

# STANDARD OPERATING PROCEDURES

FOR

WORKER PROTECTION FOR  
LEAD EXPOSURE

Prepared by: The Industrial Hygiene Sub-Committee of the  
University of Maine Environmental Health and Safety Committee

## I. PURPOSE

In accordance with the requirements of the Occupational Health and Safety Administration (OSHA) regulatory document 29 CFR 1926.62 and 29 CFR 1910.1025, the goal of this program is to establish a Standard Operating Procedure (SOP) to educate and protect employees from occupational exposures to lead. OSHA's regulatory standards require the employer to institute a worker protection program designed to reduce the work place exposure to lead through medical monitoring, exposure assessments, training, established work practices and the proper use of personal protective equipment (PPE). This document is intended to be part of the University's overall Lead Management program and addresses only worker protection issues.

## II. SCOPE

Those employees that may, during the course of employment related activities, come in contact with or be exposed to lead, are covered by the worker protection requirements established in OSHA's 29 CFR 1926.62 and 29 CFR 1910.1025 and summarized in this SOP. Employment or research related activities that may result in exposure to lead include:

- Demolition of structures where lead or lead containing materials are present;
- Removal or encapsulation of materials containing lead;
- Painting or surface preparation activities;
- New construction or renovation work that may impact previously existing lead or lead containing materials;
- Installation of products that contain lead;
- Research involving the collection or analysis of lead containing materials;
- Art related activities utilizing lead containing materials (e.g., stained glass production)
- Lead contamination emergency cleanup; and
- Maintenance activities.

The most common source of lead exposure to employees of the University is through contact with lead-based paint (LBP).

Baseline lead exposure information for employees shall be determined through the use of employee exposure assessments conducted during activities involving potential disturbance of lead or lead containing materials or research activities involving lead or lead containing materials. This information will be used by the University to determine the type of worker protection (personal protective equipment and engineering and administrative controls) for a particular work scenario.

### III. DEFINITIONS

**Action Level (lead):** Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic centimeter of air ( $\mu\text{g}/\text{m}^3$ ) calculated as a time weighted average (TWA).

**Competent Person:** One who is capable of identifying existing and predictable lead hazards in the work environment or the surrounding areas and who has authorization to take prompt and corrective measures to eliminate them.

**Exposure Assessment:** Initial determination of employee exposure to lead while performing a specific task or work related activity. Exposure assessments shall be based upon results from personal air samples collected from the breathing zone of the individual performing the specific task.

**Lead:** Metallic lead, all inorganic lead compounds and organic lead soaps. (Included in these materials are lead-based paints and lead containing solders)

**Lead-based paint (LBP):** Surface coatings, primarily used to provide decorative or protective finishes that contain lead or lead compounds.

**Permissible Exposure Level (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 eight-hour period.

### IV. PERMISSIBLE EXPOSURE

The University shall provide a workplace where employees are not exposed to lead at concentrations greater than  $50 \mu\text{g}/\text{m}^3$  averaged over an eight-hour work period. This is the permissible exposure limit or PEL. If an employee is exposed to lead for more than eight hours in any workday, the employees' allowable exposure, as a time weighted average (TWA) for that day shall be reduced by 400 divided by the hours worked in that particular day (e.g., If the employee is exposed for a ten- hour work day, the measured exposure would be reduced by  $40 \mu\text{g}/\text{m}^3$ ). If it is determined through testing that the PEL is or will be exceeded, the University shall provide adequate controls (engineering and administrative) to reduce the employees actual exposure to lead below the PEL.

When respirators are worn to limit employee exposure to lead, employee exposure may be considered at the level provided by the protection factor of the respirator for those periods the respirator is worn. Those periods may be averaged with exposure levels during periods when respirators are not worn to determine the employee's daily TWA exposure.

## V. EXPOSURE ASSESSMENT

The university shall conduct an initial exposure assessment for each distinct work area or work related task where an employee may be exposed to lead, at or above, the action level of  $30 \mu\text{g}/\text{m}^3$ . The university shall collect personal air samples representative of a full work shift. The samples shall be representative of the monitored employees daily exposure to lead and will include at least one sample for each job classification, in each work area, for each shift or for the shift with the highest expected exposure

### A. Employee Protection During the Exposure Assessment

1. Until determined otherwise, it will be assumed that the employee is exposed to an airborne lead level between the PEL ( $50 \mu\text{g}/\text{m}^3$ ) and ten times the PEL  $500 \mu\text{g}/\text{m}^3$  when performing the following tasks:

- Manual demolition of LBP containing structures (e.g., drywall);
- Manual scraping or sanding of LBP coatings;
- Heat gun applications on LBP coatings;
- Spray painting with LBP; or
- Power tool cleaning with a dust collection system.

The employer shall implement appropriate employee protection measures (e.g., respiratory protection) during the performance of these tasks. These measures will continue until the exposure assessment is completed and exposure below the PEL is demonstrated.

If an employee is performing a task that is not listed above and has any reason to believe that they may be exposed above the PEL, the employee will be considered to be exposed above the PEL and will be protected accordingly.

2. The employee will be considered to be exposed above ten times the PEL for lead ( $500 \mu\text{g}/\text{m}^3$ ), and will be protected accordingly when performing the following tasks:

- Lead burning or using lead-containing mortar;
- Rivet busting on LBP coating;
- Power tool cleaning without a dust collection system on LBP coating;
- Clean-up where dry expendable abrasives are used on LBP coatings;  
or
- Abrasive blasting enclosure movement or removal.

This will continue until the exposure assessment is completed and exposure below ten times the PEL is demonstrated.

3. The employee will be considered to be exposed above 50 times the PEL for lead ( $2500 \mu\text{g}/\text{m}^3$ ), and will be protected accordingly when performing the following tasks:

- Abrasive blasting of LBP coated surfaces;
- Welding on LBP coatings;
- Cutting of LBP coatings; or
- Torch burning on LBP coatings.

This will continue until the exposure assessment is completed and exposure below ten times the PEL is demonstrated.

#### B. Protection of Employees During Assessment for Exposure

Employees performing any of the above referenced tasks shall be provided with the following appropriate protective measures:

- Respiratory protection;
- Personal protective clothing and equipment;
- Change area;
- Hand washing facilities;
- Biological monitoring (See Section VI); and
- Training (See Section X).

#### C. Initial Determination

Employee exposures and initial determinations shall be based on personal air samples representative of a full shift including at least one sample for each job classification in each work area for each shift or for only the shift with the highest expected exposure. The samples shall be representative of the monitored employees daily exposure to lead. Initial determinations may also be based upon the exposure monitoring results and any of the following relevant information:

- Information or observations that may indicate employee exposure to lead;
- Previous measurements of airborne lead; and
- Employee complaints of symptoms that may be attributable to exposures to lead.

Initial determination monitoring may be restricted to a representative sample of those employees who are potentially exposed to the greatest concentration of airborne lead in the work place.

C. Previously Collected Monitoring Information

Previous monitoring data collected within the last twelve months may be used for the initial determination; if conducted under workplace conditions which closely resemble the process, the type of material, control methods in use, work practices and environmental conditions of the current work.

D. Exemptions

Where objective representative data demonstrates that a specific lead-based material or process involving lead cannot result in exposures at or above the action level of  $30 \mu\text{g}/\text{m}^3$ , the employer may rely on such data instead of initial monitoring. If objective representative data is used, the following criteria shall be observed:

- Objective representative data shall be accurately recorded and documented including its nature and relevancy; and
- Objective representative data as described in this paragraph is not permitted to be used for exposure assessments in accordance with Paragraph A (Protection of Employees) of this section.

E. Positive Initial Determination and Initial Monitoring

Representative monitoring shall be conducted where a determination indicates the possibility of any employee exposure at or above the action level. Previous monitoring data, collected within the last twelve months, may be used for the initial monitoring if conducted under work place conditions closely resembling the process, type of material, control methods, work practices and environmental conditions of the current work.

F. Negative Initial Determination

A written record of any determination shows that no employees are exposed at or above the action level shall be maintained. At a minimum the record shall include the following:

- Any information, observations or calculations;
- Any previous measurements of airborne lead;
- Any employee complaints of lead exposure symptoms;
- The date of the determination;
- The location within the work site; and
- Name and social security number of each employee monitored.

It is recommended that these records be maintained for a period of at least three years.

#### G. Frequency of Monitoring

If the initial assessment reveals exposure levels below the action level, further exposure assessments need not be repeated unless a change occurs as described below:

- If the initial or subsequent assessments reveal exposures above the action level but below the PEL, then further exposure assessments shall be performed at least every six months. The monitoring shall continue until at least two consecutive measurements taken at least seven days apart are at or below the action level. If these results are achieved, further exposure determinations need not be repeated unless a change occurs;
- If the initial or subsequent assessment reveals exposure above the PEL then further assessments shall be performed at least every three months. The monitoring shall continue until at least two consecutive measurements taken at least seven days apart are at or below the action level;
- If initial or subsequent assessments reveal exposure above the PEL, then further exposure assessments shall be performed at least every three months. The monitoring shall continue until at least two consecutive measurements taken at least seven days apart are at or below the PEL but above the action level.

Further exposure determination shall be performed at least every six months. The monitoring shall continue until at least two consecutive measurements taken at least seven days apart are at or below the action level. At that time further exposure assessments need not be repeated unless a change occurs.

Additional monitoring shall be conducted whenever there has been a change of equipment, process, controls, personnel or a new task has been initiated.

#### H. Employee Notification

The employer shall notify, in writing, each employee who has undergone monitoring within five working days after completion of the exposure assessment. The written notice shall include statements indicating if the exposure was at or above the PEL and the corrective action (s) taken to reduce exposures to below the PEL.

## VI. MEDICAL MONITORING

The University shall provide medical evaluations, provided by a licensed medical facility designated by the University, at no cost to the employee, in accordance with the University policy as follows:

- Employees and student employees exposed or potentially exposed (through work related activities) on any one day to lead at or above the action level;
- Medical evaluations will be performed as part of the pre-employment requirements for new hires whose jobs involve exposure or potential exposure to lead at or above the action level;
- Medical evaluations will be performed on an annual basis for all employees whose jobs involve exposure or potential exposure to lead at or above the action level;
- Routine medical evaluations shall include a general physical examination performed by a licensed physician or physician assistant (PA). In addition, a pulmonary function test (PFT) and biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin (ZPP) levels will be conducted;
- The university's medical record keeping department shall inform the individual departments that medical testing has been completed for a specific employee and that their observed blood lead levels and ZPP levels are within acceptable parameters to work with lead. This notification shall be made in writing;
- The university's medical record keeping office shall inform the Department of Environmental Health & Safety (EH&S) in writing if the employee has been determined, by a physician or PA, to be medically fit to be respirator fit tested. The department supervisor is responsible for scheduling annual respirator fit tests with the Department of Environmental Health & Safety (EH&S) for each employee required to use respiratory protection to perform required work related activities; and
- Copies of individual medical records or test results shall be available to the employee from the university's medical record keeping office upon request.

### A. General Requirements

The content of the general medical evaluation shall be determined by the examining physician and will include at a minimum:

- A detailed work history and a medical history, with attention to past lead exposure (both occupational and non-occupational), personal habits (including but not limited to smoking and hygiene) and past gastrointestinal, hematological, renal, cardiovascular, reproductive and neurological problems;

- A thorough physical examination with particular attention to teeth, gums, hematological, gastrointestinal, renal, cardiovascular, and neurological systems. Pulmonary status should be evaluated if respiratory protection will be used;
- Blood pressure;
- Blood sample and analysis which determines (1) blood lead levels, (2) hemoglobin/hematocrit determinations, red cell indices and examination of peripheral smear morphology, (3) zinc protoporphyrin (ZPP), (4) blood urea and nitrogen, and (5) serum creatinine;
- Routine urinalysis with microscopic examination; and
- Any laboratory or other tests relevant to lead exposure which the examining physician determines necessary by sound medical practice.

#### B. Special Medical Requirements

In addition to the general medical requirements the following special requirements biological monitoring in the form of blood sampling and analysis for lead and ZPP levels will be conducted as follows:

- Biological monitoring shall occur at least annually for those employees that are exposed or exposed periodically during that year. For employees who consistently perform work associated with lead exposure at or above the action level, biological monitoring shall occur at least every two months for the first six months the employee is monitored under this surveillance program and then every six months thereafter;
- For employee exposures that are project specific, biological monitoring shall occur prior to the start of the project and immediately after the project has been completed;
- Employees whose blood lead levels are determined to be at or above 40 milligrams per deciliter (mg/dl) shall be monitored at least every two months until two consecutive blood samples and analyses indicate a blood lead level below 40 mg/dl ;
- Employees who have been restricted or removed from exposure to lead due to an elevated blood lead level (>50mg/dl) shall be monitored at least monthly during the restricted period.

#### C. Medical Removal

The University shall remove any employee from work where the exposure to lead is expected to meet or exceed the action level if that employee's periodic and follow-up blood sampling test indicates that the employee's blood lead level is at or above 50 mg/dl or if it is determined through the medical evaluation that the employee has a medical condition which places the employee at increased risk of material impairment to health from exposure to lead. The employee may be returned to the restricted

activity only when two consecutive blood sampling tests indicate that the employee's blood lead levels are at or below 40 mg/dl or if the medical condition resulting in the original restriction is no longer detected.

**VII. RESPIRATORY PROTECTION**

Respiratory protection shall be used by employees as follows:

- During periods necessary to install or implement engineering or work practice controls;
- For work operations for which engineering or work practice controls are not sufficient to reduce employee exposures to or below the PEL; or
- For periods when an employee requests a respirator.

Any employee using a respirator shall comply with the requirements of the Universities Respiratory Protection Program. The appropriate level of respiratory protection shall be selected from the following table:

<b>Airborne Concentration of Lead or Condition of Use</b>	<b>Minimum Required Respirator</b>
Not in excess of 500 $\mu\text{g}/\text{m}^3$	½ mask air purifying respirator with HEPA filters
Not in excess of 1,250 $\mu\text{g}/\text{m}^3$	Loose fitting hood or helmet powered air purifying respirator with HEPA filters
Not in excess of 2,500 $\mu\text{g}/\text{m}^3$	Full face air purifying or powered air purifying respirator with HEPA filters
Not in excess of 50,000 $\mu\text{g}/\text{m}^3$	Full face supplied air respirator

**VIII. PROTECTIVE CLOTHING**

If, during the course of a workers activity, the employee is exposed to lead above the PEL or where the employee is exposed to lead compounds which may cause skin or eye irritation, the university shall provide, and assure that the employee uses appropriate protective work clothing and equipment. Protective clothing and equipment shall be selected to ensure that contamination of the employee and the employee's clothing does not occur and may include such items as:

- Coveralls or other full-body work clothing;
- Gloves, hats and shoes or disposal shoe covers; and
- Face shields, vented goggles or other appropriate protective equipment.

The university shall provide adequate clean protective clothing required to perform a specified task. These will be provided at no cost to the employee. Protective clothing and equipment shall be repaired and or replaced as needed to maintain effectiveness. All used or contaminated protective clothing shall be stored in a closed container, which, prevents the dispersion of lead outside of the container. The container shall be located in a secure area, preferably in the change area.

#### IX. HYGIENE FACILITIES AND PRACTICES

The university shall assure that in areas where employees are exposed to lead above the PEL; eating and drinking, use of tobacco products or cosmetics are not used. In addition employees shall be provided with a change area with separate storage areas for protective work clothing and equipment and for street clothing which prevents cross contamination.

Where feasible, the employer shall provide shower facilities for use by any employee working in an area where they may be exposed to lead above the PEL. At a minimum, the employer shall provide adequate hand washing facilities for use by employees exposed to lead. Where showers are not available, the employer shall ensure that employees wash their hands and faces at the end of the work shift or prior to the start of work breaks.

#### X. TRAINING

The university shall provide lead training to all employees who are subject to exposure to lead at, or above, the action level on any given day or who are subject to exposure to lead compounds which may cause skin or eye irritation, and ensure employee participation. This training shall be provided at least annually for each employee and shall be mandatory for the affected personnel. The training shall include:

- A review of the contents of 29 CFR 1926.62 and its appendices;
- The specific nature of operations which could result in exposure to lead above the action level;
- The purpose, proper selection, fitting, use and limitations of respirators;

- The purpose and a description of the medical surveillance program and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant);
- The engineering controls and work practices associated with the employee's job assignment including training of employees to follow relevant good work practices;
- A review of the contents of the university's compliance program; and
- The employees right to access personal medical and monitoring records.

Attendance at each training session shall be recorded by the use of a "sign-in" sheet and records maintained as proof of attendance. Attendance records of these training sessions shall be maintained for a period of not less than three years.

#### XI. RECORD KEEPING

The University shall establish and maintain an accurate record of all monitoring and other data used in conducting employee exposure assessments. Exposure monitoring records shall include:

- The date, number, duration, location and results of each sample taken if any, including a description of the sampling procedure used to determine representative employee exposure where applicable;
- A description of the sampling and analytical methods used and evidence of their accuracy;
- The type of respiratory protective devices worn, if any;
- The name, social security number and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent; and
- The environmental variables that could effect the measurement of employee exposure.

Monitoring records shall be maintained for a period of thirty years. Copies of these records shall be made available, upon request, to affected employees or former employees or their representatives.

