

ERNEST ORLANDO LAWRENCE  
BERKELEY NATIONAL LABORATORY



## Lawrence Berkeley National Laboratory Lead Program

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## Lead Program

### Lawrence Berkeley National Laboratory

#### 1.0 Policy

This document outlines the *guidelines* and requirements for safe work with lead and lead compounds. The information in this chapter applies to general industry and construction work. General industry work generally includes handling lead shielding, building experimental equipment, soldering, and machining lead or lead alloys (including brass and pewter). Construction work includes maintenance, demolition or remodeling of buildings, new building construction, removal of lead paint from equipment or buildings, and the use of paint or other materials that contain lead. Certain buildings at LBNL are considered “Public Buildings” as defined by the California Department of Public Health. In these buildings (currently, Buildings 7, 23, and 54), additional requirements are mandated, based on the Childhood Lead Poisoning Regulations.

Use and handling of lead and lead compounds in research laboratories is governed by the LBNL [Chemical Hygiene and Safety Plan](#), following the criteria in the Occupational Safety and Health Administration (OSHA) Laboratory Standard (29 Code of Federal Regulations (CFR) 1910.1450) — except that the general industry permissible exposure limit is applied.

*Italicized text indicates elements of this program that are not required by regulation, but are included to enhance LBNL’s program effectiveness.*

#### 2.0 Scope

All LBNL personnel (employees, participating guests, students, and supplemental labor workers), visitors, and subcontractors must follow the applicable portions of the procedures outlined in this document when performing lead work. Note: California and Federal OSHA, California Department of Public Health requirements for construction, general industry, and laboratory work contain many differences, and in some cases, the industrial hygienist may need to establish procedures that differ from those specified in this document.

#### 3.0 Controls for Lead Operations

##### 3.1 Air Exposure Limits and Biological Exposure Indices

Exposures to airborne lead and biological monitoring are evaluated against, and controlled below, the following regulatory limits:

- 29 CFR 1910.1025, “Lead.” This standard applies to elemental lead, all inorganic lead compounds, and lead soaps, in non-construction work environments. It does not apply to other organic lead compounds. The OSHA 8-hour time-weighted permissible exposure limit (PEL) for metallic lead, any inorganic lead compound, or lead soaps is  $50 \mu\text{g}/\text{m}^3$  of air averaged over an 8-hour period. The Action Level is  $30 \mu\text{g}/\text{m}^3$  of air averaged over an 8-hour period. Employees who will be potentially exposed above the action level must be enrolled in the Lead Medical Surveillance Program. Those working with lead under 30 days per year may enroll upon request.
- 29 CFR 1910.1000, “Air contaminants.” The corresponding 8-hour time-weighted PEL for tetramethyl and tetraethyl lead is  $75 \mu\text{g}/\text{m}^3$  of air. There is no PEL for other organic lead compounds.
- Title 8 California Code of Regulations (CCR) 1532.1, “Lead.” This is the Cal/OSHA standard which applies to elemental lead, inorganic lead compounds, and lead soaps, in

construction activities. It does not apply to other organic lead compounds. The PEL for metallic lead, any inorganic lead compound, or lead soaps is  $50 \mu\text{g}/\text{m}^3$  of air averaged over an 8-hour period. The Action Level is  $30 \mu\text{g}/\text{m}^3$  of air averaged over an 8-hour period. CCR 1532.1 "Lead" is the Cal/OSHA equivalent of the Federal OSHA construction standard 29 CFR 1926.62, "Lead," and is essentially the same.

- 29 CFR 1926.62, "Lead," This is the Federal OSHA construction standard that establishes the medical surveillance trigger for workers exposed on any single day to lead at or above the action level ( $30 \mu\text{g}/\text{m}^3$ ). This requirement is to be followed for any LBNL employee (or subcontractor) conducting "construction"-related work.
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values, "Air Contaminants." Exposure limits for tetraethyl lead ( $100 \mu\text{g}/\text{m}^3$  and tetramethyl lead ( $150 \mu\text{g}/\text{m}^3$ ). Note: exposure to these chemicals should be limited to  $75 \mu\text{g}/\text{m}^3$ , the applicable OSHA Standard for general industry.
- ACGIH, "Biological Exposure Index (BEI)" for Lead, as established by the (ACGIH) Threshold Limit Values. The ACGIH BEI for lead in blood is  $30 \mu\text{g}/100\text{ml}$ .

### 3.2 Surface Contamination Limits

*a) When lead-containing materials are disturbed, residual surface contamination may pose a hazard to people who subsequently occupy the area. Additionally, break areas should remain free of harmful levels of lead. In such cases, surface sampling is sometimes conducted, as determined by the industrial hygienist. Generally, the following swipe criteria would be applied:*

*<200  $\mu\text{g}/\text{ft}^2$  for change areas, storage facilities, and lunchrooms/eating areas.*

*Similarly, a housekeeping level for established lead work areas that may be used is:*

*<1800  $\mu\text{g}/\text{ft}^2$  on work surfaces in a designated area.*

*This latter value is a housekeeping level that defines whether a designated lead work area is in need of cleaning. It is derived from Lawrence Livermore National Laboratory wipe sampling protocols.*

*For work and break areas at LBNL, a higher or lower limit may be acceptable at the discretion of the EH&S Division Industrial Hygienist.*

b) For designated Public Buildings," the requirements of Title 17, CCR, Div. 1, Chapter 8 also apply. This regulation establishes the following criteria for surface contamination:

- forty micrograms per square foot ( $40 \mu\text{g}/\text{ft}^2$ ) for interior floor surfaces; or
- two hundred and fifty micrograms per square foot ( $250 \mu\text{g}/\text{ft}^2$ ) for interior horizontal surfaces; or
- four hundred micrograms per square foot ( $400 \mu\text{g}/\text{ft}^2$ ) for exterior floor and exterior horizontal surfaces.

### 3.3 Exposure Controls

The LBNL Lead Compliance Plans in Appendix B (or similar documentation) outline the specific requirements for lead work at LBNL for work that may cause an exposure over the PEL. These Lead Compliance Plans must be reviewed at least every six months for construction-related work and annually for lead work not associated with buildings (if the plans are still in effect). General work requirements, for all jobs are included in this section. Lead Compliance Plans and Lead Work Permits should be developed by the organization planning and conducting the work.

A separate Lead Compliance Plan is not required for jobs with a Negative Exposure Assessment (NEA), such as those in Appendix A.

As with other work that generates airborne hazards, ventilation is a preferred method of control, as opposed to relying exclusively on Personal Protective Equipment (PPE). Whenever ventilation is used on an ongoing project, measurements which demonstrate the effectiveness of the system will be employed at least every three (3) months. If administrative controls are implemented to control exposures, the Lab will implement a rotation program in accordance with the requirements of the OSHA lead standard.

### 3.3.1 Housekeeping and Decontamination

Surfaces should be maintained as free as practicable from accumulation of lead. Shoveling, blowing, or wet or dry sweeping and blowing of lead-containing dusts is not allowed unless specifically approved in the Lead Compliance Plan. *Contaminated work surfaces should be cleaned sufficiently to reduce lead levels to less than 1800  $\mu\text{g}/\text{ft}^2$ .* A different level may be accepted for industrial or laboratory areas, at the discretion of the EH&S Industrial Hygienist. Recommended cleanup methods include vacuuming the area with a high-efficiency particulate air (HEPA)-filtered vacuum or wet-wiping with disposable cloths. Consult your assigned Waste Management Representative/Generator Assistant to determine the proper waste disposal practices. The assigned industrial hygiene and environmental representatives can be located at:

[http://www.lbl.gov/ehs/assets/division\\_help\\_print.pdf](http://www.lbl.gov/ehs/assets/division_help_print.pdf)

Additional information is also available in LBNL PUB 3092, "Guidelines for Generators to Meet HWHF Acceptance Requirements for Hazardous, Radioactive, and Mixed Wastes at Berkeley Lab," which can be referenced at: [http://www.lbl.gov/ehs/waste/wm\\_pub\\_3092.shtml](http://www.lbl.gov/ehs/waste/wm_pub_3092.shtml)

### 3.3.2 Personal Hygienic Practices

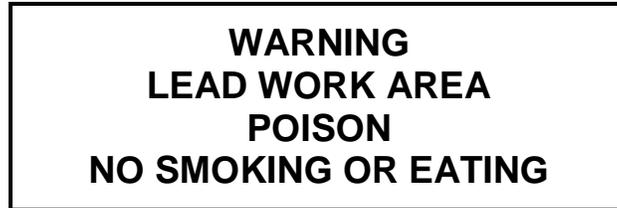
The precautions below apply to areas where lead is disturbed, and where the potential for exposure is greater than the PEL unless the work is covered by an NEA.

- Designate a separate location for eating, storing, and preparing food and beverages, and for using tobacco products and cosmetics to avoid the possibility of ingesting lead. No lead work shall be performed in these designated areas. Lunchrooms shall be kept under positive pressure by the provision of tempered, filtered air.
- Wash hands and face before eating, drinking, using tobacco products, or applying cosmetics. (Workers should shower if exposed in excess of the PEL.) Do not wear protective clothing into lunchrooms.
- Designate change rooms where workers can segregate street clothes from clothing used for work.
- Make shower facilities available. Showers located throughout the Laboratory may be used, provided that other workers do not use these showers while they may be potentially contaminated with lead dust. Showers used by lead workers should be decontaminated before use by other workers. Portable shower units should be used for required decontamination activities.
- Promptly place lead-coated or lead-containing demolition or renovation debris (e.g., sheet rock) in plastic bags or other sealable containers. Do not allow them to accumulate in the workspace. These bags should be labeled in accordance with applicable LBNL environmental guidance. Consult your assigned Waste Management Representative/Generator Assistant to determine exact requirements

### 3.3.3 Regulated Areas

Signs with the wording below shall be posted at all possible entrances to "Regulated Areas" (i.e., locations where lead work other than lead work performed pursuant to an NEA) is being

conducted. These signs should be designed in accordance with the OSHA or ANSI design criteria and color scheme. These signs shall be well illuminated so that they are easily visible to workers and visitors. Contact the Lead Program Manager (x2709) for guidance if you have any questions about signs. Refer to Appendix D for an example of the required sign.



### 3.3.4 Personal Monitoring Program

Personal air sampling shall be conducted to assess an individual's (or group's) exposure to airborne lead during work that disturbs lead-containing materials. Initial samples are required for all operations where exposure above the action level may occur. The frequency of subsequent sampling depends on the results of the initial samples.

The process for initiating and collecting air samples is as follows:

- Work supervisors shall notify the EH&S Industrial Hygienist at least 48 hours in advance of planned lead operations so that air sampling can be arranged.
- The EH&S Industrial Hygienist or a technician working under the guidance of an industrial hygienist shall do the following:
  - Collect the initial personal air samples for uncharacterized operations that may generate airborne lead, and submit them to an accredited analytical laboratory for analysis.
  - If the results of the representative samples are below the action level, no further sampling is required as long as the operation continues unchanged. If the results are above the action level but below the PEL, air sampling must be repeated at least every 6 months. For results greater than the PEL, air sampling must be repeated every 3 months, and a written compliance plan detailing the steps to be taken to reduce the airborne lead levels must be developed and implemented.
  - The results of air sampling conducted to measure exposure during operations at the Laboratory may be used to represent the level of exposure for other similar operations. The decision to accept these results, however, is at the discretion of the EH&S Industrial Hygienist.

Air monitoring results will be communicated to employees within 5 days of the receipt of final analytical results from the analyzing lab. For more complete details on lead exposure assessment, contact your industrial hygienist or refer to the appropriate OSHA lead standard.

### 3.3.5 Surface Contamination Sampling

*Floors and other surfaces in work areas where significant lead is disturbed should be tested for residual lead contamination before workers re-occupy those areas. Specifically, this guidance applies when the work involves any of the activities listed in Appendix B, when the work is lead hazard abatement or involves exposure above the action level, and when the work area is inside and will subsequently be re-occupied on a regular basis.*

*These samples are usually obtained by making two S-shaped swipes with a prewetted wipe at a 90° angle over a 1-ft<sup>2</sup> horizontal area and submitted to an Analytical Laboratory for analysis. Details on this sampling method can be found in the United States Department of Housing and Urban Development (HUD) "Guidelines for the evaluation and control of lead based paint hazards in housing." Samples are generally collected by EH&S staff.*

*Clearance swipe samples, where required for work performed by subcontractors, shall be obtained and analyzed by the subcontractor in accordance with the HUD Guidelines. However, LBNL reserves the right to request changes in the sampling and analysis procedure or to obtain parallel clearance samples.*

*The analytical laboratory must be accredited by the American Industrial Hygiene Association or another organization accredited by the EPA specifically to perform lead analyses.*

### **3.3.6 Application and Installation of Lead-Containing Products**

*With the exception of lead solder in electrical work, materials containing more than 0.06% lead should not be used, specified, or allowed in the construction of buildings or infrastructure. Requests for a special allowance requires prior review of the EH&S Industrial Hygienist and the Facilities Project Management.*

### **3.3.7 Lead Paint Abatement**

*Lead abatement refers to construction activities undertaken specifically to remediate an imminent or potential hazard to humans or the environment from lead paint. This may include the removal, enclosure, or encapsulation of paint.*

*Lead-abatement work performed by LBNL personnel or supplemental labor workers should be evaluated by an EH&S Industrial Hygienist for determination of appropriate controls. A lead compliance plan is normally required for lead-abatement work.*

*Subcontracted lead-abatement work should be conducted by a contractor licensed by the California Department of Public Health and in accordance with the HUD Guidelines. Subcontracted work is normally conducted subject to LBNL Master Specification, Section 13281, "Hazardous Materials Remediation." For designated "Public Buildings" these are actual requirements.*

*Indoor lead-abatement areas should be subjected to a final visual inspection and final surface sampling in accordance with the HUD Guidelines. For designated Public Buildings, these inspections are mandatory.*

### **3.3.8 Preconstruction Paint Sampling**

*Lead is present in paint on the surfaces of many LBNL buildings. Thus, it is necessary to identify activities such as maintenance, renovation, remodeling, and demolition that will disturb lead-coated surfaces so that the appropriate controls can be implemented before work begins. It will be necessary to test the interior and exterior of most building surfaces before beginning activities that disturb potential lead-containing material or it may be assumed that the material disturbed includes lead.*

*Specifically, painted surfaces should be tested before beginning construction activities that involve disturbance of lead-containing surfaces/materials, including but not limited to:*

- *Scraping, abrasive blasting, or sanding*
- *Demolishing buildings*
- *Cutting, sawing, or otherwise penetrating a wall or other painted surface—except for installing a few screws into a wall*
- *Burning, torch cutting, arc cutting, welding, or brazing*

- *Using a heat gun to remove paint*
- *Performing other activities that generate lead-containing dust.*

*Testing should also be conducted on other potentially lead-containing construction materials if a lead aerosol may be generated, including but not limited to:*

- *Galvanized metal that is to be cut with a torch, burned, power sawn, or otherwise heated to the melting point of lead*
- *Brass, bronze, and pewter to be sanded or heated to the melting point of lead*
- *Solders to be sanded.*

*Laboratories that analyze lead swipe or bulk samples must be accredited by the American Industrial Hygiene Association or another organization accredited by the EPA specifically to perform lead analysis. Bulk samples can be analyzed using atomic absorption or inductively coupled plasma emission spectroscopy (ICPES). Alternative techniques (e.g., laboratory or field x-ray fluorescence) may be approved by the EH&S Industrial Hygienist.*

*Work Performed by LBNL Personnel. Preconstruction testing is conducted by LBNL personnel who (1) complete the State Accreditation Program for Lead Inspectors, or Sampling Technicians. The results of any materials testing must be documented on the CDPH Form 8552, and copies submitted to CDPH. If lead paint abatement activities are to be conducted, then CDPH Form 8551 must be completed and a copy posted at the worksite, and a copy submitted to CDPH are certified by the American Board of Industrial Hygiene in industrial hygiene, or (2) work under the supervision of a Certified Industrial Hygienist or an accredited inspector. In the case of designated Public Buildings, the preconstruction testing must be performed by a State accredited person, as described in (1), above.*

*Work Performed by Subcontractors. LBNL shall either (1) test all potentially lead-containing surfaces before releasing a construction proposal for work that may disrupt lead, or (2) require the contractor to perform the test(s) before disrupting any potentially lead-containing materials. Contractors who make lead determinations must be accredited by the State of California as lead Inspector/Assessor, or a certified Sampling Technician, Subcontractors are not required to complete the Cal/OSHA Pre-Job Notification Form, as LBNL is under the jurisdiction of the Department of Energy*

### **3.3.9 Lead Shielding**

*Where it will not interfere with their shielding properties, lead items used for shielding or weighting should be encapsulated in a suitable coating to protect the lead from corrosion and to reduce worker contact. Corroded lead materials may be particularly hazardous and should be encapsulated or replaced if feasible. Newly purchased shielding bricks should be encapsulated to prevent oxidation.*

## **4.0 Training**

There are several different Berkeley Lab lead training programs, all based on the type(s) of tasks conducted, as follows:

Workers only doing light, non-routine electrical soldering may take:

- EHS0243, Soldering Hazard Awareness

Note: if an employee has completed EHS0243, there is no requirement to also complete EHS0329.

Workers who perform work under another established NEA (such as those in Appendix A) should take either:

- EHS0329, Hazard Communication Training for Lead\* or
- EHS0330, Lead Worker Training\*\*

\*Workers who have successfully completed EHS0330 are not required to take EHS0329.

\*\*EHS0330 has an annual retraining requirement.

Work in laboratories with lead or lead-containing compounds normally only requires completion of EHS0348, Chemical Hygiene and Safety Training, though if extensive lead work may be performed (such as experiments with lead batteries or extensive handling of lead bricks or other shielding) additional training may be required. Please refer to the LBNL [Chemical Hygiene and Safety Plan](#), your assigned industrial hygienist or the Lead Program Manager for more information.

If more extensive training or certification is necessary based on risks of the activity, additional training may be required, such as:

- EHS0331, Lead Construction Supervisor,
- EHS0332, Lead-Construction Worker, and
- EHS0333, Lead-Construction Refresher.

These courses are not usually taught on site. Employees who have completed these courses and maintain currency are not required to take EHS0329 or EH00330.

All workers who will generate hazardous waste must complete EHS0604, Hazardous Waste Generator Training. This course is available on-line.

#### Paint and building material evaluation and sampling:

*The State of California designates curriculum for courses for lead inspectors and lead sampling technicians. Workers who conduct surveys to determine the lead content in materials should complete this course, unless they are Certified Industrial Hygienists or work directly under the supervision of a Certified Industrial Hygienist or trained inspector. Subcontractors who perform lead surveys shall meet either the training or the certification requirement. Additionally, all samples of building materials in designated Public Buildings are required to be taken by a certified lead inspector or sampling technician.*

## **5.0 Personal Protective Equipment**

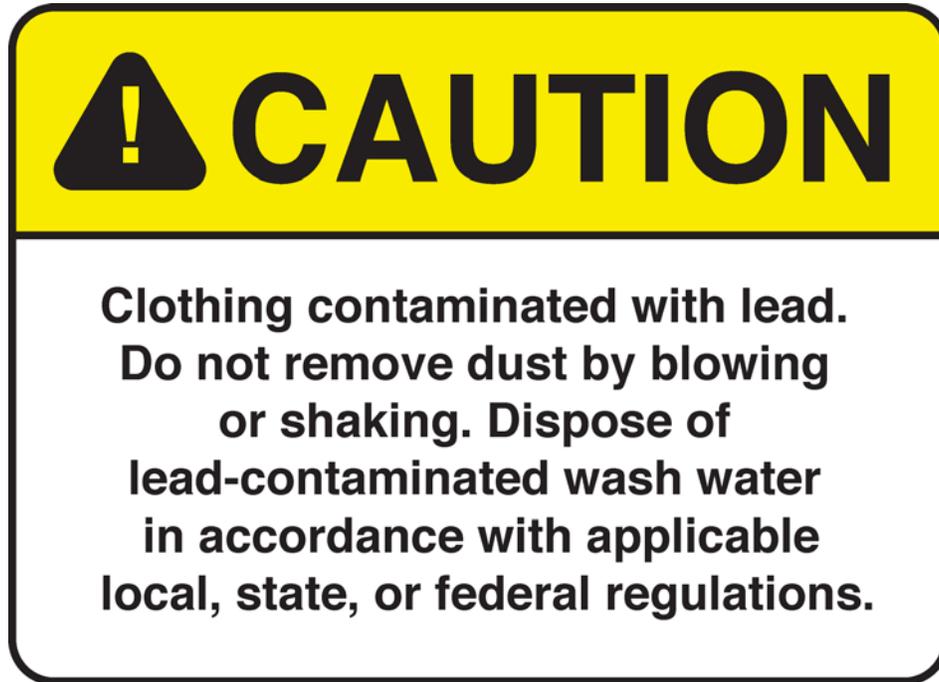
Personal Protective Equipment (PPE) such as coveralls, shoe covers, head covers, gloves, and respirators is required for operations that may generate airborne lead levels above the PEL ( $50 \mu\text{g}/\text{m}^3$ ) and operations for which there is no NEA. Safety shoes may be required for some operations. Leather gloves (or equivalent) shall be used when handling unencapsulated lead bricks or shielding. Additional requirements may be applicable if the exposure is known or expected to exceed  $200 \mu\text{g}/\text{m}^3$ . When required, such equipment shall be specified in an NEA, Hazard Evaluation, or Lead Compliance Plan that is reviewed by the EH&S Industrial Hygienist.

More information on Personal Protective Equipment can be found at: <http://www.lbl.gov/ehs/pub3000/CH19.html>

### **5.1 Protective Garments**

Workers are usually issued reusable work coveralls in lieu of disposable coveralls. These coveralls shall not be worn home. Cleaning of reusable coveralls is the responsibility of LBNL (or the subcontractor for subcontracted work) and clean coveralls are provided to workers at least

weekly, or daily, if exposure levels exceed  $200 \mu\text{g}/\text{m}^3$ . Reusable clothing must comply with the cleaning and replacement requirements in the standards, including having the following label:



## 5.2 Respiratory Protection

The EH&S Industrial Hygienist shall select respirators, except those for subcontractors other than labor only, in conformance with LBNL [Respiratory Protection Program](#) and all requirements from the OSHA standards, including presumptive tasks that require certain protection levels prior to an employee exposure assessment (see 29 CFR 1926.62, Table 1 for specific information). No worker shall be required to wear a negative-pressure respirator for more than 4.4 hours a day when feasible engineering controls are in place. Fit-testing of respirators, where required, must be conducted within 12 months prior to lead work. If requested by the worker, and sufficient for the exposure, a tight-fitting powered air-purifying respirator will be provided in lieu of a negative-pressure respirator.

## 6.0 Subcontract Work

Lead work conducted by subcontractors (other than supplemental labor) requires, before the operation begins, submission of either an NEA pursuant to the OSHA standard's basis of initial determination for exposure assessment that is satisfactory to the EH&S Industrial Hygienist, or the subcontractor's Lead Compliance Program, which must incorporate all the elements specified in the standard. Contractors also are required to work in accordance with Facilities specifications and the guidance given in this document if lead is disturbed.

### 7.1 Workers

- Follow the requirements outlined in this document and other lead-work procedures for work involving lead.
- Notify Health Services if you are pregnant or actively trying to conceive a child.

## 7.2 Supervisors/Work Leads

- Request industrial hygiene to evaluate the workplaces of all workers who may be potentially exposed to lead above established limits.
- Plan and supervise work in accordance with Berkeley Lab's Integrated Safety Management Plan (ISM) ([http://www.lbl.gov/ehs/ism/ism\\_06.pdf](http://www.lbl.gov/ehs/ism/ism_06.pdf)).
- Ensure that all available and specified engineered and administrative controls and Personal Protective Equipment are in place before work begins, and ensure that they are used appropriately.
- Verify that workers have read the NEA or the applicable lead compliance plan.
- Verify that workers are adequately and properly trained before starting work.
- Schedule workers who have been exposed to levels above the medical surveillance action level for medical exams.
- Ensure that individuals who may be potentially exposed to lead receive appropriate training.
- Conduct job-specific lead training.
- Provide an alternate workplace and job for workers whom Health Services has removed from work involving lead exposure.
- *Notify the assigned industrial hygienist at least 48 hours before lead work begins.*

## 7.3 Industrial Hygiene

- When possible, establish NEAs for consistent types of lead work.
- Perform required air monitoring.
- Notify workers, supervisors, and Health Services of air sample results (within 5 days of receipt of analytical results from the analyzing lab) and the need for medical surveillance.
- Assist in the design and implementation of engineering control systems.
- Develop and provide the necessary classroom training, or assist in identifying an alternative source of training.
- Review NEAs, bid specifications, and lead compliance plans to ensure that they incorporate adequate controls.
- Select the most appropriate type of respirator for workers involved in lead work.
- Provide respirators to qualified personnel.
- Assist supervisors in identifying potential lead-disturbing activities.
- Develop and maintain the Lead Program, and also designate a Lead Program Manager.
- *Perform bulk and surface swipe sampling, as required or as appropriate.*

## 7.4 Health Services

- Perform required respirator medical approvals and focused surveillance exams to include appropriate blood chemistry tests for employees exposed above the lead action level.
- Determine when workers must be removed from exposure because of abnormalities detected during medical surveillance.
- Determine when workers who have been removed from work involving lead because of medical abnormalities can return.

- Notify workers of any medical findings, as required.
- Notify supervisors of any work restriction related to lead work.
- Request the Industrial Hygiene Group to perform a worksite evaluation for any worker found to have an elevated blood-lead level.
- Coordinate exposure monitoring results with the Lead Program Manager.

#### 7.5 Facilities

- Notify the Lead Program Manager of purchases of lead-containing materials.
- *Prohibit Facilities personnel, supplemental labor personnel, and construction contractors from using construction products containing more than 0.06% lead, or any lead on drinking-water lines. (This does not apply to electrical solder.)*
- *Specify in construction contracts if and where lead will be disturbed; alternatively, require that subcontractors determine the presence of lead before disturbing materials that may contain lead.*
- *Develop and maintain a "Bidding Specification" that implements the LBNL Lead Safety Program in construction, renovation, and demolition contracts where lead material may be encountered.*

#### 7.6 Procurement and Property Management

- *Notify the Lead Program Manager, and obtain approval, prior to purchase of lead materials, in accordance with the established protocols.*

## **Appendix A**

### **Negative Exposure Assessments (NEAs)**

A negative exposure assessment (NEA) is a statement written by an EH&S Industrial Hygienist indicating that a specific lead-disturbing job (or a class of very similar lead-disturbing jobs) does not result in worker exposure above the action level. Work conducted pursuant to an NEA can proceed without subsequent review, provided that the controls specified in the NEA are adhered to. Examples of NEAs obtained for tasks at LBNL follow:

#### **Moving Fewer Than Five Lead Bricks**

##### **Negative Exposure Assessment**

Monitoring data indicate that moving fewer than five lead bricks (or an equivalent amount of lead) in a day will not generate airborne levels that exceed the Action Level. The following Safe Work Procedures will assure that your hands, clothes, and the work area will not become contaminated with any lead residue.

##### **Safe Work Procedure**

Handle lead bricks carefully. Hold the lead bricks out from your body so they do not contact your clothing, or wear disposable coveralls or apron. Wear gloves and wash hands after work is finished. Place lead bricks on plastic for moving and transition, if feasible.

If lead bricks are going to storage, contact the Lead Program Manager for more information. If lead bricks have visible powder on them, or otherwise known to have high levels of removable surface contamination, contact your industrial hygienist or the Lead Program Manager for cleaning information. Completion of EHS0348, Chemical Hygiene and Safety Training, is generally required, and EHS0329, Hazard Communication Training for Lead, is recommended.

#### **Lead Soldering**

##### **Negative Exposure Assessment**

Monitoring data and available literature indicate that nonproduction, benchtop, lead soldering will not exceed the Action Level.

##### **Safe Work Procedure**

Some fluxes and solder components may cause eye irritation or other health effects. Contact your Division Industrial Hygienist for information about these products. Wash your hands after working with lead. If you have any questions or concerns, contact the Lead Program Manager. Completion of EHS0243, Soldering Hazard Awareness, is recommended.

## **Appendix B**

### **Lead Compliance Plan Templates**

Lead Compliance Plans (LCPs) or other work procedures must be developed for any operation that will (or may) result in exposure above the PEL—unless the operation and its controls are fully described in the NEA. These plans must specify the manner in which the work will be altered to reduce exposure level to the PEL using both engineering and administrative controls. Examples of work requiring a LCP are as listed below.

For each of these examples, a specific Safe Work Procedure must be developed with your Division Industrial Hygienist, based on a template that uses the five core functions of Berkeley Lab's ISM Plan, before the work begins. All these examples follow the ISM template.

#### **Lead Paint Removal Prior to Hot Work**

Welding, brazing, or heating lead-painted surfaces is not allowed unless the paint has been removed to bare metal six inches from either side and behind the area to be worked.

- I        Define the Work  
(who, what, where, when, why, and how)  
Plan the job with any subcontractor.
- II       Evaluate the Hazards  
Arrange for air monitoring and evaluation. This job must be monitored.  
If this job is similar to previous work that was monitored, air monitoring may not be required.
- III      Design the Controls  
Consider local exhaust, respiratory protection, disposable coveralls, engineering controls, lead collection, disposal methods, labels, signs, cordoned off area, hand washing, and cleanup.
- IV      Work within the Controls  
Ensure that all controls are in place and working.  
Follow the HEPA Vacuum Safe Work Procedure (Appendix D).
- V        Feedback and Continuous Improvement  
Send a copy of the Safe Work Practice to the Lead Program Manager with any comments for improvement.

#### **Cleaning of Lead Bricks (or Shielding)**

- I        Define the Work  
Estimate the number of lead bricks, or describe the shielding. Identify the condition of the lead: is it clean with a dark appearance, or covered with white powdery lead carbonate. Decide if the lead bricks will be used again, and at what location, or will need to be removed from the area. Specify who will do the work and in what location. Has a radiological survey been performed on the lead?

## II Evaluate the Hazards

Provide the above information to your Division Industrial Hygienist, and work with him/her in evaluating the hazards and designing the controls.

## III Design the Controls

Considerations: Use the HEPA-filtered mobile lead brick-cleaning cart. Cordon off the work area. Use respiratory protection, gloves, disposable suit, and safety shoes. Tape the cleaned lead bricks, if possible for your application, with Permacel tape (recommended strong and only 2.5 mils thick). Follow all HEPA Vacuum Safe Work Procedures (Appendix D). Clean the area and cart with HEPA vacuum and wet-wiping after work. Dispose of protective gear after use. (*Double 6-mil plastic bags are recommended.*) If the garments are reusable, they should be labeled:

“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.”

## IV Work within the Controls

Develop a plan to meet all requirements so that nothing is forgotten. Monitoring is required until this procedure eliminates it.

## V Feedback and Continuous Improvement

Send a copy of the Safe Work Practice to the Lead Program Manager with any comments for improvement.

## **Cutting or Machining of Lead Bricks or Other Lead Shielding**

A specific written Safe Work Procedure is required for this work. It must follow or improve on this template.

### I Define the Work

Define how much cutting, machining, or hand work must be done; the priority; and other needs. Specify the location and who will perform the work.

### II Evaluate the Hazards

Work with your Division Industrial Hygienist to evaluate the hazards. Review previous work monitoring. Bandsaws must have all cracks sealed and procedures for use and maintenance.

Review employee’s or subcontractor’s experience with this work.

### III Design the Controls

All work must be HEPA exhausted or performed with other engineering controls.

Work in a designated area that controls access

Provide respiratory protection as prescribed by the assigned IH. Consider using double gloves, disposable suit, and shoe covers over safety shoes.

All containers that may contain lead should be labeled “Contains Lead.” Follow the HEPA Vacuum Safe Work Procedure (Appendix D).

All waste should be double bagged and labeled for the appropriate Satellite Accumulation Area (SAA) or 90-day Waste Accumulation Area (WAA) if more than 55-gallons of waste is generated.

Will the use of the HEPA-filtered mobile lead brick-cleaning cart add to the safety of handling the stock?

Tape lead bricks, if possible for your application, with Permacel tape (recommended strong and only 2.5 mils thick).

#### IV Work within the Controls

Follow the HEPA Vacuum Safe Work Procedure (Appendix D). Assure that all engineering controls are working. Peel gloves off backwards into the waste bags; then remove respirator. Shower at the end of each shift if exposure is expected to be over the PEL; or as a minimum, wash hands and face.

Clean the area, cart, and all machinery or equipment with a HEPA vacuum and wet-wiping after work.

Dispose of protective gear after use (*double 6 mil plastic bags are recommended*) and place properly closed and labeled container in the SAA or WAA for pick-up. If the garments are reusable, they should be labeled:

“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.”

#### V Feedback and Continuous Improvement

Send a copy of the Safe Work Practice to the Lead Program Manager with comments for improvements.

### **Handling More than Five Lead Bricks or other Lead Shielding**

#### I Define the Work

Establish the scope of the work. For example specify or the number of lead bricks to be handled, their condition and proposed disposition. If handling lead sheeting, specify the quantity and whether (and how) it will be cut or modified. Indicate where the work will be done and who will perform the tasks.

#### II Evaluate the Hazards

Plan the job with your Division Industrial Hygienist. Air monitoring is normally conducted for these activities.

#### III Design the Controls

Cordon off the area (use the sign in Appendix D, if necessary). Respiratory protection, gloves, disposable suits, training, and safety shoes, will normally be required. Handle lead bricks and material carefully. Clean the area with HEPA vacuum and wet-wiping after work, following the HEPA Vacuum Safe Work Procedure (Appendix D).

#### IV Work within the Controls

Follow the HEPA Safe Work Procedure\*. Wash hands after work, shower, if possible (or if it is required).

#### V Feedback and Continuous Improvement

Send a copy of the Safe Work Practice to the Lead Program Manager with any comments for improvement.

### **Installing Enclosure Booths in the ALS (or similar activities)**

Monitoring data show that this work does not pose an exposure risk for lead, but some more monitoring is required for continued analysis. De-installing always requires industrial hygienist evaluation.

#### **I Define the Work**

Document the scope of the work. Indicate the type and quantity of work and who will do it and the location.

#### **II Evaluate the Hazards**

Plan the job with your Division Industrial Hygienist. This job will generally require air monitoring.

#### **III Design the Controls**

Cordon off the area (use the sign from Appendix D). Consider respiratory protection, gloves, disposable suit, and safety shoes. Clean the area with a HEPA vacuum after work, following the HEPA Vacuum Safe Work Procedure (Appendix C).

#### **IV Work within the Controls**

Follow the HEPA Safe Work Procedure in Appendix C.

#### **V Feedback and Continuous Improvement**

Send a copy of the Safe Work Practice to the Lead Program Manager with any comments for improvement.

### **Demolition or Remodeling of Lead-Containing Areas**

This work requires collaboration with your Division Industrial Hygienist. Exposure monitoring is also usually required. There are extensive additional requirements for this type of work, including significant space limitations and often other safety issues. This work is normally done by subcontractor experts and will include submission and acceptance of a Lead Compliance Plan. No template is available for this work.

### **Generic Documentation for Small Jobs (Lead Work Permit)**

The following form can be used to specify the controls for smaller routine jobs. The supervisor initiates the process and obtains the LBNL Industrial Hygienist's approval signature prior to the start of work.

### LBNL Lead Work Permit

This permit is used to supplement the standard controls specified in the LBNL Lead Program Document and EHS0330, Lead Worker Training program.

<b>GENERAL INFORMATION</b>			
Building _____	Room/Area _____	Subarea _____	
Leaded material _____	Concentration _____	Condition _____	
Area to be reoccupied _____	Clearance sample by _____		
General work description _____			
Lead/particulate-generating operations _____			
Monitoring requirements _____			
Expected duration _____		Dates _____	
<b>ENGINEERING CONTROLS</b>			
Local exhaust _____	General ventilation _____		
Wetting _____	HEPA vacuum _____		
Enclosure _____	Drop sheets _____		
Critical barriers _____	Glove bag _____		
Other Engineering Controls _____			
Other Technology Considered _____			
<b>Personal Protective Equipment</b>			
Respirator (type) _____			
Coveralls _____	Shoe covers _____		
Gloves _____	Safety shoes _____		
Safety eyewear _____	Hard hats _____		
<b>HYGIENIC CONTROLS</b>			
Change area _____	Shower facility _____	Hand-wash facility _____	
<b>WORKER TRAINING</b> (If necessary, attach the names of additional workers on a separate piece of paper)			
Name	ID No.	Training expiration date	Notes
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Supervisor's signature _____		Date _____	
Industrial hygienist (approval) _____		Date _____	

This Lead Work Permit is good only for the work described. Any change in scope, procedures, or personnel requires re-approval of the permit. Keep a copy of this permit at the job site. The ES&H Industrial Hygienist and the supervisor should also keep a copy.

## **Appendix C**

### **HEPA Vacuum Safe Work Procedure**

HEPA vacuums must be labeled with the waste they collect. Dedicated vacuums for lead waste must be labeled: "Caution Contains Lead" or other similar language.

Inspect the vacuum before use for testing dates, electric cord flaws, label, needed attachments, and function check.

Maintain the vacuum and change the filters in a designated area with engineering controls to avoid exposure. Gloves and respiratory protection are required. Exposure monitoring is required for all maintenance work. Contact your Division Industrial Hygienist.

## Appendix D:

## Lead Work Area Warning Sign and Label for Contaminated Clothing

