

ENVIRONMENTAL HEALTH & SAFETY

UNIVERSITY *of* WASHINGTON

# UNIVERSITY OF WASHINGTON LEAD SAFETY PROGRAM MANUAL

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## TABLE OF CONTENTS

PURPOSE.....	4
SCOPE.....	4
ROLES AND RESPONSIBILITIES .....	5
DEFINITIONS.....	6
HEALTH EFFECTS FROM LEAD .....	7
MANAGING LEAD MATERIALS AT THE UW.....	8
LEAD-CONTAINING BUILDING MATERIALS .....	8
LEAD-CONTAINING PRODUCTS/CHEMICALS IN SHOPS AND LABS.....	9
METALLIC LEAD .....	9
EXPOSURE ASSESSMENT .....	9
EXPOSURE LIMITS.....	10
AIR MONITORING .....	11
INITIAL EXPOSURE MONITORING .....	11
PERIODIC EXPOSURE MONITORING .....	11
TERMINATION OF EXPOSURE MONITORING .....	11
SAMPLING METHODS.....	11
REPORTING OF RESULTS.....	11
OBSERVATION OF MONITORING.....	12
EXPOSURE CONTROLS.....	12
PURCHASING LEAD.....	12
POTENTIAL EXPOSURES LESS THAN 10 $\mu\text{g}/\text{m}^3$ TWA <sub>8e</sub> .....	12
POTENTIAL EXPOSURES AT OR ABOVE 10 $\mu\text{g}/\text{m}^3$ TWA <sub>8e</sub> TO LESS THAN 30 $\mu\text{g}/\text{m}^3$ TWA <sub>8e</sub> .....	15
POTENTIAL EXPOSURES AT OR ABOVE 30 $\mu\text{g}/\text{m}^3$ TWA <sub>8e</sub> TO 200 $\mu\text{g}/\text{m}^3$ TWA <sub>8e</sub> .....	15
ADDITIONAL CONTROLS FOR EXPOSURES EXCEEDING THE ACTION LIMIT .....	15
ASSUMED EXPOSURE LEVELS AND EXPOSURE CONTROLS FOR WORK ACTIVITIES.....	17
LABELING AND SIGNAGE .....	23
RESPIRATORY PROTECTION.....	25
DOCUMENTED LEAD WORK PLAN .....	25
SURFACE SAMPLING .....	26
STORAGE AND TRANSFER .....	26

INCIDENTAL LEAD PAINT IN RENOVATION, REPAIR AND PAINTING (RRP) WORK ..... 27

MEDICAL SURVEILLANCE ..... 28

    MEDICAL REMOVAL ..... 28

TRAINING ..... 29

    LEVELS OF TRAINING ..... 29

WASTE COLLECTION, RECYCLING AND DISPOSAL ..... 30

    RECYCLING OF METALLIC LEAD MATERIALS ..... 30

    DISPOSAL OF METALLIC LEAD MATERIALS..... 31

EMERGENCY RESPONSE, EXPOSURE INCIDENTS AND ACCIDENT REPORTING..... 31

    SPILLS AND RELEASES ..... 31

    EXPOSURE INCIDENTS..... 32

AUDITS AND INSPECTIONS ..... 32

RECORDKEEPING ..... 32

REFERENCES ..... 33

APPENDIX A – LEAD WORK PLAN TEMPLATE ..... 34

APPENDIX B – HIGH-RISK TASKS FOR LEAD OVEREXPOSURE ..... 39

APPENDIX C – METALLIC LEAD USE AREA/STORAGE AREA INSPECTION CHECKLIST TEMPLATE.... 40

## PURPOSE

This Lead Safety Program Manual outlines the responsibilities of University departments, University employees and the Environmental Health & Safety Department (EH&S) to protect employees from occupational lead exposure. This Manual also contains guidelines and procedures for exposure control, respiratory protection, and medical evaluations as directed by Washington state lead regulations (Washington State General Occupational Health and Safety Standard and Safety Standards for Construction Work, Washington Administrative Code 296-62-07521 and 296-155-176) and the Environmental Protection Agency (EPA) Lead-Based Paint Renovation, Repair and Painting (RRP) Rule (40 CFR 745, Subpart E).

**Note:** The current Washington Administrative Code (WAC) lead regulations are under review because of recent data suggesting that the current airborne lead exposure limits are not protective enough for workers. It is anticipated that the exposure limits will be lowered in the future to be more protective of workers; therefore, best practice is to limit lead exposures to the lowest levels possible.

## SCOPE

The Lead Safety Program applies to all University personnel working with lead-containing material. Lead containing materials include, but are not limited to, the following materials:

- Lead-containing paints and coatings on interior or exterior surfaces
- Lead pipes, joints and gaskets in plumbing
- Lead sheeting on buildings such as flashing, roofing products and gutter systems
- Window glazing and sash weights
- Masonry mortar (i.e., brick, concrete, cement)
- Lead-containing solder and welding rods
- Electrical components and electronics
- Lead bricks and lead sheeting used in X-ray room walls, doors or equipment and/or to shield radiation
- Laboratory equipment with integral lead shielding (e.g., MRI machines, scintillation counters, irradiators)
- Lead weights
- Laboratory chemicals (not including organic lead compounds, with the exception of organic lead soaps)
- Batteries (i.e., lead-acid)

The General Lead Standard or Lead in Construction Standard give base exposure and respiratory protection guidelines depending on the type of lead work conducted. These activities include, but are not limited to:

- Demolition or salvage of materials containing lead (including removal of those materials)

- New construction, alteration, repair or renovation (including encapsulation of materials containing lead)
- Installation of products containing lead
- Clean up of lead-containing material
- Transportation, disposal or storage of lead-containing material
- Maintenance operations that disturb lead-containing material
- Laboratory, shop or craft activities involving lead-containing material

## ROLES AND RESPONSIBILITIES

Role	Responsibilities
<p><b>University Organizations and Departments</b></p>	<ul style="list-style-type: none"> <li>• Implement the UW Lead Safety Program and comply with the requirements in this document and all applicable laws, regulations, codes, standards and best industry practices.</li> <li>• Ensure a qualified person oversees the management of the Lead Safety Program.</li> <li>• Provide the necessary resources, including designating a Competent Person to review all lead work plans, Standard Operating Procedures (SOPs), and/or a Job Hazard Analysis (JHA).</li> <li>• Evaluate those building materials and the potential hazards prior to commencing work where there is a potential to impact lead-containing materials.</li> <li>• Ensure academic departments that include laboratories, shops, art studios, or craft activities that use lead-containing materials develop SOPs or conduct and document JHAs for specific work activities to ensure safe use, proper exposure controls and personal protective equipment.</li> </ul>
<p><b>UW Facilities - all sites</b> The following campuses, organizational units, and offsite locations conduct their own building maintenance and/or custodial service.</p> <p>Examples, not limited to:</p> <ul style="list-style-type: none"> <li>• UW Facilities -Seattle</li> <li>• UW Facilities -Bothell</li> <li>• UW Facilities -Tacoma</li> <li>• UW Medical Center</li> <li>• Harborview Medical Center</li> <li>• Center for Sustainable Forestry at Pack Forest</li> <li>• Friday Harbor Laboratories</li> </ul>	<p>Each facilities department must comply with this written Lead Safety Program Manual, in addition to the following:</p> <ul style="list-style-type: none"> <li>• Implement the UW Lead Safety Program per the requirements of this document and all applicable laws, regulations, codes, standards and industry best practices.</li> <li>• Identify a qualified person, or contracted agent, as the responsible person for overseeing the management of lead-containing materials in their University-owned and managed buildings.</li> <li>• Ensure lead surveys are conducted and sample results are understood before impacting building materials that may contain lead-containing paint or other lead-containing materials.</li> <li>• Provide project-specific instructions on safe handling of lead-containing material and implementation of such instructions based on the requirements in this document, a Lead Work Plan or an equivalent document (see <a href="#">Appendix A</a> for Lead Work Plan template).</li> <li>• Develop safe work practices and controls, train employees, maintain records, respond to reports of damaged lead-containing materials,</li> </ul>

<ul style="list-style-type: none"> <li>• Olympic Natural Resources Center</li> <li>• Intercollegiate Athletics</li> <li>• Housing and Food Services</li> </ul>	<p>restrict access to hazardous spaces to prevent exposure, and maintain labels and signs to warn of lead-containing materials.</p>
<p><b>UW Facilities, Regulated Materials Office (RMO)</b></p>	<ul style="list-style-type: none"> <li>• Provide resources to conduct lead surveys in accordance with regulatory requirements to determine the presence of lead in building materials upon request.</li> <li>• Provide written documentation of lead survey results and consultation to the Client, upon request.</li> </ul>
<p><b>Environmental Health and Safety (EH&amp;S)</b></p>	<ul style="list-style-type: none"> <li>• Develop and maintain the UW Lead Safety Program Manual.</li> <li>• Assist University departments in regulatory compliance by providing lead hazard training, worksite assessment, exposure monitoring, waste disposal and medical surveillance.</li> <li>• Audit the Lead Safety Program periodically.</li> </ul>
<p><b>Employees</b></p>	<ul style="list-style-type: none"> <li>• Follow all requirements outlined in the UW Lead Safety Program Manual, including proper handling and working with lead-containing material to minimize the potential for their own and others' exposure to lead.</li> <li>• Stop work if potentially hazardous conditions are identified and report such conditions to their supervisor prior to resumption of work.</li> <li>• Properly store and maintain personal protective equipment (PPE).</li> <li>• Immediately report all safety incidents and any potential health effects to their supervisor and through the online accident reporting system (OARS).</li> </ul>

## DEFINITIONS

**Action Level (AL):** Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air (30 µg/m<sup>3</sup>) averaged over an eight-hour period

**Competent Person:** One who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate the hazards.

**Exposure:** Contact an employee has with lead, even if protection is provided by respirators or other personal protective equipment (PPE). Exposure can occur through various routes of entry such as inhalation, ingestion, skin contact or skin absorption.

**Hazardous Waste:** Discarded material containing greater than or equal to five parts per million (ppm) leachable lead as determined by a Toxicity Characteristic Leaching Procedure (TCLP) analysis. The discarded material must meet the definition of waste as outlined in WAC 173-303.

**Lead:** Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are tetraethyl lead and all other organic lead compounds.

**Lead-based paint:** Paint or other surface coatings that contain at least 1.0 milligram per square centimeter, 5,000 parts per million (ppm), or 0.5 percent lead by weight

**Lead-containing material:** Materials that contain lead in any concentration

**Negative Exposure Assessment (NEA):** An exposure assessment conducted by an industrial hygienist, who collects personal air monitoring data while a worker performs a specific lead-disturbing activity, that does not result in worker exposure at or above  $10 \mu\text{g}/\text{m}^3$  averaged over an eight-hour period

Note: The exposure level of  $10 \mu\text{g}/\text{m}^3$  is lower than the current regulated Action Level of  $30 \mu\text{g}/\text{m}^3$ , and is intended to provide greater protection for UW workers.

**Permissible Exposure Limit (PEL):** Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of  $50 \mu\text{g}/\text{m}^3$  averaged over an 8-hour period. If an employee is exposed to lead for more than 8 hours in any workday, the permissible exposure limit, as a time-weighted average, will be reduced to  $400 \mu\text{g}/\text{m}^3$  divided by the number of hours worked in the day.

**Qualified Person:** Designated person in an organization who has the education, technical experience and/or job experience to ensure adherence to the requirements in the Lead Safety Program Manual

**Target Housing:** Any housing constructed prior to 1978, except 0-bedroom dwellings, or housing for the elderly or persons with disabilities (unless any child who is less than 6 years of age resides, or is expected to reside, in the dwelling)

**TWA<sub>8e</sub>:** Refers to the equivalent 8-hour exposure, that is the sum of lead exposure concentrations multiplied by the length of time of exposure at each concentration, with the sum divided by 8 hours.

## HEALTH EFFECTS FROM LEAD

Lead is a potent, systemic poison that may cause significant acute and chronic health effects if not used or handled safely. Exposures can occur when lead is inhaled as a dust or fume, or accidentally ingested after direct contact or after contact with contaminated surfaces. In the body, lead gets into the blood stream and accumulates in various organs and body tissues including the heart, bones, intestines, kidneys, and reproductive and nervous systems. Pregnant women are also especially susceptible, as lead can readily pass through the placenta and pose a threat to a developing fetus. Adverse health effects may arise after periods of exposure as short as days or as long as several years. The toxic effects of lead are well documented in both children and adults. Over-exposure to lead fumes or dust can cause adverse health effects, including:

- Muscle weakness
- Difficulty with memory and concentration
- Kidney damage
- Interference with normal brain function
- Stomach problems
- Increased risk of high blood pressure
- Reproductive problems including miscarriage in women, and sterility or infertility in men

Some of these health effects are reversible when the body rids itself of lead over time, but some effects are permanent. It is best to prevent lead from ever entering the body. Those who work with lead-containing materials may be over-exposed to lead if it gets in the air, or if surface contamination results in lead ingestion. Lead dust on skin, clothes, and in vehicles could be taken home, and unknowingly expose family members. Young children, especially under the age of six, are especially susceptible to the toxic effects of lead, interfering with the development of the nervous system, and are affected at lower exposure levels than adults.

## MANAGING LEAD MATERIALS AT THE UW

Ideally, use a safer alternative instead of a lead-containing material, or eliminate the need to use it. If not feasible, follow this written Lead Safety Program Manual to manage lead-containing materials safely and use engineering controls, safe work practices and personal protective equipment (PPE), including respiratory protection as needed, to limit lead exposures to the lowest levels possible.

Lead is found in many forms, and is highly regulated because of its hazards and therefore must be managed to ensure the lowest potential exposure. Key elements for the specific types and applications of lead commonly used at the University are provided below and detailed throughout this manual, and provided in the EH&S focus sheets referenced in the sections below.

### LEAD-CONTAINING BUILDING MATERIALS

The most common lead-containing material in buildings is lead-containing paint in older buildings built before 1978. Other lead-containing building materials may include: roofing and pipework, solder in plumbing and electrical equipment and systems, mortar in brick and stonework in older buildings, glazing, and leaded glass.

Procedures must be in place to monitor its condition and address the following:

- Inform building managers and occupants of the presence of lead-containing paint and other lead-containing building materials; and to not disturb it, and report if damaged.
- Manage construction and maintenance activities so that work does not cause lead exposures to workers doing the work or building occupants.
- Conduct lead abatement projects according to regulations and inform building occupants.



For more information, see the EH&S focus sheet [Lead in Building Materials](#).



## LEAD-CONTAINING PRODUCTS/CHEMICALS IN SHOPS AND LABS

Shops, makerspaces and labs may use lead-containing products such as solder, or work with lead-containing chemicals or items in their research and academic work. Common lead-containing chemicals used in UW labs, in small quantities, include lead acetate, lead oxide, lead chloride, lead iodide, lead nitrate and lead metal.

Shops, makerspaces, and labs are required to register the lead product/chemical in the MyChem inventory and submit a Safety Data Sheet (SDS).

For more information, see the EH&S focus sheet [Lead Safety in Shops and Labs](#).



Designated soldering area with fume extractors at each station

## METALLIC LEAD



Metallic lead bricks

Metallic lead is used in many different forms including bricks, sheeting, plates, shot and weights. Lead materials can be pure lead (99.9 percent or greater) or be an alloy with other metals. Antimony, tin and arsenic, in quantities of less than 10 percent, are commonly added to metallic lead to give it greater hardness and strength.

Lead solder is typically an alloy of 60 percent tin and 40 percent lead. Antimony and tin alloys of lead are reported to be less susceptible to corrosion and oxidation than pure lead, thus reducing the potential for lead dust formation.

Low melting alloys of bismuth, lead, tin and cadmium are used to cast radiation-shielding blocks in radiotherapy. If possible, use cadmium-free and arsenic-free alloys as cadmium and arsenic are regulated carcinogens.

If exposed to air and moisture, metallic lead may oxidize or react to form oxides or other lead compounds on the surface, which can potentially contaminate the work or storage area and become airborne and inhaled if disturbed. Lead materials can be encapsulated or covered to minimize oxidation and lead exposure potential.

Researchers, medical personnel, scuba divers and others who use metallic lead as shielding for radiation sources, weights, and other applications are required to register the metallic lead in the MyChem inventory and submit an SDS.

For more information, see the EH&S focus sheets [Metallic Lead Safety](#) and [Lead Safety for Scuba Divers](#).

## EXPOSURE ASSESSMENT

University facilities, work activities and processes where lead-containing material is used or disturbed must be identified and the hazard assessed by the department residing in the facility

or performing the work. UW Facilities [Regulated Materials Office](#) (RMO) conducts bulk sample collection and analysis for regulated building materials, including lead. Contact EH&S for consultation on air monitoring for exposure assessment as necessary.

Exposure assessments are conducted for representative tasks in which lead-containing material is used or disturbed. Exposure assessments are conducted by EH&S or delegated to other qualified personnel. Initial exposure determinations can be qualitatively based on assumed exposure levels in Tables 1, 2 and 3 below. If a specific activity is not listed in the tables below, an industrial hygienist shall conduct a Negative Exposure Assessment (NEA) to quantitatively determine the airborne lead exposure concentration for the specific activity. Air monitoring must be performed in accordance with the Air Monitoring section of the Lead Safety Program Manual. When exposure levels are unknown for an activity, workers must wear respiratory protection and follow basic safe work practices during the exposure assessment as if the exposure was at or above the PEL.

[Back to Top](#)

## EXPOSURE LIMITS

As defined above in Definitions, the regulatory permissible exposure limits for lead are:

<b>Action Level (AL)</b>	30 µg/m <sup>3</sup> TWA <sub>8e</sub>
<b>Permissible Exposure Limit (PEL)</b>	50 µg/m <sup>3</sup> TWA <sub>8e</sub>

Engineering controls, safe work practices and PPE, including respiratory protection, are recommended to limit exposures to the lowest reasonably achievable levels.

The UW has established a **UW Action Limit of 10 µg/m<sup>3</sup> TWA<sub>8e</sub>** (also the proposed Action Limit in the Washington state [June 2019 Draft DOSH Lead Rule](#)) and basic safe work practices based on the following:

1. According to the Centers for Disease Control and Prevention (CDC), there are no safe levels of lead exposure.
2. The current lead standards are 45 years old.
3. Existing Federal and state laws do not adequately protect workers from high lead exposures associated with serious [health effects](#) including cardiovascular disease, infertility and miscarriage through their work or by bringing home lead dust to their families, posing a higher risk to children.

## AIR MONITORING

### INITIAL EXPOSURE MONITORING

EH&S and/or the responsible UW department will conduct representative personal exposure monitoring on selected individuals working with lead-containing material during a specific activity.

If air monitoring results indicate exposures for the task are below  $10 \mu\text{g}/\text{m}^3 \text{TWA}_{8\text{e}}$ , then no further monitoring is required. Basic safe work practices and proper PPE are still required to minimize lead exposure, contamination, and “take-home” lead to the lowest feasible levels.

If air monitoring results indicate exposures are at or above  $10 \mu\text{g}/\text{m}^3 \text{TWA}_{8\text{e}}$ , respiratory protection is recommended when performing the activity, along with basic safe work practices, proper PPE and other controls depending on the exposure level. If there are any changes in the facility/work area or lead-related work practices, repeat the exposure assessment.

Negative Exposure Assessments (NEAs) can be conducted for specific activities or processes that are repeated more than once or continuous. NEAs have a 12-month duration and are not valid if the conditions specific to the NEA change (e.g., percentage of lead content, materials, controls). The level of respiratory protection can be reduced when an NEA confirms exposure levels are below  $10 \mu\text{g}/\text{m}^3$  averaged over an 8-hour period.

### PERIODIC EXPOSURE MONITORING

Periodic monitoring is required whenever lead exposures are at or above the AL. University departments whose employees are engaging in work with lead-containing material are responsible for arranging and bearing the cost of periodic monitoring. If periodic monitoring is necessary, the frequency will be:

<u>Measured Concentration</u>	<u>Monitoring Frequency</u>
At or above AL ( $30 \mu\text{g}/\text{m}^3 \text{TWA}_{8\text{e}}$ )	6 months
At or above PEL ( $50 \mu\text{g}/\text{m}^3 \text{TWA}_{8\text{e}}$ )	3 months

### TERMINATION OF EXPOSURE MONITORING

Periodic monitoring may be discontinued if results from two consecutive sampling periods taken at least seven days apart show that employee exposure is below the AL. Prior to termination, the initial hazard assessment must be reviewed and revised to incorporate any changes.

### SAMPLING METHODS

Personal exposure monitoring must be representative of a full shift and will be conducted using NIOSH Method 7082, 7105, 7300, 7701, 7702 or equivalent.

### REPORTING OF RESULTS

Within five days of receipt of laboratory results, EH&S will notify the department, and the department will disseminate exposure assessments and monitoring results to affected

employees. If levels exceed the PEL, the written notification must include steps the department will take to reduce exposure, including engineering and/or administrative controls.

## **OBSERVATION OF MONITORING**

The department must allow affected employees or their designated representatives to observe any exposure monitoring. Whenever observation of exposure monitoring requires entry into an area where the use of respirators, protective clothing or equipment is required, the department must provide the observer with and ensure the use of such respirators, clothing and equipment. The department must also require the observer to comply with all other applicable safety and health procedures.

## **EXPOSURE CONTROLS**

### **PURCHASING LEAD**

To avoid potential exposures to lead, consider alternative lead-free materials, products, and chemicals, or modify the process so that lead is not needed. Replace lead-containing products with lead-free or lower lead content products when possible. Wherever possible, avoid purchasing new metallic lead and reuse existing metallic lead on-site or transferred from another department.

Metallic lead products are purchased and used for many purposes including:

- Radiation shielding in medical equipment, technical and research applications (e.g., bricks, sheets, glass windows, ingots)
- Radiation shielding in medical and dental procedures (e.g., sheets, fabric)
- Noise control
- Construction applications (e.g., sheeting, leaded drywall)
- Plumbing and roofing products (e.g., flashings, vents, brass fixtures)
- Marine ballast and counter weights
- Weights used by scuba divers

If lead-containing products must be used, consider those that are encased, coated with paint, epoxy, powder-coated or covered by other means by the lead manufacturer. Use lead alloys that contain antimony and tin, which are harder and stronger than pure metallic lead. These alloys may be less susceptible to damage, oxidation and corrosion than pure lead and reduce the potential for exposure to airborne lead dust or surface contamination.

Do not purchase or limit the quantity purchased of small forms of metallic lead, such as lead wool, that have a large surface area and produce the largest amount of lead dust compared to larger lead forms.

### **POTENTIAL EXPOSURES LESS THAN 10 $\mu\text{g}/\text{m}^3$ TWA<sub>8e</sub>**

- **Basic safe work practices**

Follow the basic safe work practices listed below when working with **any** lead material. See Tables 1, 2 and 3 below for specific work activities and the required and recommended exposure controls.

### Basic safe work practices for working with lead

Perform all work with lead-containing materials using the following basic safe work practices to reduce potential exposure to lead as low as reasonably achievable. Each organization or department implementing a lead safety program must:

- Develop an SOP and/or JHA, or specific lead work practices for working with the lead material.
- Provide [Labeling and Signage](#) for lead use and storage areas as required.
- Provide all personnel working with lead-containing materials with a minimum of safety glasses/goggles, gloves, and lab coat, apron, shoe covers, or coveralls (Tyvek), and appropriate respiratory protection.
- Keep the workplace free from lead dust and debris by vacuuming with a HEPA vacuum and wet cleaning methods (water and detergent, misting sprayer, wet cloths/mop, sponges, etc.) to reduce airborne releases.
- Discharge HEPA filtered air outside or to a safe location.
- Dispose of all lead contaminated waste and wastewater in accordance with UW hazardous waste policies and procedures (note: unacceptable methods of removing lead containing debris include dry sweeping, non-HEPA vacuum cleaners, non-HEPA shop vacuums, and compressed air).
- Provide hand and face washing facilities adjacent to where lead work activities are occurring.
- Do not remove lead dust by blowing or shaking.
- Do not eat, drink, smoke or apply cosmetics inside work area and only after proper decontamination.
- Handle and store pure metallic lead and lead alloy materials properly to avoid potential exposure to airborne lead dust or contact with lead oxides on the surface of the lead.
- Use a mechanical lifting device when working with lead bricks, sheets or weights if handling more than the equivalent of two lead bricks. When handling, lift one brick at a time, using both hands (a single lead brick weighs 27 pounds). Use correct lifting techniques.
- Cover unsealed lead sheets, bricks or weights with plastic or other encapsulating method to prevent exposures and contamination.
- Do not discard lead materials in regular trash.

## **POTENTIAL EXPOSURES AT OR ABOVE 10 $\mu\text{g}/\text{m}^3$ TWA<sub>8e</sub> TO LESS THAN 30 $\mu\text{g}/\text{m}^3$ TWA<sub>8e</sub>**

- **Basic safe work practices**
- **Lead Work Plan**
- **Respiratory protection (recommended)**

In addition to following basic safe work practices, develop a documented Lead Work Plan described in the section below for doing the work and use the [Lead Work Plan Template](#) in Appendix A. Respiratory protection is recommended and requires participation in the [UW Respiratory Protection Program](#). This includes medical clearance, and annual respirator training and fit testing. See Tables 1, 2 and 3 below for specific work activities and the required exposure controls.

## **POTENTIAL EXPOSURES AT OR ABOVE 30 $\mu\text{g}/\text{m}^3$ TWA<sub>8e</sub> TO 200 $\mu\text{g}/\text{m}^3$ TWA<sub>8e</sub>**

- **Basic safe work practices**
- **Lead Work Plan**
- **Respiratory protection**
- **Additional controls**

Additional controls are needed to ensure adequate protection from lead exposure where airborne concentrations are at or above the AL (30  $\mu\text{g}/\text{m}^3$ ) and below 200  $\mu\text{g}/\text{m}^3$ . These are provided in the section below.

### **ADDITIONAL CONTROLS FOR EXPOSURES EXCEEDING THE ACTION LIMIT**

Engineering controls, additional safe work practices (including administrative controls), and PPE are required when personal exposures to lead are above the AL, regardless of respiratory protection, or when the exposure is unknown. Conduct follow-up exposure assessments to determine the effectiveness of the control measures.

Work that may cause exposures to exceed or likely exceed the PEL (50  $\mu\text{g}/\text{m}^3$ ) is recommended to be performed by qualified contractors due to additional requirements for air monitoring, medical surveillance, and engineering controls. [Appendix B](#) lists high-risk work activities that may cause a worker to be overexposed to lead. These high-risk activities are not typically performed, and if so, must be performed by properly trained and equipped lead workers. Short-term work may be acceptable, determined by a Competent Person, as long as very effective controls are implemented to minimize potential exposures.

### Engineering controls

- Local exhaust ventilation systems designed to remove lead particulate, fume or vapors
- Special tools and other methods to isolate workers from the hazards
- Power tools, such as drills, saws, rotary hammers and sanders with attached local HEPA exhaust ventilation when working with lead-containing paint or other lead-containing materials in buildings
- Conduct shop or laboratory tasks inside a chemical fume hood or equally effective device for capturing lead dust or fumes at the source. Ductless fume hoods where filtered air is returned to the room or area where personnel are working is not recommended with the exception of soldering with small amounts of lead solder.
- Use a fume extractor at soldering stations.
- Use construction tools and equipment that have water spray systems, including slurry or wet abrasive systems, hydro blast and misting systems. When using wet methods, clearly describe containment, cleanup and waste handling procedures in the work plan.

### Safe work practices and administrative controls

- Develop and implement an SOP or conduct a JHA for the job or task, and require workers to use specific safe work practices that go beyond the basic safe work practices.
- Use job rotation or limit the duration and frequency of the job or task to minimize the potential exposure.
- Use specific wet methods to control lead exposures. Minimize dust generation and potential exposure by wetting surfaces, and wet scraping and sanding on surfaces that contain lead. A common practice in drilling into walls is to drill through a wet sponge to contain dust.

### Personal protective equipment

- Use more protective respiratory protection as an additional control, such as a full face air-purifying respirator or a powered air-purifying respirator (PAPR) with a face piece or full hood.
- Use dedicated leather gloves for handling and stacking lead bricks and store them in a labeled bag after use.

Where lead-containing materials are used or disturbed and there is a risk of worker exposure **above the PEL**, the University must provide:

- Designated change areas at the worksite for staff to remove contaminated clothing
- Washing facility at the work area for washing hands and face
- Eating areas physically separated from the work area



Because of the additional controls required managing exposures above the PEL (50  $\mu\text{g}/\text{m}^3$ ), EH&S recommends contracting certified lead workers to perform this work.

## **ASSUMED EXPOSURE LEVELS AND EXPOSURE CONTROLS FOR WORK ACTIVITIES**

Assumed exposure levels are based on air monitoring results from UW experience and/or published in the literature or recognized and generally accepted good safety and health practices in industry consensus documents or published in academic journals. For activities not listed, contact EH&S for advice and performing an exposure assessment as described in the [AIR MONITORING](#) section.

The tables below summarize typical work activities performed by employees with lead-containing materials along with the associated exposure controls, safe work practices, PPE and training required to perform the tasks safely. When performed as stated, the assumed exposure level given in the table for the activity should not be exceeded in the breathing zone, even if the employee is wearing a respirator. The tables also indicate what activities are recommended to be performed by certified lead workers due to a higher risk of lead overexposure. Contractors trained, equipped and certified in lead work or abatement can be hired for these more hazardous jobs. Contact EH&S to discuss procedures, controls and PPE for activities not listed in the tables.

**Table 1: Assumed Exposure Level for Maintenance and Construction Activities**

Activity	Assumed Exposure $TWA_{ge}$	Controls	Training	Monitoring Requirement
Where lead coatings or paint are present: Working around undisturbed lead coatings	$< 10 \mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> <li>Basic safe work practices</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>Lead awareness</li> <li>EPA/WA Dept. Commerce RRP training and certification needed for Target Housing/Child occupied facilities</li> </ul>	<ul style="list-style-type: none"> <li>No air monitoring or BLL monitoring required</li> </ul>
<ul style="list-style-type: none"> <li>Leaf blowing</li> <li>Weeding in soil contaminated with lead</li> </ul>	$< 10 \mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> <li>Basic safe work practices</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>Lead awareness</li> </ul>	<ul style="list-style-type: none"> <li>No air monitoring or BLL monitoring required</li> </ul>
Where lead coatings or paint are present: Working around disturbed lead coatings	$\geq 10 \mu\text{g}/\text{m}^3$ and $< 30 \mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> <li>Basic safe work practices</li> <li>Recommended: Half-face or full-face negative pressure respirator (APF 10 or more) or powered air purifying respirator (PAPR) with HEPA filters</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>Lead Worker 2 hr. (initial, annual refresher)</li> <li>Respirator if used</li> <li>Lead Work Plan</li> <li>EPA/WA Dept. Commerce RRP training and certification needed for Target Housing/Child occupied facilities</li> </ul>	<ul style="list-style-type: none"> <li>No air monitoring or BLL monitoring required</li> <li>Respirator medical clearance</li> </ul>
Where lead coatings or paint are present: Work with hand tools only <ul style="list-style-type: none"> <li>Manual scraping and sanding</li> <li>Manual demolition of dry wall</li> </ul>	$\geq 30 \mu\text{g}/\text{m}^3$ - $200 \mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> <li>Basic safe work practices</li> <li>Half-face or full-face negative pressure respirator (APF 10 or more) or PAPR with HEPA filters</li> <li>Additional exposure controls</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>Lead worker 2 hr. (initial, annual refresher)</li> <li>Respirator</li> <li>Lead Work Plan</li> <li>EPA/WA Dept. Commerce RRP training and certification needed for Target Housing/Child occupied facilities</li> </ul>	<ul style="list-style-type: none"> <li>Air monitoring or BLL monitoring may be required where presumed exposure exceeds AL.</li> <li>Respirator medical clearance</li> </ul>

<ul style="list-style-type: none"> <li>• Using power tools with HEPA dust collection systems</li> <li>• Heat gun applications</li> </ul>	<p>≥ 30 – 200 µg/m<sup>3</sup></p>	<ul style="list-style-type: none"> <li>• Basic safe work practices</li> <li>• Half-face or full-face negative pressure respirator (APF 10 or more) or PAPR with HEPA filters</li> <li>• Additional Exposure Controls</li> </ul>	<ul style="list-style-type: none"> <li>• Hazard communication</li> <li>• Lead worker 2 hr. (initial, annual refresher)</li> <li>• Respirator</li> <li>• Lead Work Plan</li> <li>• EPA/WA Dept. Commerce RRP training and certification needed for Target Housing/Child occupied facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Air monitoring and BLL monitoring may be required where presumed exposure exceeds AL.</li> <li>• Respirator medical clearance</li> </ul>
<ul style="list-style-type: none"> <li>• Using power tools w/o dust collection system</li> <li>• Working with lead mortar</li> <li>• Lead burning</li> <li>• Rivet busting</li> <li>• Clean up dry expendable abrasives</li> <li>• Moving abrasive blasting enclosures</li> </ul>	<p>500-2500 µg/m<sup>3</sup></p>	<p>Certified Lead Worker / Abatement</p>		
<ul style="list-style-type: none"> <li>• Welding</li> <li>• Cutting</li> <li>• Torch burning</li> <li>• Abrasive blasting</li> </ul>	<p>More than 2500 µg/m<sup>3</sup></p>	<p>Certified Lead Worker / Abatement</p>		

TWA<sub>8e</sub>- equivalent 8-hr exposure time-weighted average

≥ - greater than or equal to

**Table 2: Assumed Exposure Levels for Shop and Lab Activities**

Activity	Assumed Exposure TWA <sub>8e</sub>	Controls	Training	Monitoring Requirement
<ul style="list-style-type: none"> <li>Working with lead-containing chemicals in the laboratory</li> </ul>	<p>&lt; 10 µg/m<sup>3</sup> (if in fume hood)</p>	<ul style="list-style-type: none"> <li>Basic safe work practices</li> <li>Work in chemical fume hood, ventilated enclosure or use local exhaust</li> <li>See <a href="#">Laboratory Safety Manual</a>) for additional safe work practices for labs</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>SOP or JHA</li> <li>Lead awareness</li> </ul>	<ul style="list-style-type: none"> <li>No air monitoring or BLL monitoring required</li> </ul>
<ul style="list-style-type: none"> <li>Working with precursors of lead perovskite, forming methylammonium lead halide</li> </ul>	<p>&lt; 10 µg/m<sup>3</sup></p>	<ul style="list-style-type: none"> <li>Basic safe work practices</li> <li>Work in glovebox for mixing, ventilated enclosure or use local exhaust during production of lead perovskite</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>SOP or JHA</li> <li>Lead awareness</li> </ul>	<ul style="list-style-type: none"> <li>No air monitoring or BLL monitoring required</li> </ul>
<ul style="list-style-type: none"> <li>Soldering with lead-containing solder</li> </ul>	<p>&lt; 10 µg/m<sup>3</sup></p>	<ul style="list-style-type: none"> <li>Basic safe work practices</li> <li>Work in chemical fume hood, ventilated enclosure or use soldering fume extractors</li> <li>Never heat lead solder higher than typical soldering iron temperatures (620°F-700°F)</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>Lead awareness</li> </ul>	<ul style="list-style-type: none"> <li>No air monitoring or BLL monitoring required</li> </ul>
<ul style="list-style-type: none"> <li>Cutting brass keys in lock shop</li> </ul>	<p>&lt; 10 µg/m<sup>3</sup></p>	<ul style="list-style-type: none"> <li>Basic safe work practices</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>Lead awareness</li> </ul>	<ul style="list-style-type: none"> <li>No air monitoring or BLL monitoring required</li> </ul>

<ul style="list-style-type: none"> <li>• Thermal Evaporation - thin film deposition of lead compounds</li> </ul>	<p>&lt; 10 µg/m<sup>3</sup></p>	<ul style="list-style-type: none"> <li>• Basic safe work practices</li> <li>• Work in chemical fume hood, ventilated enclosure or use local exhaust</li> </ul>	<ul style="list-style-type: none"> <li>• Hazard communication</li> <li>• Lead awareness</li> </ul>	<ul style="list-style-type: none"> <li>• No air monitoring or BLL monitoring required</li> </ul>
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TWA<sub>8e</sub> - equivalent 8-hr exposure time-weighted average

**Table 3: Assumed Exposure Levels for Work with Metallic Lead**

Activity	Assumed Exposure TWA <sub>8e</sub>	Controls	Training	Monitoring Requirement
<ul style="list-style-type: none"> <li>Handling sealed lead bricks, other forms of metallic lead, and sheets for radiation shielding</li> <li><b>For 30 min or less and minimal quantities,*</b> handling unsealed lead bricks and sheets for radiation shielding, and handling unsealed lead weights</li> </ul>	< 10 µg/m <sup>3</sup>	<ul style="list-style-type: none"> <li>Basic safe work practices</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>Lead awareness</li> </ul>	<ul style="list-style-type: none"> <li>No air monitoring or BLL monitoring required</li> </ul>
<p><b>Over 30 min. time periods and over minimal quantities,**</b> handling unsealed lead bricks and sheets for radiation shielding, and handling unsealed lead weights</p>	≥ 10 µg/m <sup>3</sup> and < 30 µg/m <sup>3</sup>	<ul style="list-style-type: none"> <li>Basic safe work practices</li> <li>Recommended: Half-face or full-face negative pressure respirator (APF 10 or more) or PAPR with HEPA filters</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>Lead Worker 2 hr. (initial, annual refresher)</li> <li>Respirator</li> <li>Lead Work Plan</li> </ul>	<ul style="list-style-type: none"> <li>No air monitoring or BLL monitoring required</li> <li>Respirator medical clearance</li> </ul>
Melting, pouring fusible lead alloy (Woods alloy, Cerrobend, Metspec 158, never heated more than melting point)	< 10 µg/m <sup>3</sup>	<ul style="list-style-type: none"> <li>Basic safe work practices</li> <li>Work in chemical fume hood, ventilated enclosure or use local exhaust</li> </ul>	<ul style="list-style-type: none"> <li>Hazard communication</li> <li>Lead awareness</li> </ul>	<ul style="list-style-type: none"> <li>No air monitoring or BLL monitoring required</li> </ul>

TWA<sub>8e</sub> - equivalent 8-hr exposure time-weighted average

≥ - greater than or equal to

\*For 30 minutes or less in a day and the equivalent of five or less unsealed lead bricks or five square feet or less of unsealed lead sheeting

\*\*More than 30 minutes in a day, and more than the equivalent of five unsealed lead bricks or five square feet of unsealed lead sheeting

[Back to Top](#)

## LABELING AND SIGNAGE

### Secondary containers

Lead-containing products and chemicals need to be clearly labeled with the original manufacturer's label and hazard warnings. If transferred to other containers, secondary labels must be put on the container according to Globally Harmonized System (GHS) requirements. See example below of a secondary chemical container label that can be developed and printed using the [secondary container chemical label templates](#) on the EH&S website.

<b>Chemical Composition:</b>	%	
Lead Oxide	> 95	
Jane Researcher		5/15/19
<b>Name of Researcher:</b>	<b>Date:</b>	

### Lead storage areas

Post warning signs in areas and on containers where metallic lead is stored. The signs must indicate the hazard and prohibited activities.

See [Warning Sign for Lead Storage Area](#) on the EH&S website to print signs for posting.



### Lead use areas



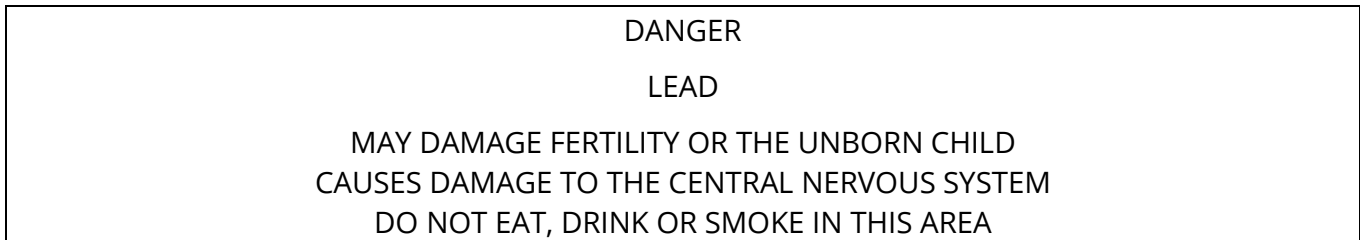
Post warning signs in designated lead use areas where metallic lead-containing materials are used routinely or periodically (e.g., working with low melting lead alloy to form radiation shielding blocks). The signs must indicate the hazard and prohibited activities. Exposures to lead should **not be above the PEL** in these areas.

See [Warning Sign for Lead Use Area](#) on the EH&S website to print signs for posting.

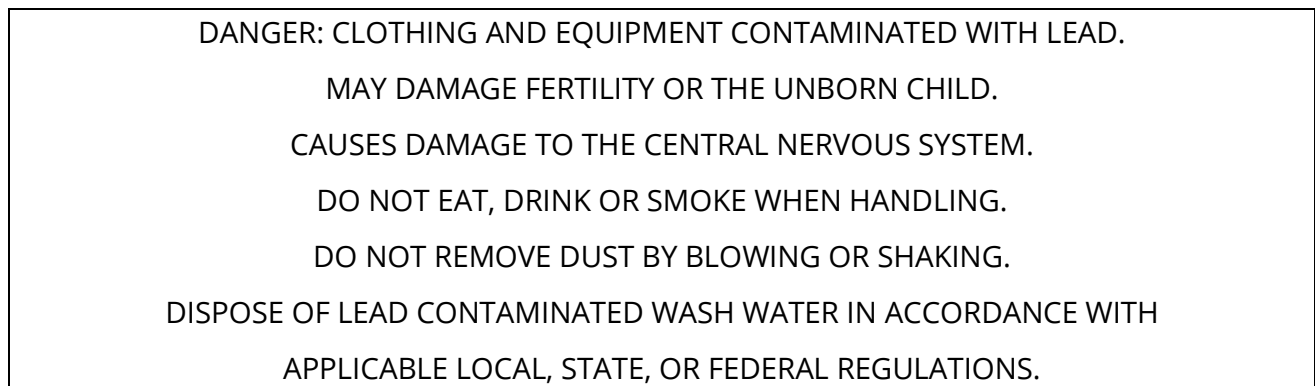
Post a warning label on a HEPA vacuum that is dedicated for working with lead-containing materials or cleaning up lead dust and debris.

### Lead work area that may be above the PEL

The warning sign below must be posted in work areas where a worker's exposure to lead may be **above the PEL**. Examples include an area or containment where lead-containing paint is being removed with power tools or a heat gun. Warning signs that meet regulatory requirements may be purchased from safety sign vendors.



Employees working with lead-containing materials must not wear clothing contaminated with lead outside the work area. Bag contaminated clothing and label the bag as lead-contaminated clothing with the warning sign below (available from safety sign vendors). Send non-disposable lead-contaminated clothing to a laundry facility licensed to handle such material or dispose according to applicable regulations.



[Back to Top](#)



## RESPIRATORY PROTECTION

Respiratory protection may be needed when airborne contaminants cannot be adequately controlled by engineered exhaust ventilation. As part of the UW Lead Safety Program, EH&S recommends respiratory protection when airborne lead exposure may be at or above  $10 \mu\text{g}/\text{m}^3$  TWA<sub>8e</sub> but below the AL ( $30 \mu\text{g}/\text{m}^3$  TWA<sub>8e</sub>) as shown in Tables 1, 2, and 3 above for specific lead work activities. This is more protective than current regulations and is intended to limit lead exposures to the lowest levels possible.

The use of respiratory protection has stringent regulatory requirements. Users must participate in the [UW Respiratory Protection Program](#), which includes medical clearance, annual training and fit testing.

As written in the Exposure Assessment and Air Monitoring sections above, respiratory protection is required when the lead exposure level is unknown. Respiratory protection is not required only after a Negative Exposure Assessment (NEA) has been conducted and exposure levels are verified by air monitoring to be less than  $10 \mu\text{g}/\text{m}^3$  TWA<sub>8e</sub>.

## DOCUMENTED LEAD WORK PLAN

If the level of employee personal exposure to lead is known or has the potential to be at or above  $10 \mu\text{g}/\text{m}^3$  TWA<sub>8e</sub>, regardless of respiratory protection provided, University departments for which the employee works must establish and implement a written Lead Work Plan prior to the beginning of a project. A Lead Work Plan Template is given in [Appendix A](#). A fillable form Word document of the Lead Work Plan Template with instructions is given on the [EH&S website](#). The Lead Work Plan must contain the following elements (at a minimum):

- **Controls, protective equipment and clothing** – Describe the engineering and administrative controls and personal protective equipment, including respirators, to limit employee exposure.
- **Safe work practices** – Describe the work practices to work safely with the lead-containing materials.
- **Housekeeping measures** – Describe the methods to prevent contamination of areas outside the work zone, and to clean up and dispose of waste.
- **Hygiene practices** – Describe how employees will prevent contamination of personal clothing, how they will decontaminate and wash exposed skin and hair, and prevent “take-home” of lead contamination.

The project manager, supervisor or lead for each maintenance or minor alterations project must determine whether the tasks involved will disturb lead-containing material. If lead-containing material will be disturbed, a lead survey (specific to the scope of work) and Lead Work Plan must be available at the location where the activity is taking place.

The project manager, supervisor or lead is responsible for ensuring that lead-containing building material is handled so as not to pose a health hazard to University employees. A Competent Person shall review and approve lead work plans prior to work. The project manager, supervisor or lead may also be the Competent Person, if they meet the definition of a Competent Person.

EH&S is available to review lead work plans and provide comments or recommendations upon request.

### **Lead Work Plans in laboratories and shops**

Laboratories and shops in support of academic departments may complete an SOP or JHA, instead of the Lead Work Plan, for work with lead-containing materials. The SOP or JHA must be included in their health and safety plan ([Accident Prevention Plan](#)) for any activity or process involving lead-containing materials. A Competent Person is responsible for reviewing and approving all JHAs or SOPs to ensure adherence with the requirements of this document.

See the EH&S website for guidelines for what to include in an [SOP](#) and a [JHA](#).

## **SURFACE SAMPLING**

Conduct surface sampling to determine the amount of free lead dust and debris found on a surface to verify cleaning protocols or identify where additional cleaning and removal is required. Surface sampling is not required but advised where lead could be inadvertently picked up on clothing and skin or disturbed and become airborne and potentially ingested or inhaled.

Qualitative methods can be used to determine if lead is present. A common product used for detection is [3M LeadCheck swab](#) for testing wood, metal, drywall or plaster surfaces for lead that gives a color indicating lead is present on surfaces at a reported detection limit of 600 ppm.

[Full Disclosure wipes](#), although not intended to determine lead in paint, paint chips or painted surfaces, it is used to determine the effectiveness of hand washing to remove lead residues, spot check lead contaminated work surfaces and evaluate the effectiveness of lead removals. The product was developed by NIOSH and is sold by SKC, Inc. to detect the presence of elemental lead and some lead salts. The extraction solution will not solubilize all lead salts. Full Disclosure is suitable for elemental lead, lead nitrate, lead sulfate, and lead oxide. Full Disclosure will not detect lead chromate or alkyl lead.

The qualitative methods can help determine if lead is present and evaluate surface cleaning; however, quantitative methods must be used to determine if the area is below recommended surface contamination limits for lead.

Quantitative surface sampling for lead dust is performed by wipe sampling a measured area and sending the sample to a laboratory for lead analysis (see [NIOSH Method 9102 and ASTM Standard E1728-16](#)). A recommended surface contamination limit of 40  $\mu\text{g}/\text{ft}^2$  (4.3  $\mu\text{g}/\text{dm}^2$ )\* can be used as guidance to assess surface contamination and the need for cleaning in lead work and storage areas.

\*based on Environmental Protection Agency (EPA) and Housing and Urban Development (HUD) clearance levels for floors and surfaces in public housing

## **STORAGE AND TRANSFER**

Lead-containing products and chemicals used in shops and labs must be stored in designated chemical storage areas.

Metallic lead must be stored in areas that minimize oxidation and degradation of lead. Lead oxides on the surface are more likely to become airborne and contaminate other surfaces, leading to potential exposures. Store metallic lead indoors in an area or container that is cool, dry, well ventilated, out of direct sunlight and away from chemicals, heat and ignition sources. Minimize the amount of lead in storage areas.

Coatings applied to lead bricks and weights help reduce contamination from use or storage. They require careful handling, storage, and transport to prevent scratching and chipping. If coating is not feasible, proper hygiene and PPE must be used to limit employee exposure to lead and to minimize the spread of lead debris in the work environment.

Store uncoated lead bricks or weights, or those with deteriorating coatings, so that surrounding surfaces and equipment are not contaminated with lead dust. Store bricks/weights on plastic sheeting or rubber mats in a designated area away from traffic corridors and frequently used equipment. Replace the underlayment periodically to prevent accumulation of lead dust.

Periodically (not less than once per year) inspect unpainted/uncovered metallic lead condition for damage and oxidation, and clean as needed to prevent personal exposures or environmental contamination. Periodically inspect painted/covered lead and clean or repaint/recover as needed. Conduct surface testing of the storage area for lead contamination and clean as needed. See Surface Sampling section above. When lead materials have been moved from a storage area, the area should be inspected and cleaned.

Handle and transport lead bricks and weights using proper lifting techniques to avoid ergonomic injuries such as back sprains, muscle pulls, and wrist, elbow, and spinal injuries. With two hands, lift no more than one 27-pound brick at a time. Limit lifting to no more than 50 pounds. Use mechanical lifting equipment, forklifts with pallets and other methods when moving large quantities.

When storing large quantities of lead bricks and weights, address structural and non-structural support issues related to seismic risks with consolidated weights greater than 400 pounds or in stacks/structures greater than 5 feet in height.

Lead used for radiation shielding from radioactive sources must be surveyed for radiation prior to transport and reuse. Contact EH&S Radiation Safety at [radsaf@uw.edu](mailto:radsaf@uw.edu) or 206.543.0463 for assistance.

When transferring metallic lead from one area or department to another, bag the materials in plastic bags and move in a manner that minimizes the potential for personal exposure and environmental contamination. Protect from contact with rain to prevent release of lead.

## INCIDENTAL LEAD PAINT IN RENOVATION, REPAIR AND PAINTING (RRP) WORK

WAC 365-230 Accreditation of Lead-Based Paint Training Programs and the Certification of Firms and Individuals Conducting Lead-Based Paint Activities and Renovation applies to Target Housing and child-occupied facilities.

Contractors conducting RRP work must be compliant with the Department of Commerce and Environmental Protection Agency (EPA) programs and have certification from them when required. The EPA's [Renovation, Repair and Painting \(RRP\) rule](#) requires that renovations of pre-1978 homes, child-care facilities and schools that may be occupied by children (under six years old) be carried out only by Lead-Safe Certified renovation firms, using certified renovators trained in lead-safe work practices. This ensures that renovation, repair, or painting activities does not inadvertently contaminate a facility and expose children to hazardous lead dust. The intention of this type of work is not lead abatement, and activities include work only with hand tools and power tools with HEPA dust collection systems.

In Washington State, the RPP program is administered by the [Washington state Department of Commerce](#) that provides approved training and certifications in lead-safe work practice.

## MEDICAL SURVEILLANCE

A medical surveillance program must be instituted for all employees who are or may be exposed at or above the Action Level ( $30 \mu\text{g}/\text{m}^3 \text{TWA}_{8\text{e}}$ ) for more than thirty days per year (WAC 296-62-07521). The UW occupational health nurse practitioner will coordinate medical surveillance procedures for lead including medical examinations, blood testing, consultations, and other procedures. It is not anticipated that medical surveillance will be required for most University employees based on the type, short duration and low frequency of typical activities working with lead-containing materials described in this program. However, medical examinations, blood testing and consultations are available for all employees:

- Potentially exposed to lead at concentrations at or above the Action Level ( $30 \mu\text{g}/\text{m}^3 \text{TWA}_{8\text{e}}$ ) for more than 30 days in any 12-month period; baseline examinations will be initiated prior to exposure whenever possible and repeated annually.
- With a blood lead level (BLL) at or above  $40 \mu\text{g}/100\text{g}$  of whole blood, within the previous twelve months, with annual follow up
- If there is a reasonable possibility that the employee was exposed to airborne lead
- Who develop signs and symptoms of lead exposure
- As medically appropriate for employees under medical removal (see below)

Results of any blood sampling tests will be reported to the employee within five working days after receiving the laboratory report. Additional medical information will be made available to exposed employees within 15 days of the medical assessment.

## MEDICAL REMOVAL

University employees must be temporarily removed from work that causes an exposure to lead at or above the AL,  $30 \mu\text{g}/\text{m}^3 \text{TWA}_{8\text{e}}$ , when either of the following occurs:

- If the employee's BLL is at or above  $60 \mu\text{g}/100 \text{g}$  of whole blood
- A medical finding, determination or opinion states that the employee is at increased risk of lead-related adverse health effects and diseases

Employees must maintain all compensation and benefits during the medical removal period. Employee must return to former job status only after subsequent medical evaluation determines that the employee is no longer at increased risk of lead-related adverse health effects and diseases.

## TRAINING

Lead training for employees is provided by EH&S in cooperation with UW Facilities, or other qualified units. Equivalent training may be provided by UW Facilities departments that manage lead-containing materials. Course offerings are outlined on the [EH&S website](#).

### LEVELS OF TRAINING

The minimum training requirements for University employees working with or around lead-containing materials, **and performing specific activities**, are given in Tables 1, 2, and 3 above.

Departments performing renovation, repair, and painting projects that disturb lead-containing paint in homes, child care facilities and preschools built before 1978 must use certified renovators who are trained by EPA-approved training providers to follow lead-safe work practices in accordance with EPA's [Lead Renovation, Repair and Painting Rule \(RRP Rule\)](#). The primary UW building that this rule applies to is the Center for Human Development and Disability Clinic (CHDD). Refer to [Incidental Lead Paint in Renovation, Repair and Painting \(RRP\) Work](#) section above.

#### **Lead Awareness Training – Online**

Employees who may potentially be exposed to lead-containing materials but not significant amounts of lead dust or fume must receive Lead Awareness Training. This online course explains the hazards of lead exposure if lead-containing materials are disturbed, the nature of lead, products that may contain lead, health hazards of lead, routes of exposure, signage, and how to control lead exposure. This course does not teach abatement or cleanup of lead.

#### **Lead Worker Training – Classroom 2-hours initial and refresher training**

This course explains the hazards of lead exposure if lead-containing materials are disturbed and/or used, the nature of lead, products that may contain lead, health hazards of lead, routes of exposure, signage, and how to control lead exposure. This course provides an overview of the UW requirements for safe work practices, medical surveillance and recordkeeping when exposed to lead in concentrations above  $10 \mu\text{g}/\text{m}^3$  TWA<sub>8e</sub> but below the regulatory requirements required to be a certified lead worker when impacting or using lead-containing materials in the workplace.

#### **Asbestos <1% Wallboard Systems and Lead Work Practices – Classroom Initial 7.5 –hours**

This specialized course for building maintenance and alterations staff provides information and specific procedures to reduce exposure to asbestos and lead in wallboard systems that contain less than one percent asbestos and/or lead-containing paint.

The course material covers recognizing the types of regulated building materials (asbestos, lead, PCB's, etc.) used in building wallboard systems and other building materials; the health effects, routes of exposure; engineering controls and work practices; procedures to prevent exposure;

proper use and limitations of personal protective equipment; and building signage and warning labels.

The hands-on instruction portion of the class covers pre-task planning, personal protective equipment, work area containment setup, engineering control implementation, cleanup and disposal of generated waste for work on wallboard systems containing less than one percent asbestos and/or lead-containing paint. This course is not intended to cover abatement or cleanup of other asbestos-containing materials.

This class satisfies the requirements for the 2-hour Asbestos Awareness Class and the 2-hour Lead Worker Class.

Intended Audience: Employees who perform maintenance and alterations work on building wallboard systems that contain less than one percent asbestos and/or lead-containing paint.

### **Respiratory Protection Training**

Employees who may be exposed to airborne lead above the Action Level and who will be required to wear respiratory protection must be in the [UW Respiratory Protection Program](#) and receive Respiratory Protection Training. Employees who may be exposed to lead levels above 10  $\mu\text{g}/\text{m}^3 \text{TWA}_{8\text{e}}$  where respiratory protection is recommended must also be in the [UW Respiratory Protection Program](#) if they wear a respirator. Participation in the Respiratory Protection Program includes medical clearance, annual training and fit testing.

[Back to Top](#)

## **WASTE COLLECTION, RECYCLING AND DISPOSAL**

Departments generating waste suspected of containing lead must contact EH&S Environmental Programs regarding the appropriate disposal protocol. Any waste material with **greater than or equal to 5 ppm** leachable lead (by the EPA method, Toxicity Characteristic Leaching Procedure (TCLP)) shall be handled as a hazardous waste.

For lead waste generated during projects with lead-containing building materials, including lead-containing paint, manage in accordance with UW EH&S Environmental Programs and construction project specifications for lead, if applicable.

For lead waste generated in shops and labs, such as chemical and solder waste, label containers with accumulated waste and submit an online request for pickup via the MyChem inventory or on the [EH&S website](#). Contact [chmwaste@uw.edu](mailto:chmwaste@uw.edu) or 206.616.5835 for more information.

### **RECYCLING OF METALLIC LEAD MATERIALS**

Contact UW Recycling at [recycle@uw.edu](mailto:recycle@uw.edu) to find out whether metallic lead materials, such as lead bricks, weights, sheeting and foil that cannot be reused at the University (see [STORAGE AND TRANSFER](#) above) can be recycled. This includes metallic lead that has been painted, encapsulated or covered. See the [Recycling webpage](#) for more information.

**Metallic lead used for radiation shielding** from radioactive sources must be surveyed for radioactive contamination prior to transport and recycling. Contact EH&S Radiation Safety at [radsaf@uw.edu](mailto:radsaf@uw.edu) or 206.543.0463 for assistance.

**Large quantities of metallic lead (greater than the equivalent of five lead bricks) that have oxidized** and may be contaminated with lead dust or particulate must be handled and packaged (in plastic sheeting or bags) by workers trained in handling metallic lead while wearing respirators before transport and recycling. Contact Regulated Materials Office (RMO) at [asbestos@uw.edu](mailto:asbestos@uw.edu) for more information.

**Small quantities of oxidized, or any quantity of non-oxidized, metallic lead** (the equivalent of five or less lead bricks) can be handled and packaged by any UW department employee wearing gloves, a lab coat and safety glasses.

Contact UW Recycling for more information about pickup of metallic lead for recycling at [recycle@uw.edu](mailto:recycle@uw.edu) or 206-685-2811.

After metallic lead has been removed from an area, inspect the area for lead dust or particulates. Clean the area and test the surfaces for lead contamination (see Surface Sampling above), and re-clean as needed.

## **DISPOSAL OF METALLIC LEAD MATERIALS**

Lead shielding that cannot be decontaminated of radiation shall be disposed of as a “mixed” radioactive waste. Contact EH&S Radiation Safety at [radsaf@uw.edu](mailto:radsaf@uw.edu) or 206.543.0463 for assistance.

Metallic lead that cannot be recycled must be disposed of as hazardous waste. Examples of metallic lead that cannot be recycled include lead aprons and lead alloys containing cadmium.

For more information about waste collection, disposal, and waste collection forms, see the [Chemical Waste Disposal webpage](#) on the EH&S website, or contact EH&S Environmental Programs at [chmwaste@uw.edu](mailto:chmwaste@uw.edu) or 206.616.5835.

## **EMERGENCY RESPONSE, EXPOSURE INCIDENTS AND ACCIDENT REPORTING**

### **SPILLS AND RELEASES**

If a spill or release occurs, stop work. Properly protected and trained personnel must clean up spills immediately. Do not attempt to clean up any spill if not trained, wearing appropriate personal protective equipment, or comfortable. For large spills, evacuate the area and call 9-1-1\* on any campus phone for help.

If qualified and comfortable, clean up the spill with proper protection, bag or contain the spilled material and debris, and cleanup materials. Double bag all waste in plastic bags labeled with a hazardous waste label for EH&S pickup.

For questions on spill cleanup, contact EH&S Spill Advice consultants at 206.543.0467.

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\* On the UW Seattle campus call 9-1-1 on a campus phone; at UW medical centers and other locations, follow internal emergency procedures.

## EXPOSURE INCIDENTS

In cases where an employee develops signs or symptoms of lead exposure or suspects that lead-containing material may have been disturbed:

- Work must be stopped immediately.
- The employee must notify his/her supervisor immediately.
- Access to the work area must be restricted to prevent others from unknowingly entering a contaminated area.
- Contact UW Employee Health at [emphlth@uw.edu](mailto:emphlth@uw.edu) or 206.685.1026 to consult with an occupational medical professional regarding lead exposures.
- Report all accidents and incidents to the [Online Accident Reporting System](#) within 24 hours (8 hours if hospitalization).

## AUDITS AND INSPECTIONS

Inspect lead use areas and storage areas periodically for lead contamination and overall adherence to requirements in the Lead Safety Program Manual. A template inspection form [Metallic Lead Use Area/Storage Area Inspection is in Appendix C](#). A fillable form Word document is available on the [EH&S website](#).

EH&S will audit the Lead Safety Program on a regular basis and changes will be documented in the Lead Safety Program Manual to reflect updates in current regulations and best safe work practices to ensure maximum protection for employees working with lead-containing materials. EH&S will notify affected departments and update lead information on the EH&S website.

## RECORDKEEPING

University departments must keep records of employee training, respirator use and lead work plans.

Record Type	Minimum Retention Time
Lead Work Plans	6 years
Lead use area/storage area inspections	1 year
Employee training	7 years
Employee respirator training	Duration of employment
Employee respirator fit test results	Until retested

EH&S will maintain the following records:

Record Type	Minimum Retention Time
Exposure assessments/air monitoring data	40 years or duration of employment plus 20 years, whichever is longer
Respiratory protection training	Duration of employment



Respirator fit test results	Until retested
Medical records	40 years or duration of employment plus 20 years, whichever is longer
Dangerous waste shipment and disposal records	6 years
Lead recycling shipment records (bill of lading)	6 years

## REFERENCES

[WAC 296-62-07521 Lead \(General Industry\)](#)

[WAC 296-155-176 Lead \(Construction\)](#)

[UW Administrative Policy Statement \(APS\) 12.1, \*Managing Asbestos and Other Regulated Building Materials\*](#)

Environmental Protection Agency (EPA) [Lead-Based Paint Renovation, Repair and Painting \(RRP\) Rule \(40 CFR 745, Subpart E\)](#)

[Washington state Department of Commerce](#) WAC 365-230 Accreditation of Lead-Based Paint Training Programs and the Certification of Firms and Individuals Conducting Lead-Based Paint Activities and Renovation

[Back to Top](#)

## APPENDIX A – LEAD WORK PLAN TEMPLATE

Lead Work Plan Template and instructions for work with Lead-Containing Materials. See [Lead Work Plan Template](#) for a fillable form Word document.

See next page.

## Lead Work Plan

A Lead Work Plan is required when lead exposure is assumed or known to be at or above 10 µg/m<sup>3</sup>TWA<sub>8e</sub> of lead in air.

Department	Location (building, room)
Description of Work	
Type and Quantity of Lead Containing Material (LCM)	
<input type="checkbox"/> % of lead in material(s)	Sample Source: <input type="checkbox"/> RMO <input type="checkbox"/> Consultant <input type="checkbox"/> Other

Project schedule	Expected start date <a href="#">Click to enter date</a>	Expected completion date <a href="#">Click to enter date</a>
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- **Workers must review and sign this Lead Work Plan prior to starting work. Workers must understand this plan and be trained in lead work practices and the systems and equipment that will be used.**
- **Address other hazards relevant to the work by following specific program requirements for those hazards.**
- **Post this Lead Work Plan at the worksite for the duration of work activities.**
- **If any of the project conditions change, revise the work plan to address the changes.**

1. Tools and equipment used that will disturb LCM (check all that apply)			
<input type="checkbox"/>	Paint scraper	<input type="checkbox"/>	Rotohammer with HEPA vacuum dust attachment
<input type="checkbox"/>	Hand trowel	<input type="checkbox"/>	Power saw
<input type="checkbox"/>	Pry bars	<input type="checkbox"/>	Grinder
<input type="checkbox"/>	Hammer	<input type="checkbox"/>	Drill
<input type="checkbox"/>	Pressure washer (1000 to 1500 psi)	<input type="checkbox"/>	Wire brush
<input type="checkbox"/>	Scraper	<input type="checkbox"/>	Mechanical lifting device
<input type="checkbox"/>	Soldering Iron	<input type="checkbox"/>	Other:
<input type="checkbox"/>	Welding equipment	<input type="checkbox"/>	Other:
<input type="checkbox"/>	Torch	<input type="checkbox"/>	Other:
2. Precautions for warning and protecting building occupants or others			
<input type="checkbox"/>	Post lead warning sign(s) around worksite perimeter	<input type="checkbox"/>	Review any SDS of chemical used with employees prior to start of project and provide copy on the job site
<input type="checkbox"/>	Close off work area to public	<input type="checkbox"/>	Other:
<input type="checkbox"/>	Notify building coordinator of work schedule and provide copy of Lead Work Plan Name: _____ Date/Time _____	<input type="checkbox"/>	Other:
3. Safe work procedures (include controls and work practices to minimize employee exposures)			
<input type="checkbox"/>	Interior locations: Erect a sealed containment structure to isolate lead contaminated materials from entering occupied areas when working inside. Provide negative air exhaust ventilation with HEPA filters.	<input type="checkbox"/>	Use local exhaust ventilation when cutting, soldering, torching or welding lead containing materials.
<input type="checkbox"/>	Exterior Location: Tape plastic sheeting below work area to catch debris and prevent from contaminating equipment, soil or entering storm or sanitary sewer conveyance systems.	<input type="checkbox"/>	Wipe off walls with damp rags

<input type="checkbox"/>	Provide portable tools with dust collection shrouds and connect to vacuum systems with HEPA filtration.	<input type="checkbox"/>	Use shaving cream or sponge method when drilling into building materials				
<input type="checkbox"/>	HEPA Vacuum (do not use compressed air)	<input type="checkbox"/>	Rotate workers to reduce exposure time				
<input type="checkbox"/>	Wet mist debris before collection	<input type="checkbox"/>	Other:				
<input type="checkbox"/>	For pressure washing, place catch mat below work area and seal all storm drains. Cover vegetation as much as possible.	<input type="checkbox"/>	Other:				
<b>4. Personal Protective Equipment</b>							
<input type="checkbox"/>	Respirator Type: Cartridge:	<input type="checkbox"/>	Safety glasses/goggles				
<input type="checkbox"/>	Coveralls	<input type="checkbox"/>	Disposable hood				
<input type="checkbox"/>	Shoe covers	<input type="checkbox"/>	Other:				
<input type="checkbox"/>	Gloves	<input type="checkbox"/>	Other:				
<b>5. Air Monitoring</b>							
<input type="checkbox"/>	Arrange air monitoring with EH&S	<input type="checkbox"/>	Previous air monitoring has shown that employee exposures are below the AL for this work				
<input type="checkbox"/>	Personal Exposure	<input type="checkbox"/>	Clearance Sampling				
<input type="checkbox"/>	Area Monitoring	<input type="checkbox"/>	Other:				
<input type="checkbox"/>	Air monitoring results	<input type="checkbox"/>	Other:				
<b>6. Employee(s) trained to work under this plan</b>							
<b>Name (print)</b>		<b>Current Training (within last year)</b>					
		<input type="checkbox"/>	Lead awareness	<input type="checkbox"/>	Lead worker	<input type="checkbox"/>	Respiratory protection
		<input type="checkbox"/>	Lead awareness	<input type="checkbox"/>	Lead worker	<input type="checkbox"/>	Respiratory protection
		<input type="checkbox"/>	Lead awareness	<input type="checkbox"/>	Lead worker	<input type="checkbox"/>	Respiratory protection
		<input type="checkbox"/>	Lead awareness	<input type="checkbox"/>	Lead worker	<input type="checkbox"/>	Respiratory protection
		<input type="checkbox"/>	Lead awareness	<input type="checkbox"/>	Lead worker	<input type="checkbox"/>	Respiratory protection
<b>7. Clean up procedures</b>							
<input type="checkbox"/>	HEPA vacuum	<input type="checkbox"/>	Remove contaminated clothing/PPE before exiting worksite.				
<input type="checkbox"/>	Clean equipment with soap and water or other effective cleaning agent	<input type="checkbox"/>	HEPA vacuum any debris from plastic, roll plastic and tape ends closed and seal in 6 mil plastic bags.				
<input type="checkbox"/>	Clean and disinfect respirator	<input type="checkbox"/>	Tape ends of HEPA vacuum hoses when not in use. Return to designated storage room when finished.				
<input type="checkbox"/>	Remove all disposable contaminated clothing and package for waste disposal	<input type="checkbox"/>	Conduct surface sampling for lead using recommended surface contamination limit of: <input type="text"/> $\mu\text{g}/\text{ft}^2$				
<input type="checkbox"/>	Wash hands and face with soap and water before exiting work area.	<input type="checkbox"/>	Other:				
<input type="checkbox"/>	Remove all contaminated clothing/PPE before leaving containment. Place in double sealed bags and label.	<input type="checkbox"/>	Other:				
<b>8. Disposal</b>							
<input type="checkbox"/>	Attach waste disposal instructions provided by EH&S Environmental Programs (contact: <a href="mailto:chmwaste@uw.edu">chmwaste@uw.edu</a> )	<input type="checkbox"/>	Recycle lead materials as follows:				
<input type="checkbox"/>	Label containers/bags with hazardous waste labels.	<input type="checkbox"/>	Other:				
<input type="checkbox"/>	Complete and submit an <a href="#">Online Chemical Waste Collection request</a>	<input type="checkbox"/>	Other:				

**9. Work plan approval(s):** By signing below, I certify that all required precautions including, but not limited to, wearing of proper protective equipment and clothing, participation in a medical surveillance program if necessary, and following the procedures referenced above will be followed during this project. These employees have received appropriate training in the tasks to be performed and understand the risks associated with working with lead-containing material.

Name of project manager, supervisor, or lead	Signature	Date
		Click to enter date
<b>10. Reviewed by Competent Person* (name)</b>		
		Click to enter date

\*Project manager, supervisor, or lead may also be the Competent Person, if they meet the definition of a Competent Person.

<b>11. Employee(s) have reviewed and understand the work under this lead work plan</b>		
Name (print)	Signature	Date
		Click to enter date
		Click to enter date
		Click to enter date
		Click to enter date
		Click to enter date

**THIS WORK PLAN MUST BE AVAILABLE AT THE JOB SITE.**

## Instructions for filling out the Lead Work Plan

Complete top part of form:

- What lead work is planned? Removing lead paint, repairing/replacing lead flashing, moving lead bricks, encapsulating lead weights, other?
- What type and quantity of LCM? Paint, pipe, sheeting, bricks, weights, other? How much in sq. ft., linear feet, number, other? Percent in paint, 99.9% solid lead, lead alloy (check Safety Data Sheet)?

Complete all sections of the form, add items where needed:

1. Tools and equipment that will disturb LCM
2. Precaution for warning and protecting building occupants or others
3. Preparation and work procedures
4. Personal Protective Equipment
5. Air Monitoring *Do you need air monitoring? Who does it?*
6. Employee Training
7. Clean up Procedures
8. Waste Disposal
9. Project manager, supervisor or lead signs the work plan *Before the work*
10. Competent person signs the work plan *Before the work*
11. Employees read/understand/sign work plan *Before the work*

After work is completed:

- If work done through Regulated Materials Office (RMO), send completed form to:  
**Regulated Materials Office**  
Email: [asbestos@uw.edu](mailto:asbestos@uw.edu) Fax: 206-221-7079 Box 354285
- RMO will retain Lead Work Plans for at least 6 years.
- In other departments, retain Lead Work Plan for at least 6 years in the department.

## APPENDIX B – HIGH-RISK TASKS FOR LEAD OVEREXPOSURE

From [WAC 296-62-07521 Lead \(General Industry\)](#)

Appendix D. Recommendations to employers concerning high-risk tasks (non-mandatory).

The department advises employers that the following tasks have a high risk for lead overexposure (this list is not complete; other tasks also can result in lead overexposure):

- Any open flame operation involving lead-containing solder in a manner producing molten solder, including the manufacture or repair of motor vehicle radiators
- Sanding, cutting or grinding of lead-containing solder
- Breaking, recycling or manufacture of lead-containing batteries
- Casting objects using lead, brass, or lead-containing alloys
- Where lead-containing coatings or paints are present:
  - abrasive blasting
  - welding
  - cutting
  - torch burning
  - manual demolition of structures
  - manual scraping
  - manual sanding
  - heat gun applications
  - power tool cleaning
  - rivet busting
  - cleanup activities where dry expendable abrasives are used
  - abrasive blasting enclosure movement and removal
- Spray-painting with lead-containing paint
- Using lead-containing mortar
- Lead burning
- Operation or cleaning of shooting facilities where lead bullets are used
- Formulation or processing of lead-containing pigments or paints
- Cutting, burning, or melting of lead-containing materials

The department recommends that annual blood lead testing be offered to all employees potentially overexposed to lead, including those performing the tasks listed above, regardless of air lead levels. Research has shown that air lead levels often do not accurately predict workers' lead overexposure. The blood lead testing will provide the most information if performed during a period of peak lead exposure. Employers should be aware that the United States Public Health Service has set a goal of eliminating occupational exposures which result in whole blood lead levels of 25 µg/dl or greater. This goal should guide whether employees' blood lead levels indicate lead overexposure.

If blood lead levels are elevated in an employee performing a task associated with lead overexposure, employers should assess the maintenance and effectiveness of exposure controls, hygiene facilities, respiratory protection program, the employee's work practices and personal hygiene, and the employee's respirator use, if any. If a deficiency exists in any of these areas, the employer should correct the problem.

## APPENDIX C – METALLIC LEAD USE AREA/STORAGE AREA INSPECTION CHECKLIST TEMPLATE

Metallic Lead Use Area/Storage Area Inspection checklist template for periodically inspecting metallic lead use areas and metallic lead storage areas. See [Metallic Lead Use Area/Storage Area Inspection Template](#) for a fillable form Word document.

See next page.



Enter information electronically in shaded areas, name Word document file, and save to device. Or print document to enter information manually.

## Metallic Lead Use Area/Storage Area Inspection

Department	Location
How is lead used here?	
What type and how much lead is stored here?	
Inspection conducted by:	Date <a href="#">Click to enter date</a>

Metallic Lead Use Area		Yes	No
1	Is area posted with "Lead Use Area" warning sign?	<input type="checkbox"/>	<input type="checkbox"/>
2	Is lead-containing material listed with SDS in MyChem inventory?	<input type="checkbox"/>	<input type="checkbox"/>
3	Are SOPs, JHAs and/or Lead Work Plan available for the work?	<input type="checkbox"/>	<input type="checkbox"/>
4	Is PPE readily available?	<input type="checkbox"/>	<input type="checkbox"/>
5	Are work surfaces clean and free of lead-containing debris?	<input type="checkbox"/>	<input type="checkbox"/>
6	Is ventilation sufficient for the work?	<input type="checkbox"/>	<input type="checkbox"/>
7	Is spill kit available?	<input type="checkbox"/>	<input type="checkbox"/>
8	Are surface sampling swabs or wipes available to check for lead contamination on surfaces?	<input type="checkbox"/>	<input type="checkbox"/>
9	Are hand washing facilities available near the area?	<input type="checkbox"/>	<input type="checkbox"/>
10	Is HEPA vacuum dedicated for area, labeled with "Warning Contains Lead" sign?	<input type="checkbox"/>	<input type="checkbox"/>
11	Are HEPA vacuum filters changed regularly in dedicated area with engineering controls and proper PPE (i.e., gloves, respirator, lab coat)?	<input type="checkbox"/>	<input type="checkbox"/>
12	Other:	<input type="checkbox"/>	<input type="checkbox"/>
13	Other:	<input type="checkbox"/>	<input type="checkbox"/>
Metallic Lead Storage Area		Yes	No
14	Is area and/or containers storing lead posted with "Lead Storage Area" warning sign?	<input type="checkbox"/>	<input type="checkbox"/>
15	Is lead-containing material listed with SDS in MyChem inventory?	<input type="checkbox"/>	<input type="checkbox"/>
16	Is the area dry, cool, ventilated, free from sunlight?	<input type="checkbox"/>	<input type="checkbox"/>
17	Is PPE readily available?	<input type="checkbox"/>	<input type="checkbox"/>
18	Is the lead material covered, painted or encapsulated?	<input type="checkbox"/>	<input type="checkbox"/>
19	Does the lead material appear oxidized?	<input type="checkbox"/>	<input type="checkbox"/>
20	Does the lead material appear chipped or scraped?	<input type="checkbox"/>	<input type="checkbox"/>
21	Is there lead dust or debris under the stored lead?	<input type="checkbox"/>	<input type="checkbox"/>
22	Are surface sampling swabs or wipes available to check for lead contamination on surfaces?	<input type="checkbox"/>	<input type="checkbox"/>
23	Is the lead physically stable and secure in the storage area?	<input type="checkbox"/>	<input type="checkbox"/>
24	Are hand washing facilities available near the area?	<input type="checkbox"/>	<input type="checkbox"/>
25	Other:	<input type="checkbox"/>	<input type="checkbox"/>
26	Other:	<input type="checkbox"/>	<input type="checkbox"/>

Item #	Comments/Action Items