

Lead

S412 | ©SAIF 07.22

saif
Work. Life. Oregon.

Table of contents

An overview	4
Step-by-step approach	4
Background	4
General information	5
Location	5
Health hazards	5
Routes of entry into the body	6
Factors affecting the magnitude of occupational risk	6
Prevention of occupational poisoning	6
The occupational lead standard	7
Highlights of the general industry lead standard:	7
Exposure monitoring	7
Methods of compliance (when employee exposure exceeds the PEL)	7
Written compliance plan	8
Mechanical ventilation	8
Administrative controls	8
Respiratory protection	9
Protective work clothing and equipment	10
Cleaning and replacement	10
Housekeeping	10
Hygiene facilities and work practices	11
Medical surveillance	11
Medical examinations and consultations	11
Employee training and information	12
Signs	13
Recordkeeping	13
Resources	14

Appendix 1: lead flow chart.....	15
Appendix 1A: program requirements when air monitoring results show levels less than the action level (30 µg/m³)	16
Appendix 1B: program requirements when air monitoring results show levels between the action level and the PEL (between 30 -- 50 µg/m³).....	16
Appendix 1C: program requirements when air monitoring results show levels above the PEL (50 µg/m³) for less than 30 days per year	17
Appendix 1D: program requirements when air monitoring results show levels above the PEL (50 µg/m³) for more than 30 days per year.....	19

This publication provides practical workplace safety and health information to assist you in making your place of work safer. It is not legal advice. SAIF has made every effort to bring significant Oregon Occupational Safety and Health Administration (Oregon OSHA) regulations to your attention. Nonetheless, compliance with Oregon OSHA remains your responsibility. You should read and understand all relevant Oregon OSHA regulations that apply to your job site(s). You may want to consult with your own attorney regarding aspects of Oregon OSHA that may affect you.

Note: The information in this publication is time sensitive. Do not rely upon this document if its publication date is more than three years old. Please check the "Safety and health" section of our web site at saif.com/safetyandhealth for a more recent, printable copy. You'll also find a variety of other valuable safety information designed to help your business prevent injuries and control costs.

An overview

Lead is an element that found great utility in our civilization and can cause great harm. Many industrial processes use lead, with resulting worker exposures. When uncontrolled, the health effects for the worker and his/her family can be great. The Oregon Occupational Safety and Health Division (Oregon OSHA) has a special standard for lead.

SAIF Corporation developed this guide to provide employers with knowledge of the rules for lead, the toxic effects of lead and how to control exposures to lead. Before reading this guide, you need to assess whether you have lead in your workplace:

- Review your Hazard Communication Program and your Safety Data Sheets
- (SDSs) to make this determination.

If you do have lead exposures, ask whether you need the lead in your process. It would be best if the lead could be substituted with something less toxic.

If you eliminate lead from your workplace, then going through the extensive controls for lead is unnecessary. You can stop here. However, if lead is essential to your operation, then this guide will help you control this exposure to your employees.

Step-by-step approach

1. Review the Oregon OSHA rules on lead (Oregon Administrative Rules 437, Division 2, Subdivision Z: Lead 1910.1025)
2. Review your Hazard Communication Program and determine whether you have lead at your workplace.
3. If you have lead at your workplace, clearly identify the staff member responsible for developing, implementing, and monitoring the lead program. If there is an airborne exposure to lead, monitor the airborne levels by having initial and periodic air sampling conducted for lead.
4. Follow the Lead Flow Chart to complete your program. (See Appendix 1)

Background

Lead (Pb) is a natural constituent of the earth's crust, the atmosphere and hydrosphere. It has been used for thousands of years because of its availability and desirable properties. In the early days, there was recognition of the health hazards associated with lead. It was found that lead could be absorbed by inhalation and ingestion and that lead absorption was responsible for loss of movement in printers' fingers exposed to heated lead and for "dry gripes" in pottery and glass workers. By the early 20th century, studies revealed that the absorption of excessive quantities of lead (lead intoxication or plumbism) caused disease of the kidney and peripheral and central nervous systems.

This document consists of three major parts.

- The first part covers general information regarding the hazards of lead and general control principles

- The second part summarizes the Oregon Occupational Safety and Health Code OAR (Oregon Administrative Rules), Division 2, General Occupational Safety and Health Rules (29 CFR 1910) Subdivision Z: Toxic & Hazardous Substances: Lead (1910.1025).
- The final section includes a lead flow chart and appendices that describe the code requirements based on exposure levels.

General information

Lead is a heavy metal. It is most hazardous in the form of dust or as metal fume which is caused by burning or welding. Lead is not typically absorbed through skin, except tetraethyl and tetramethyl lead, which are used in gasoline.

Location

Industries with potential lead exposures include battery plants, radiator repair shops, sawmills that use lead babbitts, ship dismantling, paint manufacturing, auto body shops, lead based paint, foundries, smelters, circuit board manufacturing, lead abatement activities, and dress cleaning. A variety of different industrial processes, such as welding, grinding, and abrasive blasting also have potential lead exposures. Schools also have potential exposures to lead in stained glass, ceramics, and painting processes.

Health hazards

Effects on the blood: Lead inhibits the body's ability to produce heme, part of the molecule hemoglobin, which is responsible for oxygen transport in the red blood cells of mammals. It also reduces the life span of the red blood cells. The result is anemia. Anemia symptoms include weakness, tiredness, pallor, headache, and irritability.

Effects on the nervous system: Lead affects both the central nervous system (brain and spinal cord) and the peripheral nervous system. Symptoms of lead exposure range from coma, heart or lung stoppage, and fatal brain damage at very high levels, to subtle behavior and nervous system changes at low levels. There is also a tendency for muscular weakness to develop at the same time with the above symptoms. This weakness may progress to paralysis often observed as a characteristic "wrist drop" or "foot drop" and is called peripheral neuropathy.

Effects on the kidneys: Lead also affects the kidneys, in two different ways. It affects the ability of the tubes in the kidneys to reabsorb sugars, protein's building blocks (amino acids), and phosphates. These effects are reversible with therapy. Other problems with the kidneys occur with prolonged high lead exposures. Progressive kidney disease from high lead exposure leads to scarring between the tissues of the kidneys, scarring with the blood vessels in the kidney and a wasting away of the kidney's tubes. Death may ensue from kidney failure.

Reproductive effects: Among male workers, symptoms of overexposure include impotence, decreased ability to produce healthy sperm, and sterility. Among female workers, symptoms of overexposure include abnormal ovarian cycles, menstrual disorders, premature childbirth, sterility, spontaneous miscarriage, and stillbirth. Infants of mothers with lead poisoning have lower birth weights, slower growth, and nervous system disorders.

Routes of entry into the body

Lead may be absorbed through the lung via airborne dust or fume, or ingested via food, contaminated drinks, cosmetics, and cigarettes contaminated with lead. Employees' families may be exposed to lead from contaminated clothing and articles brought home from the place of employment or from painted surfaces. Children six years old and younger are more at risk than adults.

Factors affecting the magnitude of occupational risk

The process: The process is important. High processing temperatures, extensive fume, dust or aerosol formation, and outdated working methods increase the risk--the more extreme the conditions, the greater the risk.

Engineering controls: The adequacy of the elimination technique used directly impacts the occupational lead exposure. Efficient ventilation, combined with prevention techniques to reduce or eliminate the spreading of lead dust, greatly reduce the risk. The two methods of ventilation used are dilution ventilation and local exhaust ventilation. Dilution ventilation (general ventilation) is the dilution of contaminated air with uncontaminated air for the purpose of controlling potential airborne health hazards, fire and explosive conditions, odors, and nuisance type contaminants. Due to lead's toxicity, dilution ventilation alone is usually not recommended as a control measure for lead exposures.

Local exhaust ventilation (LEV) is the most desirable method for removal of lead fume and dust in the workplace. Effective local exhaust systems capture and remove the contaminant prior to it entering the employee's breathing zone and the general work environment.

Workplace hygiene: Housekeeping, personal hygiene, and personal protective equipment (PPE) have an impact on the magnitude of workplace exposure.

Prevention of occupational poisoning

Substitution by less toxic substances: The ideal method of prevention is the substitution for a toxic agent with one less toxic in nature. This can be a challenging decision. Some material substitutes have little information available as to the toxic effects, so research into the substitute material should be extensive.

Ventilation: An effective (LEV) system is one of the best methods for the control of atmospheric contamination. The air must not be re-circulated or discarded in a way that would cause environmental pollution. It is important to remember that open windows and doors or cooling fans can interfere with the effectiveness of the ventilation system. Regular cleaning and maintenance of the ventilation system is critical.

Housekeeping: The prevention of spreading of dust and fume is critical to minimize exposure. Vacuuming is the preferred method, by use of a HEPA (high efficiency particulate air filter). Proper use of a HEPA vacuum prevents the dust from being dispersed back into the air. It is important that when the HEPA vacuums are cleaned and the filter disposed, that dust be controlled to minimize the reentry of lead into the workplace. Use of compressed air to clean floors and other surfaces is absolutely prohibited.

Eating, drinking, smoking, and applying lip balm and cosmetics must be prohibited in areas where lead is used.

Hygiene facilities such as lunchroom change room and showers may be needed for employees exposed to lead.

Protective coveralls or clothing must be laundered by the employer. Contaminated clothing must be properly bagged and labeled before being sent to a laundry facility.

Personal protective equipment (PPE): Use personal protective equipment when engineering control measures fail to reduce exposures to an acceptable level. The type of respiratory protection recommended varies according to the airborne concentration of lead.

The occupational lead standard

- The Oregon Administrative Rule, Chapter 437, Division 2, General Occupational Safety and Health Rules (29 CFR 1910) Subdivision Z: Toxic & Hazardous Substances: LEAD (1910.1025) applies to all occupational exposures to lead excluding construction and agriculture.

Highlights of the general industry lead standard:

The action level (AL) and permissible exposure limit (PEL)

- Action Level Exposure is $30 \mu\text{g}/\text{m}^3$ averaged over an eight-hour period.
- Time Weighted Average Permissible Exposure Limit (TWA-PEL) is 50 micrograms of lead per cubic meter of air ($\mu\text{g}/\text{m}^3$) averaged over an eight-hour period.
- For employees exposed to lead more than 8 hours in any workday, the PEL must be reduced according to the following formula:
 - Maximum permissible limit ($\mu\text{g}/\text{m}^3$) = $400 \div \text{hours worked in the day}$

Exposure monitoring

It is each employer's responsibility under the statute to determine employee exposures to lead at or above the action level. The standard bases these provisions only on exposure levels and applies whether the employees wear respiratory protection. Employees must be told of the exposure monitoring results within 15 working days of receipt.

Methods of compliance (when employee exposure exceeds the PEL)

Engineering and work practice controls: If an employee is exposed to lead above the PEL for more than a total of 30 days per year, the employer must implement engineering and work practice controls (including administrative controls) to reduce and maintain employee exposures to lead below the PEL.

Wherever the engineering and work practice controls, which can be implemented, are not sufficient to reduce employee exposure to or below the PEL, the employer shall nonetheless use them to reduce exposures to the lowest feasible level and shall supplement them using respiratory protection. Where any employee is exposed to lead above $200 \mu\text{g}/\text{m}^3$, but for 30 days or less per year, the employer shall implement engineering controls to reduce exposures at or below 200

$\mu\text{g}/\text{m}^3$. If the employee exposure is below $200 \mu\text{g}/\text{m}^3$ but above $50 \mu\text{g}/\text{m}^3$, any combination of engineering, work practice (including administrative controls), and respiratory controls may be implemented to reduce and maintain employee lead exposure to or below $50 \mu\text{g}/\text{m}^3$.

Written compliance plan

A written compliance plan is needed if the employer must reduce exposures to or below the PEL by means of engineering and work practice controls. The plan must be readily accessible at the workplace. The written plan must include the following:

1. A description of each operation in which lead is emitted; e.g., machinery used, material processed, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices.
2. A description of the specific ways compliance is to be achieved.
3. A report of the technology used in meeting the PEL.
4. Air monitoring data which documents the source of lead emissions.
5. A detailed schedule for implementation of the program, including proof of orders for equipment or construction contracts.
6. A work practice program (respiratory protection and/or administrative controls).
7. An administrative control schedule (how employees will be rotated, hours of work planned).
8. Other relevant information.

The written plan must be revised and updated at least annually to reflect the current status of the program.

Mechanical ventilation

The employer must measure to determine the effectiveness of any mechanical ventilation system used to control lead exposure. The parameters for measurement that the employer can use are the capture velocity, duct velocity, or static pressure. Take these measurements at least every three months. If any change in the production process occurs, the employer is required to complete measurements of the mechanical ventilation system. The regulations allow the employer five days after the change of the process to complete the measurements.

Recirculation of exhaust air in the workplace must be accompanied by high efficiency filters with reliable back up as well as a monitoring system to test the levels of lead in the return air and set up so that the system will bypass the recirculation if the system fails.

Administrative controls

Employers are required to maintain a job rotation schedule if the company uses administrative controls to reduce employee exposures. The schedule must include:

1. Name or identification number of each affected employee.
2. Duration and exposure levels at each job or workstation where each affected employee is located; and
3. Any other information which may be useful in assessing the reliability of administrative controls to reduce exposure to lead.

Respiratory protection

Respiratory protection is recommended for reduction of employee exposure to hazardous levels of lead when engineering controls or work practice controls are not adequate, periods when an employee requests a respirator, and while improvements are being made. Respirators are to be provided at no cost to employees.

Employers must:

1. Select, and provide to employees, the appropriate respirators specified in paragraph (d)(3)(i)(A) of 29 CFR 1910.134.
2. Provide employees with full facepiece respirators instead of half mask respirators for protection against lead aerosols that cause eye or skin irritation at the use concentrations.
3. Provide HEPA filters for powered and non-powered air-purifying respirators.
4. Provide employees with a powered air-purifying respirator (PAPR) instead of a negative pressure respirator.

Respirators can cause some people distress, as they increase breathing resistance and decrease communications between workers. If an employee has breathing difficulty during fit testing or respirator use, the employer must provide the employee with a medical examination (with no cost to the employee) to determine whether the employee can use a respirator while performing the required duty.

Airborne concentration of lead or condition of use	Required respirators
Not in excess of 0.5 mg/m ³ (10 x PEL)	Half-mask, air-purifying respirator equipped with high efficiency filters
Not in excess of 2.5 mg/m ³ (50 x PEL)	<ol style="list-style-type: none"> 1. Full facepiece, air-purifying respirator with high efficiency filters 2. Half-mask powered air-purifying respirator (PAPR) with high efficiency filters
Not in excess of 50 mg/m ³ (1000 x PEL)	<ol style="list-style-type: none"> 1. Any full facepiece powered, air-purifying respirator with high efficiency filters 2. Half mask supplied-air respirator operated in positive pressure mode 3. A full facepiece supplied-air respirator (SAR) or airline respirator in continuous or pressure-demand or other positive-pressure mode
Not in excess of 500 mg/m ³ (10,000 x PEL)	Full facepiece or helmet/hood self-contained breathing apparatus (SCBA) in pressure-demand or other positive-pressure mode
Greater than 500 mg/m ³ or unknown concentration	Full facepiece, SCBA in pressure-demand mode

A respiratory protection program is required to be instituted in accordance with Oregon OSHA regulations 29 CFR 1910.134 (b) through (d) except (d) (1) (iii), and (f) through (m).

Protective work clothing and equipment

When employees are exposed to lead above the PEL or where skin or eye irritation may occur, appropriate protective clothing must be provided. Such equipment may include:

1. Full body suit or coveralls
2. Gloves, hats, and shoes or disposable shoe coverlets
3. Face shields or vented goggles

Cleaning and replacement

For protective clothing to function, it needs to be clean and dry. The employer is required to provide clean, dry clothing at least weekly. For employees whose exposures exceed $200 \mu\text{g}/\text{m}^3$ as an eight-hour TWA, employers are required to provide clean protective clothing daily. The employer is responsible for cleaning, laundering, disposal, and maintenance of protective clothing.

It is important to place contaminated clothing being removed, laundered, cleaned, or otherwise sent for disposal in a closed container in the change room. This prevents lead dispersion in the workplace, and possibly to home. The employer is required to notify the laundering company in writing of the potentially harmful effects of lead. The laundry containers must have the following label:

DANGER
CLOTHING AND EQUIPMENT CONTAMINATED WITH LEAD. MAY DAMAGE FERTILITY OR THE UNBORN CHILD. CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM. DO NOT EAT, DRINK OR SMOKE WHEN HANDLING. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS.

Prior to June 1, 2015, employers may include the following information on laundry containers in lieu of the labeling requirements mentioned above:

CAUTION
CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS

Housekeeping

Keep work surfaces free of accumulations of lead. For example, vacuum regularly work surfaces contaminated with dust from a lead operation. However, be aware that vacuums can contribute to lead contamination, unless employees use a vacuum equipped with a high efficiency filter and employ work practices during emptying which preclude contamination. Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other equally effective methods

have been tried and found not to be effective. Using compressed air for blowing lead dust from surfaces should not be allowed.

Hygiene facilities and work practices

When exposures exceed the PEL, food or beverage consumption, tobacco products use, and cosmetics use in the work area should be prohibited and restricted to change rooms, lunchrooms, and showers.

The code also requires that the employer provide change rooms, showers, and lunchrooms when exposures exceed the PEL, without regard to the use of respirators. Furnish the change rooms with separate storage facilities for protective work clothing and equipment and for street clothes to prevent cross contamination.

Employees must shower at the end of the work shift before leaving the workplace. The employee cannot take clothing or equipment worn during work home with them. The regulations require one shower for every 5 (10 outside Oregon) employees of each sex during the same shift. The employer must also furnish body soap, hot and cold water, and clean towels.

The employer is also required to provide lunchrooms. This facilitates good personal hygiene and provides opportunities for employees to eat in areas other than their work area. The lunchroom facility needs a temperature controlled, positive pressure, filtered air supply, and needs to be readily accessible to employees. Employees are not to use the lunchroom with protective work clothing or equipment on unless they have decontaminated their clothing and/or equipment.

The employer shall assure that employees, who work in areas where their airborne exposure to lead is above the PEL without regard to the use of a respirator, wash their hands and face prior to eating, drinking, smoking, or applying cosmetics.

Medical surveillance

It is required for the employer to set up a medical surveillance program at no cost to the employees if they are over the action level for more than 30 days per year. The action level for lead is $30 \mu\text{g}/\text{m}^3$. Each employee covered must have blood lead monitoring at least every six months.

If blood analysis indicates that the blood level is at or above $40 \mu\text{g}/100 \text{ g}$ of whole blood, then blood sampling and analysis needs to take place at least every two months until two consecutive blood samples show a blood level below the $40 \mu\text{g}/100 \text{ g}$ of whole blood.

An employee is to be removed from work having exposure to lead at or above the action level whenever the averages of the last three blood samples or the average of the previous six-month tests (whichever is longer) indicate that the employee's blood lead level is at or above $50 \mu\text{g}/100 \text{ g}$ of whole blood. An employee covered by the medical removal program is to receive benefits during the removal time equal to the amount at the time of removal. Specific requirements for medical removal protection can be found in the appendices of the lead standard.

Medical examinations and consultations

Medical examinations for each covered employee are required on the following schedule:

1. At least annually for anyone having a blood lead level of $40 \mu\text{g}/100 \text{ g}$ during the preceding 12 months.

2. Prior to assignment for each employee assigned to an area having lead above the action level.
3. As soon as possible when an employee notifies the employer of health effects associated with lead exposure, wishes for medical advice concerning fertility or has had difficulties breathing with a respirator.

The medical examination is to include work history and a medical history with particular attention to past lead exposure, personal habits, past gastrointestinal, hematological, renal, cardiovascular, reproductive, and neurological problems. A physical examination must include attention to the teeth, gums, blood, gastrointestinal, renal, cardiovascular, and neurological systems, and blood pressure. The blood work includes blood lead level; hemoglobin and hematocrit determinations, red cell indices, cell morphology; zinc protoporphyrin; blood urea nitrogen, and serum creatinine. If the employer selects the initial examining physician, then the employee is allowed to select a second physician. All employees must be notified of the right for a second opinion.

The employer must provide the examining physicians with the following information:

1. A copy of the Oregon OSHA lead standard
2. A description of the affected employee's duties
3. The employee's exposure level or anticipated level to lead or any other toxic substance
4. A description of any personal protective equipment used
5. Prior blood lead determinations
6. All prior written medical opinions concerning the employee under the employers' control

The employer is to obtain and furnish the employee with a copy of the written medical opinion. This must include the opinion as to whether the employee can safely work at the assigned job, any special protective measures indicated, any limitations on employee's use of respirators, and the blood lead results.

The employer shall remove an employee from work having an exposure to lead at or above the action level on each occasion that the average of the last three blood sampling tests conducted pursuant to this section (or the average of all blood sampling tests conducted over the previous six months, whichever is longer) indicates that the employee's blood lead level is at or above 50 µg/100 g of whole blood; provided, however, that an employee need not be removed if the last blood sampling test indicates a blood lead level at or below 40 µg/100 g of whole blood.

Employee training and information

All employers who have a workplace which has a potential exposure to airborne lead at any level should inform their employees of the content of Appendixes A and B of the Oregon OSHA lead standard.

The employer should provide training prior to the time of job assignment and annually thereafter for all employees who are potentially exposed to airborne lead at or above the action level. Those employees who have the possibility of skin or eye irritation from lead exposure should also be included in the training.

The contents of training must include:

1. The contents of the Oregon OSHA lead standard and its appendices. Copies of the lead standard and its appendices should be made available for the effected employees.
2. The specific nature of the operations which could result in overexposure to lead.

3. The purpose, proper selection, fitting, use and limitations of respirators, and any other personal protective equipment used.
4. The purpose and 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 reproduction effects on both males and females).
5. The engineering controls and work practices associated with the employee's job assignment.
6. The contents of any compliance plan in effect.
7. Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician.

Signs

Warning signs must be posted in areas where the PEL is exceeded. The employer must assure that no statement appears on or near any sign required by this paragraph which contradicts or detracts from the meaning of the required sign. The signs are required to be stated:

DANGER
LEAD
MAY DAMAGE FERTILITY OR THE UNBORN CHILD
CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM
DO NOT EAT, DRINK OR SMOKE IN THIS AREA

Prior to June 1, 2016, employers may use the following warning sign in lieu of that listed above:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

Recordkeeping

The employer must maintain a record of all exposure monitoring data, medical surveillance data and medical removal data. The employer must also keep these monitoring records for at least 40 years or for the duration of employment plus 20 years, whichever is longer.

Resources

Oregon OSHA topic page: lead

<http://osha.oregon.gov/Pages/topics/lead.aspx>

Oregon OSHA Quick Fact Sheets in English and Spanish:

<http://osha.oregon.gov/OSHAPubs/factsheets/qf011.pdf>

<http://osha.oregon.gov/OSHAPubs/factsheets/qf012.pdf>

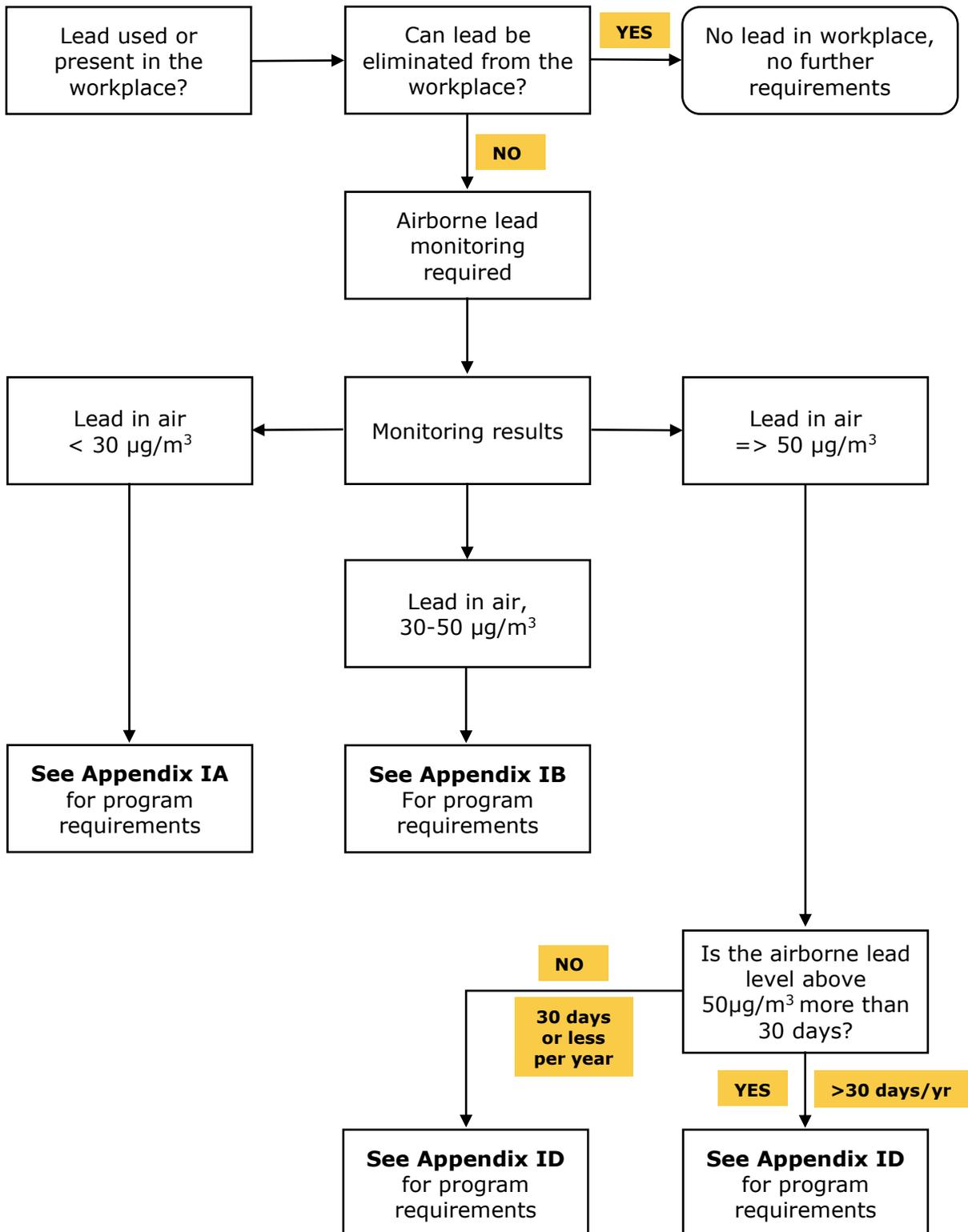
Federal OSHA safety and health topics: lead

<http://www.osha.gov/SLTC/lead/index.html>

CDC/NIOSH workplace safety & health topics: lead

<https://www.cdc.gov/niosh/lead/index.html>

Appendix 1: lead flow chart



Appendix 1A: program requirements when air monitoring results show levels less than the action level (30 µg/m³)

1. Record employee(s) exposure level(s).
2. Record any information, observations, or calculations which would indicate employee exposure to lead, any previous measurements of airborne lead, and any employee complaints of symptoms which may be attributable to exposure to lead.
3. Record any monitoring for initial determination (this may be limited to a representative sample of the exposed employees who you believe are exposed to the greatest airborne concentrations of lead in the workplace). Monitoring completed within 12 months may be used to satisfy this requirement.

Record the:

- Date of determination,
 - Location within the work site
 - Names and social security numbers of each employee monitored (Oregon OSHA doesn't require this)
4. Notify the affected employees of monitoring results within fifteen working days after receipt of those results.
 5. Repeat the monitoring whenever there has been a production, process, control, or personnel change which may result in new or additional exposure to lead, or whenever you feel there is a new or additional exposure to lead for your employees.

Appendix 1B: program requirements when air monitoring results show levels between the action level and the PEL (between 30 -- 50 µg/m³)

1. Repeat the monitoring every six months.
2. Notify the affected employees of monitoring results within 15 working days after receipt of those results.
3. Medical monitoring is necessary if air samples show lead at greater than 30 µg/m³ for more than 30 days per year (see 1910.1025 Medical Surveillance Guidelines).
4. Possible medical removal if blood lead is greater than 60 µg/100 grams of blood (see 1910.1025 Medical Surveillance Guidelines).
5. Annual employee training, using Appendix A and B of the lead standard.
6. Continue monitoring until at least two consecutive measurements, taken at least seven days apart, are below the action level. At this time, you can discontinue monitoring for that employee.
7. Repeat the monitoring whenever there has been a production, process, control, or personnel change which may result in new or additional exposure to lead or whenever you feel there is a new or additional exposure to lead for your employees.

Appendix 1C: program requirements when air monitoring results show levels above the PEL (50 µg/m³) for less than 30 days per year

1. Repeat monitoring quarterly.
2. Notify employees of the results of each monitoring within 15 working days of receipt of the results.
3. Engineer the concentration to less than 200 µg/m³.
4. Use administrative controls and respiratory protection to reduce the exposure to less than 50 µg/m³ (see 1910.1025(e)(5) and 1910.1025(f)).
5. If the engineering and work practice controls do not reduce the employee exposure to or below the 50 µg/m³ PEL, supplement these controls with respiratory protection.
6. If all the above are not sufficient to reduce the exposure to or below the PEL, you nevertheless need to use them to reduce exposures to the "...lowest feasible level and shall supplement them by the use of respiratory protection..."
7. Establish a written compliance program, including:
 - Description of each operation where lead is emitted
 - Description of specific means used to achieve compliance
 - Engineering plans, studies, etc.
 - Report of the technology considered in meeting the PEL
 - Air monitoring data which documents the source of lead emissions ■ Schedule for implementation
 - Work practice program
 - Administrative control schedule
 - Other relevant information
 - Revise and update the written program at least every six months to reflect the current status of the program
8. Establish a mechanical ventilation program when ventilation is used to control lead exposures (see 1910.1025(e)(4))
9. Establish procedures for use of protective work clothing and equipment, including:
 - Provisions and use
 - Cleaning and replacement
 - Dry and clean clothing at least weekly and daily to employees exposed to over 200 µg/m³ for an 8-hour TWA.
 - Provide cleaning, laundering, or disposal of protective clothing and equipment.
 - Repair or replace required protective clothing and equipment as needed to maintain their effectiveness.
 - Ensure that all protective clothing is removed at the completion of a work shift only in change rooms provided for that purpose

- Assure that contaminated protective clothing which is to be cleaned, laundered, or disposed of is placed in a closed container in the change room which prevents dispersion of lead outside the container.
- Inform in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of exposure to lead.
- Ensure that containers of contaminated protective clothing and equipment are labeled as below:

DANGER

CLOTHING AND EQUIPMENT CONTAMINATED WITH LEAD. MAY DAMAGE FERTILITY OR THE UNBORN CHILD. CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM. DO NOT EAT, DRINK OR SMOKE WHEN HANDLING. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS

Prior to June 1, 2015, employers may include the following information on bags or containers of contaminated protective clothing and equipment in lieu of the labeling requirements above

CAUTION

CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS

Prohibit the removal of lead from protective clothing or equipment by blowing, shaking or any other means which disperses lead into the air.

10. Establish housekeeping procedures which deal with sweeping and vacuuming the floors (see 1910.1025(h)).
11. Establish hygiene facilities and practices (see 1910.1025(i)), including:
 - Change rooms
 - Showers
 - Lunchrooms
 - Lavatories
12. Annual training, using the Appendix A and B of the Oregon OSHA lead standard.

Appendix 1D: program requirements when air monitoring results show levels above the PEL (50 µg/m³) for more than 30 days per year

1. Repeat monitoring quarterly.
2. Notify employees of the results of each monitoring within 15 working days of receiving the results.
3. Implement engineering and work practice controls to reduce and maintain employee exposure to lead in accordance with Table 1, except if you can demonstrate that such controls are not feasible.
4. If the engineering and work practice controls do not reduce the employee exposure to or below the 50 µg/m³ PEL, supplement these controls with respiratory protection.
5. Use administrative controls and respiratory protection to reduce the exposure to less than 50 µg/m³.
6. If all the above are not sufficient to reduce the exposure to or below the PEL, you nevertheless need to use them to reduce exposures to the "...lowest feasible level and shall supplement them by the use of respiratory protection..."
7. Establish a written compliance program, including:
 - Description of each operation where lead is emitted
 - Description of specific means used to achieve compliance
 - Engineering plans, studies, etc.
 - Report of the technology considered in meeting the PEL
 - Air monitoring data which documents the source of lead emissions
 - Schedule for implementation
 - Work practice program
 - Administrative control schedule
 - Other relevant information
 - Revise and update the written program at least every six months to reflect the current status of the program
8. Establish a mechanical ventilation program when ventilation is used to control lead exposures (see 1910.1025(e)(4)).
9. Establish procedures for use of protective work clothing and equipment, including:
 - Provisions and use
 - Cleaning and replacement
 - Dry and clean clothing at least weekly, and daily to employees exposed to over 200 µg/m³ for an 8-hour TWA.
 - Provide cleaning, laundering, or disposal of protective clothing and equipment.
 - Repair or replace required protective clothing and equipment as needed to maintain their effectiveness.

- Ensure that all protective clothing is removed at the completion of a work shift only in change rooms provided for that purpose.
- Assure that contaminated protective clothing which is to be cleaned, laundered, or disposed of is placed in a closed container in the change room which prevents dispersion of lead outside the container.
- Inform in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of exposure to lead.
- Ensure that containers of contaminated protective clothing and equipment are labeled as below:

DANGER

CLOTHING AND EQUIPMENT CONTAMINATED WITH LEAD. MAY DAMAGE FERTILITY OR THE UNBORN CHILD. CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM. DO NOT EAT, DRINK OR SMOKE WHEN HANDLING. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS

Prior to June 1, 2015, employers may include the following information on bags or containers of contaminated protective clothing and equipment in lieu of the labeling requirements above

CAUTION

CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS.

Prohibit the removal of lead from protective clothing or equipment by blowing, shaking or any other means which disperses lead into the air.

10. Establish housekeeping procedures which deal with sweeping and vacuuming the floors (see 1910.1025(h)).
11. Establish hygiene facilities and practices (see 1910.1025(i)), including:
 - Change rooms
 - Showers
 - Lunchrooms
 - Lavatories
12. Establish a medical surveillance program (see 1910.1025(j)), including:
 - Biological monitoring (blood lead levels):
 - Every six months for each employee covered by this regulation.
 - At least every two months for employees whose last blood sample was at or above 40 µg/100 g of whole blood.
 - At least monthly during the removal period of each employee removed from exposure to lead due to an elevated blood lead level.

- Follow-up blood sampling tests.
- Accuracy of blood lead level sampling and analysis.
- Employee notification: Within five working days after receipt of biological monitoring results, notify in writing each employee whose blood lead level exceeds 40 µg/100 g of:
 - o The employee's blood lead level, and
 - o That the standard requires temporary medical removal with Medical Removal Protection benefits when the employee's blood lead level exceeds that indicated in the code (see 1910.1025(k)).
 - o Medical examinations and consultation (see 1910.1025(j)(3)) Chelation, if necessary (see 1910.1025(j)(4)).

13. Medical Removal Protection.

14. Record keeping of all medical records for 40 years, or for the duration of employment plus 20 years, whichever is longer.

15. Annual training, using the Appendix A and B of the Oregon OSHA lead standard.