can request a respirator from your employer and your employer is required to give you a respirator. This means you can still get a respirator even if you are not exposed to lead above the PEL or doing any of the lead-related tasks.

Your employer must provide a respirator for any employee exposed to lead who asks for one. You may want to have this extra protection, especially if you are planning to have children. To prevent reproductive hazards, OSHA recommends that you not be exposed to lead air levels 35 ug/m³ or higher without a respirator.

Whenever you are exposed above the PEL, you can always ask your employer for a Powered Air Purifying Respirator (PAPR). If you are exposed above the PEL, by law, your employer must provide you with a PAPR — if you ask for it and if it protects you enough. If a PAPR is not protective enough for the job — for example, abrasive blasting — then your employer must provide you with a better respirator that is suitable for this type of work. (Section (f)(1)(iv) Respiratory protection)

What type of respirator can I use?

The respirator you use will depend on the amount of lead in the air and the job you are doing. The standard says you must have a respirator at least as protective as those listed in the table on the next page. You can always ask your employer for a Powered Air Purifying Respirator (PAPR). By law, your employer must give you a PAPR if you are exposed above the PEL and you ask for one—and it provides enough protection. Sometimes a PAPR will not protect you enough—for example, if you were doing abrasive blasting. In that case, your employer must give you a better respirator. Any respirator you use must have a stamp of approval by National Institute of Occupational Safety
and Health (NIOSH) or the Mine Safety and Health Administration (MSHA).
(Table 1 Respiratory Protection for Lead Aerosols)

**What do I need to do before I wear a respirator?**

You need to have a medical exam by a doctor to make sure that you can use a respirator safely. Your employer should pay for this exam. You also need fit testing and training about your respirator.

**What personal protective equipment do I need other than a respirator?**

If you are working in an area with lead above the PEL or if you are doing any of the tasks listed under Class 1, 2, or 3, your employer must give you protective work clothing. (Section (g) Protective work clothing and equipment) This clothing should include:

- Coveralls with a hood
- Booties
- Hard hat
- Gloves
- Face shields or vented goggles

**Who has what responsibilities for my protective clothing?**

If you are exposed at or below the PEL (50 ug/m³), your employer is not required to provide you with protective clothing. If you are exposed above the PEL but below 200 ug/m³ — or you are doing a Class 1 task — your employer must wash and dry protective clothing or give you new clothing **every week**. If you are exposed at or above 200 ug/m³, your employer must provide clean or new protective clothing **every day**. If you are doing a Class 2 or 3 task, and an exposure assessment for the task has not been completed, your employer must assume that you are being exposed at the higher levels associated with these tasks. The employer must provide clean or new protective clothing **every day until the assessment determines** that your exposure is less than 200 ug/m³.
Many employers provide **disposable suits**. These suits are easily torn. You should inspect your protective clothing regularly for tears or rips. If your suit tears or rips and you cannot repair it, you must get a new protective suit.

Some employers provide **reusable, non-disposable protective clothing**. This clothing is usually more durable than the disposable suits, but if it does rip or tear, have it repaired immediately to minimize your chances of being contaminated. If you are given non-disposable protective clothing, your employer is responsible for cleaning, drying, and repairing it. (Section (g)(2) Cleaning and replacement)

**Where should I put my used protective clothing?**

Your employer must have a closed container in the change area for used protective clothing. The container must be labeled as follows:

```
CAUTION: Clothing contaminated with lead.
DO NOT REMOVE DUST BY BLOWING OR SHAKING.
Dispose of lead-contaminated wash water in accordance with applicable local, state, or federal regulations.
```

This helps to prevent your family and other people living in the community from being exposed to lead. The standard says your employer can not let you leave the work area with protective clothing on.

**3. Your workplace**

**How clean do we keep our job site?**

The standard says you must keep all surfaces as free of lead as possible. You must clean-up floors and other surfaces with a vacuum. This vacuum must have a High Efficiency Particulate Air (HEPA) filter. Only use shoveling, dry-sweeping, wet-sweeping, or brushing if your employer shows that vacuuming does not work to pick up the dust on your job site.
Compressed air is allowed on steel structure jobs. Compressed air is not prohibited for some cleaning purposes—if you have proper ventilation and air filtration. You may use compressed air when cleaning the containment on a steel structure job. (Section (h) Housekeeping)

Can we eat or drink on the job?

NO! Your employer must not allow you to eat, drink, smoke, chew tobacco, or apply cosmetics in the work area where your exposure to lead is above the PEL. Your employer must have a place where anyone exposed above the PEL can eat and drink safely, away from lead. (Section (i) Hygiene facilities and practices)

Where can we change our clothes and wash?

Whenever you work with lead, your employer must have a place for you to wash your hands and face. Your employer must make sure that you wash your hands and face at the end of each work-shift.

The standard says your employer must have places where anyone exposed above the PEL or doing any of the lead related tasks (Class 1, 2, or 3) can change in and out of their work clothes. Your employer must have a place where anyone exposed above the PEL can shower, if feasible. OSHA officials have said that if your employer decides having a shower is not feasible, he or she must be able to explain their reasoning to any OSHA inspector who comes on the site. (Section (i)(2) Change areas)

Does my employer have to post warning signs in the work area?

Your employer must post warning signs in the work area where employees are exposed above the PEL. (Section (m) Signs) They must say:

```
WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING
```
4. Training

How can workers find out about the hazards of lead?
OSHA standard says that employers must provide training to anyone:

- Working with lead at or above the Action Level (30 ug/m³)
- Doing any of the tasks listed under Class 1, 2, or 3
- Using any lead compounds which cause eye or skin irritation

(Section (l) Employee information and training)

What does the training about lead have to include?

- OSHA Interim Final Lead in Construction Standard
- Jobs that expose workers to lead above the Action Level
- Information on respirators: their use, the different types, and the importance of a proper fit
- Medical exams required for everyone working with lead
- Ways your employer can reduce your exposure to lead
- What your employer is doing to reduce your exposure to lead

5. Recordkeeping

What records does my employer have to keep?
Your employer must keep records of:

- All exposure assessments done on your job site
- The types of respiratory protection worn on your job site
- Names and social security numbers of all employees
- All medical surveillance done on employees
- All training done for employees
- All cases of medical removal of employees

All records must be kept for at least 30 years. (Section (n) Recordkeeping).
Do I have the right to see any of these records?

YES! You have the right to see any of the air sampling results or any other types of exposure assessments done on your job site. You have the right to have a copy of your medical exam and blood test results. You can get copies of either of these types of records. Your employer is required to send a copy of your medical records to anyone you choose. Any requests to send your medical records to someone else should be in writing.

6. Medical surveillance

Special medical exams are required when you work with lead. (Section (j) Medical surveillance) These exams are called medical surveillance. There are two types:

- Initial medical surveillance
- Medical surveillance program

Initial medical surveillance

Initial medical surveillance is blood tests that check the amount of lead in your blood. It is also called biological monitoring. The two blood tests used in the biological monitoring are the blood lead level test and the zinc protoporphyrin (ZPP) test. You need medical surveillance if you do any of the tasks in class 1, 2 or 3 listed in this standard or if you are exposed to lead on the job any one day at or above the Action Level.

On-going medical surveillance program

You need a medical surveillance program if you are or may be exposed to lead on the job at or above the Action Level for more than 30 days in any continuous 12 month period. If you are a lead abatement worker, you can be exposed to lead above the Action Level for 30 or more days in a year. When you expect to do lead abatement work for at least 30 days, you should take part in a medical surveillance program.
Who must provide medical surveillance?

*Medical surveillance must be provided by your employer.*

Your employer must provide medical surveillance for you at no cost to you, the worker — and at a reasonable time and place.

All medical examinations and procedures must be supervised or performed by a licensed physician. Your employer must notify you of the results of the exam within 5 working days. This is called “notification.” You may have another doctor review the findings and provide a second exam. The employer must pay for the second review. This is called “multiple physician review.”

What does multiple physician review mean?

If you are not comfortable with the available doctor or do not agree with the doctor’s findings, you can request a second medical exam with a doctor of your choice. This request must be made within 15 days after you receive your copy of the initial medical exam results. Your employer must pay for the second exam.

If the doctors do not agree, they are asked to talk with each other. If there is still no agreement, then a third doctor selected by the two previous doctors will review the findings and conduct any necessary exams. The third doctor gives a written recommendation to the employer. The third opinion is followed unless you and your employer jointly agree to follow the recommendation of either of the previous doctors. (Section (j)(3)(iii) Multiple physician review mechanism)
8. Medical treatment

What is the treatment for lead poisoning?

Chelation is the medical treatment for severe lead poisoning. It is a risky treatment. Chelation can get rid of some of the lead in your body, but it can be harmful to your health. Chelation is a serious medical treatment. When possible, you want to know that at least two doctors think it is necessary for you to have it. The second doctor should be a doctor that you know and trust. This second opinion is paid for by your employer, when you request it. This is when the multiple physician review is most helpful.

Prophylactic chelation means giving chelating drugs to someone to try and prevent lead poisoning. Chelating drugs will not protect anyone from lead poisoning. Chelating drugs will only help remove lead from your body after you have been poisoned. It is illegal for your employer or anyone employed by your employer to give you chelating drugs.

Prophylactic chelation is prohibited. It is illegal.

Chelating drugs are dangerous to your health. They can hide lead poisoning that may be happening to you. The chelating drugs may also make your body take in lead more easily (Section (j)(4) Chelation).

Whenever possible, get a second medical opinion to determine whether you need chelation treatment.
7. Medical removal

What is medical removal?
Medical removal means that you are removed from the lead exposure on your job. The standard states you must be removed if your blood lead levels get too high. Medical removal can prevent you from getting severe lead poisoning. Removing you from the lead exposure gives your body time to get rid of the lead. Sometimes this is enough to bring the blood lead level down. Medical removal is a way to protect you from becoming lead poisoned. There are two times that you may be medically removed:

Elevated blood lead level
If your blood lead level reaches 50 ug/dl, for the periodic blood test and the follow-up blood test, you must be removed from exposure to lead. It is dangerous for you to work with lead when your blood lead level is so high. You cannot wear a respirator to lower your exposure when your blood lead level is so high. If you get more lead into your body, you could become lead poisoned. Your employer must provide you with a job with no lead exposure. If your employer cannot, he/she must pay you your normal wages until your blood lead level is at 40 ug/dl on two separate tests. You then return to your former job. If your blood lead level remains above 40 ug/dl, your wages must be paid as long as the job exists or up to 18 months. This is called medical removal protection.

Final medical determination
Final medical determination means the doctor has given a written medical opinion to remove you from lead exposure. The doctor believes that you have a medical problem that will be affected by lead exposure. The doctor believes that the risk to your health is high. The doctor must inform the employer of the medical recommendation regarding working with lead.

The doctor does not tell the employer what the medical problem is, but states that you are at high risk of ill health with lead exposure.