

LEAD IN CONSTRUCTION

BACKGROUND

Although Occupational Safety and Health Administration (OSHA) regulations for occupational lead exposure have been in effect since 1971 for the construction and general industries, the agency recognized the need to provide better protection and revised the regulations for general industry in 1978. The 1978 lead standard, however, excluded the construction industry from coverage because of insufficient information regarding lead use in construction.

In 1990, the National Institute for Occupational Safety and Health (NIOSH) set a national goal to eliminate worker exposures resulting in blood lead concentrations greater than 25 micrograms per deciliter (25 µg/dl) of whole blood. Consequently, OSHA began developing a proposal for a comprehensive standard regulating occupational exposure to lead in construction. In October 1992, the Congress passed Section 1031 of Title X of the Housing and Community Development Act of 1992 (P.L. 102-550) requiring OSHA to issue an interim final lead standard for the construction industry, effective until OSHA issues a final standard.

The interim final rule, published on May 4, 1993¹, amended the OSHA standards for occupational health and environmental controls in Subpart D of Title 29 *Code of Federal Regulations* (CFR) 1926 by adding a new section 1926.62, containing employee protection requirements for construction workers exposed to lead.

HEALTH HAZARDS OF LEAD EXPOSURE

Pure lead (Pb) is a heavy metal (at room temperature and pressure) and is a basic chemical element. It can combine with various other substances to form numerous lead compounds.

¹ *Federal Register* 58(84):26590-26649, May 4, 1993.

When absorbed into the body in certain doses, lead is toxic. It can be absorbed into the body by inhalation and ingestion. Except for certain organic lead compounds not covered by this standard, lead is not absorbed significantly through the skin. When scattered through the air as a dust, fume, or mist, lead can be inhaled and absorbed through the lungs and upper respiratory tract. Inhalation of airborne lead is generally the most important source of occupational lead absorption. Lead also can be absorbed through the digestive system if it enters the mouth and is ingested.

A significant portion of the lead inhaled or ingested gets into the blood stream. Once in the blood stream, lead is circulated through the body and stored in various organs and body tissues. Some of this lead is quickly filtered out of the body and excreted, but some remains in the blood and tissues. As exposure continues, the amount stored will increase if the body is absorbing more lead than it is excreting. The lead stored in the tissues can slowly cause irreversible damage, first to individual cells, then to organs and whole body systems.

Lead adversely affects numerous body systems and causes forms of health impairment and disease that arise after periods of exposure as short as days (acute exposure) or as long as several years (chronic overexposure). A short-term dose of lead exposure can lead to acute encephalopathy, a condition affecting the brain that develops quickly into seizures, coma, and death from cardiorespiratory arrest. Short-term occupational exposures of this type are highly unusual, but not impossible. Similar forms of encephalopathy, however, may arise from extended chronic exposure to lower doses of lead. Consequently, there is no sharp distinction between rapidly developing acute effects of lead and longer term chronic effects.

Long-term (chronic) overexposure to lead may result in severe damage to the blood-forming, nervous, urinary, and reproductive systems. Some common symptoms include the following:

- loss of appetite
- constipation
- excessive tiredness
- headache
- fine tremors
- colic with severe abdominal pain
- metallic taste in the mouth
- weakness
- nervous irritability
- hyperactivity
- muscle and joint pain
- anxiety
- pallor
- insomnia
- numbness
- dizziness

Damage to the central nervous system in general and the brain in particular is one of the most severe forms of lead poisoning. Chronic overexposure to lead also significantly impairs the reproductive systems of both men and women. Lead can alter the structure of sperm cells--raising the risk of birth defects--and there is evidence of miscarriage and stillbirth in women exposed to lead or whose husbands have been exposed to lead. Children born of parents who were exposed to excess lead levels are more likely to have birth defects, mental retardation, behavioral disorders, or to die during the first year of childhood.

The interim OSHA standard aims to reduce the exposure to lead for construction workers. The most significant way to achieve this is by lowering the permissible exposure limit (PEL) from 200 micrograms per cubic meter of air ($200 \mu\text{g}/\text{m}^3$) as an 8-hour time weighted average (TWA) to $50 \mu\text{g}/\text{m}^3$.

SCOPE AND APPLICATION

For the purpose of this standard, lead includes metallic lead, all inorganic lead compounds, and organic lead soaps.

OSHA's lead in construction standard applies to all construction work where an employee may be occupationally exposed to lead. All work related to construction,

alteration, or repair--including painting and decorating--is included. Under this standard, construction includes, but is not limited to, the following:

- demolition or salvage of structures where lead or materials containing lead are present;
- removal or encapsulation of materials containing lead;
- new construction, alteration, repair, or renovation of structures, substrates, or portions containing lead, or materials containing lead;
- installation of products containing lead;
- lead contamination from emergency cleanup;
- transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed; and
- maintenance operations associated with construction activities described above.

PROVISIONS OF THE STANDARD

The standard establishes maximum limits of exposure to lead for all workers covered, including a permissible exposure limit and action level.

Permissible Exposure Limit

The permissible exposure limit, or PEL, sets the maximum worker exposure to lead. For example, no employee may be exposed to lead at airborne concentrations greater than 50 $\mu\text{g}/\text{m}^3$ averaged over an 8-hour period. If employees are exposed to lead for more than 8 hours in any workday, the following formula must be used to reduce exposure as a TWA:

Employee exposure (in $\mu\text{g}/\text{m}^3$) = 400 divided by hours worked in the day.²

Action Level

An action level is the level at which an employer must begin certain compliance activities outlined in the standard. The action level, regardless of respirator use, for the lead in construction standard is an airborne concentration of $30 \mu\text{g}/\text{m}^3$ calculated as an 8-hour TWA.

Exposure Monitoring and Medical Surveillance

Assessing Exposures

Where initial employee exposure³ is at or above the action level, the employer must collect personal samples representative of a full work shift, including at least one sample for each shift or for the shift with the highest exposure level for each job classification in each work area. These samples must represent the monitored employee's **regular, daily exposure** to lead. Measurements made within the previous 12 months also may be used to determine how far above the action level employee exposure may be.

An initial determination of whether employees are exposed to lead at or above the action level and the results of that determination must be made available based on the following:

- any information, observation, or calculation that indicates employee exposure to lead;

² When respirators are used to limit employee exposure to lead, the measured exposure can be considered at the level provided by the protection factor of the respirator for those periods worn. Those periods may be averaged with exposure levels during periods when respirators are not worn to determine the employee's daily TWA exposure.

³ For the purpose of this section, exposure is considered to be the level occurring if the employee were not using a respirator.

- any previous measurements of airborne lead;
- any employee complaints of symptoms attributable to lead exposure; and
- objective data regarding materials, processes, or operations.

The employer may discontinue required monitoring when at least two consecutive measurements--taken at least 7 days apart--are below the action level.

Monitoring for the initial determination whether employees are exposed at or above the action level may be limited to a representative sample of those employees exposed to the greatest concentrations of airborne lead. Measurements made within the preceding 12 months, which were performed by the same employer and applicable to the same employee tasks, may be used.

The employer must establish and maintain an accurate record documenting the nature and relevancy of previous exposure data. Instead of performing initial monitoring, the employer may rely on objective data that demonstrate that a particular lead-containing material or product does not result in employee exposure at or above the action level when processing, using, or handling.

Until the employer performs an exposure assessment and documents that employees are not exposed above the PEL, the employer must treat employees performing certain operations as if they were exposed above the PEL. This means providing respiratory protection, protective work clothing and equipment, change areas, hand washing facilities, biological monitoring, and training--as required by the standard--for the following tasks:

- manual demolition of structures (e.g., dry wall), manual scraping, manual sanding, and use of heat gun where lead-containing coatings or paints are present;
- abrasive blasting enclosure movement and removal;

- power tool cleaning;
- lead burning;
- using lead-containing mortar or spray painting with lead-containing paint;
- abrasive blasting, rivet busting, or welding, cutting, or burning on any structure where lead-containing coatings or paint are present;
- cleanup activities where dry expendable abrasives are used; and
- any other task the employer believes may cause exposures in excess of the PEL.

For an initial determination that indicates no employee is exposed at or above the action level ($30 \mu\text{g}/\text{m}^3$), the employer must keep a written record of the determination, including the date, location within the work site, and the name and social security number of each monitored employee. (See "Recordkeeping" section elsewhere in this discussion for more information.)

Monitoring and Observing

If the initial determination proves employee exposure is below the action level, further exposure determination need not be repeated unless there is a change in processes or controls.

If employee exposure is at or above the action level, but at or below the PEL, the employer must perform monitoring at least every 6 months and continue until at least two consecutive measurements--taken at least 7 days apart--are below the action level.

If employee exposure is above the PEL, the employer must perform monitoring quarterly and continue until at least two consecutive measurements--taken at least 7 days apart--are at or below the PEL but at or above the action level. The employer then must repeat and continue monitoring every 6 months to bring the exposure to or below the action level as described above.

When there has been a change of equipment, process, control, personnel, or a new task has been initiated that could increase employee lead exposure at or above the action level, the employer must conduct additional monitoring.

The employer must notify each employee in writing of employee exposure assessment results within 5 working days after their receipt. Whenever the results indicate that the representative employee exposure, without the use of respirators, is at or above the PEL, the employer must include a written notice stating that the employee's exposure was at or above that level and describing the corrective action taken or to be taken to reduce exposure to below that level.

The employer must provide affected employees or their designated representatives an opportunity to observe any monitoring of employee lead exposure. The employer must provide the observer with and ensure the use of respirators and protective clothing and equipment when monitoring requires entry into an area where they are necessary. The observer, who must comply with all applicable safety and health procedures, is entitled to receive an explanation of the measurement procedures, observe all steps related to lead-monitoring performed at the place of exposure, and record the results obtained or receive copies of the results when returned by the laboratory.

Medical Surveillance and Multiple Physicians' Review

Employers must make available, at no cost to the employee, initial medical surveillance for employees occupationally exposed to lead at or above the action level for more than 1 day per year. For employees with exposure more than 30 days per year and who have a blood lead level over 40 µg/dl, full medical surveillance is required. All medical exams must be performed by or under the supervision of a licensed physician. In addition, full medical examinations with extensive testing must be made available to those employees exposed at or above the action level for more than 30 days per year.

Initial medical surveillance must include biological monitoring in the form of blood sampling and analysis for lead or zinc protoporphyrin levels. Biological monitoring tests must be conducted in an OSHA-approved lab and be accurate (to a confidence

level of 95 percent) within plus or minus 15 percent, or 6 µg/dl, whichever is greater. The tests must be performed as follows:

- at least every 2 months for the first 6 months and every 6 months thereafter for employees exposed at or above the action level for more than 30 days annually;
- at least every 2 months for employees whose last blood sampling and analysis indicated a blood lead level at or above 40 µg/dl; and
- at least monthly during the removal period for each employee removed from exposure due to an elevated blood lead level.

Within 5 days of receiving biological monitoring results, the employer must notify each employee, in writing, of his/her blood lead levels. Employees whose blood lead levels exceed 50 µg/dl must be removed temporarily with medical removal protection benefits, such as pay, seniority, and other rights.

When the results of a blood lead level test indicate the level exceeds the criteria for medical removal, the employer must provide a second (followup) blood sampling test within 2 weeks after receiving initial test results to confirm that removal is necessary.

Under certain limited circumstances, special drugs called chelating agents may be administered to remove circulating blood lead. Using chelation as a preventive measure--that is, to lower blood level but continue to expose a worker--is prohibited and therapeutic or diagnostic chelations of lead that are required must be done under the supervision of a licensed physician in a clinical setting. The employee must be notified in writing prior to treatment.

The employer must make available medical exams to employees exposed at or above the action level for more than 30 days per year as follows:

- at least annually for each employee whose blood lead level within the past 12 months was at or above 40 µg/dl;

- when the employee has developed signs or symptoms commonly associated with lead intoxication;
- when the employee is pregnant; and
- when medically appropriate for employees removed from lead exposure due to a sustained health risk or following a final medical determination.

Medical exams must include the following information:

- detailed work and medical histories, with particular attention to past lead exposure (occupational and nonoccupational), personal habits (smoking and hygiene), and past gastrointestinal, hematologic, renal, cardiovascular, reproductive, and neurological problems;
- a thorough physical exam, with particular attention to gums, teeth, hematologic, gastrointestinal, renal, cardiovascular, and neurological systems; evaluation of lung function if respirators are used;
- a blood pressure measurement
- a blood sample and analysis to determine blood lead level; hemoglobin and hematocrit determinations, red cell indices, and an exam of peripheral smear morphology; zinc protoporphyrin; blood urea nitrogen; and serum creatinine;
- a routine urinalysis with microscopic exam; and
- any lab or other test the examining physician deems necessary.

The employer must provide all examining physicians with a copy of the lead in construction standard, a description of the affected employee's duties, the employee's lead exposure level, a description of personal protective equipment used, prior blood lead determinations, and all prior written medical opinions for the employee.

The employee must receive written medical opinions from each examining or consulting physician that contain the following:

- opinions regarding any detected medical condition that could place the employee at an increased health risk from lead exposure;
- recommendations for special protective measures or limitations on the employee's exposure;
- limitations on the employee's use of respirators; and
- results of all prior blood lead determinations.

The examining physician must not reveal to the employer either by written or oral opinion any findings unrelated to the employee's occupational exposure to lead. The physician must advise the employee of any medical condition (occupational or nonoccupational) that requires further medical attention.

If the employer selects the initial physician to conduct medical exams or consultation, the employee may designate a second physician to review the findings of the first physician and to conduct exams, consultations, and tests as the second physician deems necessary. The employer must promptly notify each employee of the right to seek a second medical opinion following each medical exam or consultation conducted by the initial physician.

Until the employee (1) informs the employer of his/her intent to seek a second medical opinion and (2) initiates steps to make an appointment with a second physician (within 15 days after receipt of notification or receipt of the initial physician's written opinion), the employer may condition his/her participation in and payment for the multiple physician review mechanism. If the findings of the second physician differ from those of the initial physician, the employee and employer must work together to see that the two physicians resolve any disagreement. If no agreement is feasible, the employer and employee may designate a third physician to review findings and conduct exams, tests, and

consultations to resolve the disagreement. The employer must act on the third physician's recommendations unless the employer and employee reach agreement consistent with those of at least one of the three physicians.

Medical Removal Protection

Employers must remove employees with lead exposure at or above the action level each time:

- a periodic and followup blood sampling test indicates a blood lead level at or above 50 µg/dl; and
- a final medical determination⁴ indicates a detected medical condition that increases health risks from lead exposure.

Employers must return employees to their former job status when:

- two consecutive blood sampling tests indicate a blood lead level is at or below 40 µg/dl for employees removed due to a blood lead level at or above 50 µg/dl; and
- a subsequent final medical determination indicates there is no longer a detected medical condition that increases health risks from lead exposure.

The employer must remove any limitations placed on employees or end any special protective measures when a subsequent final medical determination indicates they are no longer necessary.

⁴ Refers to the written medical opinion on the employee's health status or the outcome of the multiple physician review mechanism.

When the multiple physicians' review mechanism has not yet resulted in a final medical determination, the employer must:

- remove employees from lead exposure, provide special protective measures, or place limitations on employees; or
- return employees to their former job status; end special protective measures; and remove limitations **except** when the initial removal special protection, or limitation resulted from a medical determination different from the finding of the initial physician, or when the employee has been on removal status for the preceding 18 months due to an elevated blood lead level and must await final medical determination.

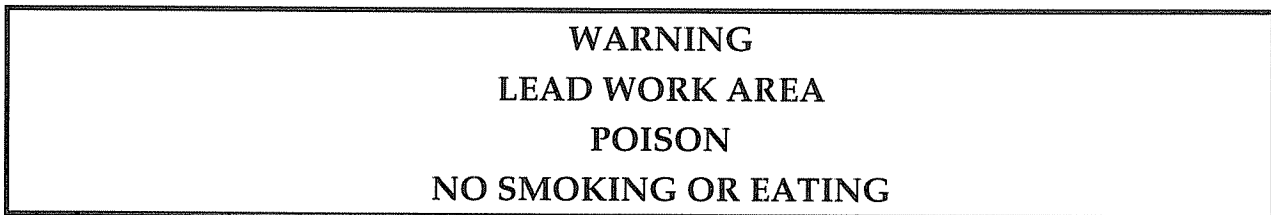
The employer must provide up to 18 months of medical removal protection benefits each time an employee is removed from lead exposure. As long as the position/job exists, the employer must maintain the earnings, seniority, and other employment rights and benefits as though the employee had not been removed from the lead exposure. The employer may condition medical removal protection benefits on the employee's participation in followup medical surveillance.

If a removed employee files a worker's compensation claim for a lead-related disability, the employer must continue medical removal protection benefits pending the disposition of the claim. The employer's obligation will be reduced to the extent that the employee received compensation for earnings lost during removal either from a publicly or employer-funded compensation program or from employment with another employer during the employee's removal.

Information and Training

The employer must inform employees about lead hazards according to the requirement of OSHA's Hazard Communication standard for the construction industry, 29 CFR 1926.59, including--but not limited to--the requirements for warning signs and labels, material safety data sheets (MSDSs), and employee information and training.

For example, the following warning signs must be posted in each work area where employee exposure to lead is above the PEL:



All signs must be well lit and kept clean so that they are easily visible. Statements that contradict or detract from the signs' meaning are prohibited. Signs required by other statutes, regulations, or ordinances, however, may be posted in addition to, or in combination with, this sign.

The employer must institute a training program and ensure participation by all employees subject to exposure to lead or lead compounds at or above the action level on any day. Initial training must be provided prior to initial job assignment or the startup date for this requirement, whichever comes last. Training must be repeated at least annually and must include the following:

- the content of the standard and its appendices;
- the specific nature of operations that could lead to lead exposure above the action level;
- the purpose, proper selection, fit, use, and limitations of respirators;
- the purpose and a description of the medical surveillance program, and the medical removal protection program;
- the engineering and work practice controls associated with employees' job assignments;
- the contents of the compliance plan in effect;

- instructions to employees that chelating agents must not be used routinely to remove lead from their bodies and when necessary only under medical supervision; and
- the right to access records under "Access to Employee Exposure and Medical Records," 29 CFR 1910.20.

All materials relating to the training program and a copy of the standard must be made readily available to all employees.

METHODS OF COMPLIANCE

Compliance Program

Prior to each job where employee exposure exceeds the PEL, the employer must establish and implement a written compliance program to reduce employee exposure to the PEL or below. The compliance program must provide for frequent and regular inspections of job sites, materials, and equipment by a competent person.⁵ Written programs, which must be revised and updated at least every 6 months, must include the following:

- a description of each activity in which lead is emitted (e.g., equipment used, material involved, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices);
- specific plans to achieve compliance and engineering plans and studies where engineering controls are required;
- information on the technology considered to meet the PEL;

⁵ A competent person is one who can identify existing and predictable lead hazards in the surroundings or working conditions that are hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate those hazards.

- air monitoring data that document the source of lead emissions;
- a detailed schedule for implementing the program, including copies of documentation (e.g., purchase orders for equipment, construction contracts);
- a work practice program including regulations for the use of protective work clothing and equipment and housekeeping and hygiene facility guidelines;
- an administrative control schedule for job rotation, if used;
- a description of arrangements made among contractors on multi-contractor sites to inform affected employees of potential exposure to lead and their responsibility to comply with this standard; and
- any other relevant information.

Engineering, Work Practice, and Administrative Controls

The lead in construction standard requires employers to use--when feasible--engineering, work practice, and administrative controls to reduce and maintain employee lead exposure to or below the PEL. When all feasible controls have been instituted but are not sufficient to reduce employee exposure to or below the PEL, they must be used to reduce exposure to the lowest feasible level and supplemented by respirators.

Engineering controls reduce employee exposure in the workplace either by removing or isolating the hazard or isolating the worker from exposure through the use of technology. Under the lead in construction standard, mechanical ventilation may be used to control lead exposure. If used, the employer must evaluate, as necessary, the mechanical performance of the system in controlling exposure to maintain its effectiveness.

Work practice controls reduce the likelihood of exposure by altering the manner in which a task is performed. Safe work practices under the lead in construction

standard include but are not limited to maintaining separate hygiene facilities (i.e., change rooms, showers, hand washing facilities, and lunch areas) and requiring proper housekeeping practices (i.e., cleanup methods).

Housekeeping

All surfaces must be maintained as free as practicable of accumulations of lead. Compressed air must **not** be used to cleanup floors and other surfaces where lead accumulates unless it is used in conjunction with a ventilation system designed to capture the airborne dust created by the compressed air. Shoveling, dry or wet sweeping, and brushing must be used only where vacuuming and other equally effective methods have been tried and found to be ineffective.

Vacuums must be equipped with high-efficiency particulate air (HEPA) filters and used and emptied in a manner that minimizes the reentry of lead into the workplace.

Hygiene Facilities and Practices

Food, beverages, tobacco products, and cosmetics are prohibited in all areas where employees are exposed to lead above the PEL regardless of respirator use.

Employers must provide clean change areas and hand washing and shower facilities, where feasible, for employees who work in areas where airborne exposure to lead is above the PEL regardless of respirator use, or as interim protection (except for showers) for employees performing tasks specified in the "Assessing Exposures" section of this discussion. Change areas must be equipped with separate storage facilities for protective work clothing and equipment and for street clothes to prevent cross-contamination. Shower facilities must contain an adequate supply of cleansing agents and towels for those employees required to shower. Employees required to shower must not leave the workplace wearing any protective clothing or equipment worn during the work shift.

Where showers are not provided by the employer, employees must wash their hands and face at the end of the workshift. The employer must provide adequate handwashing facilities--including an adequate supply of water, soap, and clean towels--for employees. Employers also must provide lunchroom facilities or eating

areas for employees who work in areas where their airborne exposure to lead is above the PEL regardless of respirator use. These facilities must be as free as practicable from lead contamination and be easily accessible to all employees. Employees must wash their hands and face prior to eating, drinking, smoking or applying cosmetics in eating areas. In addition, employees are prohibited from entering these areas when wearing personal protective clothing or equipment unless surface lead dust has been removed by vacuuming, downdraft booth, or other cleaning method.

Administrative Controls can be used to reduce employee exposure by removing the employee from the hazard (i.e., job rotation). If administrative controls are used to reduce employee exposure to lead, the employer must establish and implement a job rotation schedule. The program must identify by name or number each affected employee; specify the duration and exposure level at each job or work station where each affected employee is located; and include other information useful to assess the reliability of administrative controls to reduce employee lead exposures.

Respirators

The employer must provide respiratory protection, at no cost to the employee, and must ensure its use when:

- employee exposure to lead exceeds the PEL;
- engineering and work practice controls are not sufficient to reduce exposure levels to or below the PEL;
- an employee requests a respirator; and
- as interim protection for employees performing the tasks listed under the "Assessing Exposures" section of this discussion and section (d)(2) of the standard.

An appropriate respirator, which has been approved by the Mine Safety and Health Administration (MSHA) and NIOSH must be selected to protect against lead dust, fumes, and mists. (See the table for recommended respiratory protection.)

Respirators issued to employees must exhibit minimum facepiece leakage and fit the employee properly. Employers must perform either quantitative or qualitative (for half-mask respirators only) face fit tests at the time of initial fitting and at least every 6 months for each employee wearing a negative-pressure respirator. If the employee shows signs of breathing difficulty during the fit test or during use, the employer must make available an examination in accordance with the medical surveillance requirements of the standard.

RESPIRATORY PROTECTION FOR LEAD AEROSOLS	
Airborne Concentration of Lead or Condition of Use	Required Respirator *
Not in excess of 500 µg/m ³	Half-mask air-purifying respirator with high-efficiency filters. **, *** Half-mask supplied-air respirator operated in demand (negative-pressure) mode.
Not in excess of 1,250 µg/m ³	Loose fitting hood or helmet powered air-purifying respirator with high-efficiency filters. *** Hoods or helmet supplied-air respirator operated in continuous-flow mode--for example, type CE abrasive blasting respirators operated in a continuous-flow mode.
Not in excess of 2,500 µg/m ³	Full-facepiece air-purifying respirator with high-efficiency filters. *** Tight-fitting powered air-purifying respirator with high-efficiency filters. *** Full-facepiece supplied-air respirator operated in demand mode. Half-mask or full-facepiece supplied-air respirator operated in continuous-flow mode. Full-facepiece self-contained breathing apparatus (SCBA) operated in demand mode.
Not in excess of 50,000 µg/m ³	Half-mask supplied-air respirator operated in pressure-demand or other positive-pressure mode.
Not in excess of 100,000 µg/m ³	Full-facepiece supplied-air respirator operated in pressure-demand or other positive-pressure mode--for example, type CE abrasive blasting respirators operated in a positive-pressure mode.
Greater than 100,000 µg/m ³ , unknown concentration, or firefighting	Full-facepiece SCBA operated in pressure-demand or other positive-pressure mode.

Source: "Lead Exposure in Construction; Interim Final Rule," *Federal Register* 58(84):26630, May 4, 1993.

* Respirators specified for higher concentrations can be used at lower concentrations of lead.

** Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

*** A high-efficiency particulate air filter means a filter that is 99.97 percent efficient against particles of 0.3 micron or larger.

Employees who use filter respirators must be permitted to change the filter elements whenever an increase in breathing resistance is detected and must be allowed to leave work areas to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.

A respiratory protection program is required in accordance with 29 CFR 1910.134.

Protective Clothing and Equipment

The employer must provide at no cost to the employee and ensure the proper use of personal protective equipment where employees are exposed to lead above the PEL, are exposed to lead compounds that may cause skin or eye irritation, or as interim protection for employees performing tasks specified in the "Assessing Exposures" section of this discussion--regardless of respirator use. Appropriate personal protective work clothing and equipment, which prevent contamination of employees and their garments, include but are not limited to coveralls or full-body work clothing; gloves, hats, and shoes or disposable coverlets; and face shields, vented goggles, or other appropriate protective equipment that complies with 29 CFR 1910.133.

The employer is required to provide clean and dry protective clothing at least weekly, and daily to employees whose exposure levels--regardless of respirator use--are above 200 $\mu\text{g}/\text{m}^3$ of lead as an 8-hour TWA.

To maintain the effectiveness of the personal protective clothing and equipment, the employer must:

- clean, launder, or dispose of contaminated protective clothing;
- repair or replace torn or defective clothing or equipment; and
- ensure all protective clothing is removed at the end of the work shift in change areas provided for that purpose.

All contaminated protective clothing and equipment to be cleaned, laundered, or disposed of must be placed in a closed container in the change area to prevent dispersion of lead outside the container. Blowing, shaking, or otherwise dispersing lead into the air is prohibited for removing lead from contaminated materials. Containers of contaminated personal protective clothing and equipment must be labeled as follows:

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

The employer also must inform, in writing, any person who cleans or launders the protective clothing or equipment of the potentially harmful effects of lead exposure.

Recordkeeping

The employer must establish and maintain an accurate record of all monitoring and other data used to conduct employee exposure assessments as required by this standard and in accordance with provisions in 29 CFR 1910.120. The following must be included in **exposure assessment** records:

- the dates, number, duration, location, and results of each sample taken, including a description of the sampling procedure used to determine representative employee exposure;
- a description of the sampling and analytical methods used and evidence of their accuracy;
- the type of respiratory protection worn, if any;

- the name, social security number, and job classification of the monitored employee and all others whose exposure the measurement represents; and
- environmental variables that could affect the measurement of employee exposure.

The employer must maintain an accurate record for each employee subject to **medical surveillance**, including:

- the name, social security number, and description of the employee's duties;
- a copy of the physician's written opinions;
- the results, as supplied to the examining physician, of any airborne exposure monitoring done for the representative employee and all others represented; and
- any employee medical complaints related to lead exposure.

In addition, the employer must keep or ensure that the examining physician keeps the following medical records:

- a copy of the medical examination results including medical and work history;
- a description of the laboratory procedures and a copy of any guidelines used to interpret the test results; and
- a copy of the results of biological monitoring.

The employer must maintain--for at least the duration of employment--an accurate record for each employee subject to **medical removal**, including:

- the name and social security number of the employee;

- the date on each occasion that the employee was removed from current lead exposure and the corresponding date which the employee was returned to former job status;
- a brief explanation of how each removal was or is being accomplished; and
- a statement about each removal indicating whether the reason for removal was an elevated blood level.

The employer must maintain a record of any objective data relied on to determine initial exposure if it was used in lieu of exposure monitoring for exposure assessment purposes.

The employer must make all records--including exposure monitoring, medical removal, and medical records--available upon request to affected employees, former employees, and their designated representatives and to the OSHA Assistant Secretary and the Director of NIOSH for examination and copying in accordance with 29 CFR 1910.20.

When an employer ceases to do business, the successor employer must receive and retain all required records. If no successor is available, these records must be sent to the Director of NIOSH.

OTHER SOURCES OF OSHA ASSISTANCE

Safety and Health Management Guidelines

Effective management of worker safety and health protection is a decisive factor in reducing the extent and severity of work-related injuries and illnesses and their related costs. To assist employers and employees in developing effective safety and health programs, OSHA published recommended *Safety and Health Management Guidelines* (January 26, 1989, 54 FR:3908-3916). These voluntary guidelines apply to all places of employment covered by OSHA.

The guidelines identify four general elements critical to the development of a successful safety and health management program:

- management commitment and employee involvement,
- work site analysis,
- hazard prevention and control, and
- safety and health training.

The guidelines recommend specific actions, under each of these general elements, to achieve an effective safety and health program.

WORKER PROTECTION PROGRAMS

Lead has been poisoning workers for thousands of years. In the construction industry, traditionally most over-exposures to lead have been found in the trades, such as plumbing, welding and painting.

In building construction, lead is frequently used for roofs, cornices, tank linings, and electrical conduits. In plumbing, soft solder, used chiefly for soldering tinplate and copper pipe joints, is an alloy of lead and tin. Soft solder, in fact, has been banned for many uses in the United States. The use of lead-based paint in residential application has also been banned by the Consumer Product Safety Commission. However, since lead-based paint inhibits the rusting and corrosion of iron and steel, it is still used on bridges, railways, ships, lighthouses, and other steel structures, although substitute coatings are available.

Significant lead exposures can also arise from removing paint from surfaces previously coated with lead-based paint, such as in bridge repair, residential renovation, and demolition. With the increase in highway work, including bridge repair, residential lead abatement, and residential remodeling, the potential for exposure to lead-based paint has become more common. The trades potentially exposed to lead include iron work, demolition work, painting, lead-based paint abatement work, plumbing, heating/air-conditioning, electrical work, and carpentry/renovation/remodeling.

Operations that generate lead dust and fume include the following:

- Flame-torch cutting, welding, the use of heat guns, sanding, scraping and grinding of lead painted surfaces in repair, reconstruction, dismantling, and demolition work;
- Abrasive blasting of bridges and other structures containing lead-based paints;

- Use of torches and heat guns, and sanding, scraping, and grinding lead-based paint surfaces during remodeling or abating lead-based paint; and
- Maintaining process equipment or exhaust duct work.

The employer of construction workers is responsible for the development and implementation of a worker protection program in accordance with 29 CFR 1926.20 and 29 CFR 1926.62(e). This program is essential in minimizing worker risk of lead exposure. Construction projects vary in their scope and potential for exposing workers to lead and other hazards. Many projects may involve limited exposure, such as the removal of paint from a few interior residential doors. Others may involve the removal, or stripping off, of substantial quantities of lead-based paints on large bridges. The employer should, as needed, consult a qualified safety and health professional¹ to develop and implement an effective worker protection program.

The most effective way to protect workers is to minimize exposure through the use of engineering controls and good work practices. It is OSHA policy that respirators are not to be used in lieu of engineering and work practices to reduce employee exposures to below the PEL. Respirators can only be used in combination with engineering controls and work practices to control employee exposures.

OSHA's new interim final standard for lead in construction limits worker exposures to 50 micrograms of lead per cubic meter of air averaged over an eight-hour workday.

At the minimum, the following elements should be included in the employer's worker protection program for employees exposed to lead:

- Hazard determination, including exposure assessment;
- Engineering and work practice controls;
- Respiratory protection;

¹ Sources for professional safety and health advice include insurance carriers, trade organizations, state 7(c)(1) on-site consultation programs, and consultants.

- Protective clothing and equipment;
- Housekeeping;
- Hygiene facilities and practices;
- Medical surveillance and provisions for medical removal;
- Training;
- Signs; and
- Recordkeeping.

To implement the worker protection program properly, the employer needs to designate a competent person, i.e., one who is capable of identifying existing and predictable hazards or working conditions which are hazardous or dangerous to employees, in accordance with the general safety and health provisions of OSHA's construction standards. The competent person must have the authorization to take prompt corrective measures to eliminate such problems. Qualified medical personnel must be available to advise the employer and employees on the health effects of employee lead exposure and supervise the medical surveillance program.

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ENGINEERING CONTROLS

Because lead is a cumulative and persistent toxic substance and because lead-caused health effects may result from low levels of exposure over prolonged periods of time, engineering controls and good work practices must be used where feasible to minimize employee exposure to lead. At a minimum, exposures must not exceed the OSHA interim final PEL of 50 micrograms per cubic meter of air ($50 \mu\text{g}/\text{m}^3$) averaged over an 8-hour-period. When feasible engineering controls and work practice controls cannot reduce worker exposure to lead to at or below $50 \mu\text{g}/\text{m}^3$, respirators must be used to supplement the use of engineering and work practice controls.

A competent person should review all site operations and stipulate the specific engineering controls and work practices designed to reduce worker exposure to lead. Engineering measures include local and general exhaust ventilation, process and equipment modification, material substitution, component replacement, and isolation or automation. Examples of recommended engineering controls that can be used to reduce worker exposure to lead are as follows:

- **Exhaust Ventilation**

Power tools used for the removal of lead-based paint should be equipped with dust collection shrouds or other attachments exhausted through a high-efficiency particulate air (HEPA) vacuum system. Operations such as welding, cutting/burning, heating should be provided with local exhaust ventilation. HEPA vacuums should be used during clean-up activities.

For abrasive blasting operations where full containment exists or is required, the containment structure should be designed to optimize the flow of ventilation air past the worker(s), so that the airborne concentration of lead is reduced and the visibility is increased. The affected area should be maintained under negative pressure to reduce the chances that lead dust will contaminate areas outside the enclosure. A containment structure should be equipped with dust collection and an air-cleaning

device to control emissions of particulate matter to the environment.

- **Enclosure/Encapsulation**

Lead-based paint can be made inaccessible either by encapsulating it with a material that bonds to the surface, such as acrylic or epoxy coating or flexible wall coverings, or by enclosing it using systems such as gypsum wallboard, plywood panelling, and aluminum, vinyl or wood exterior siding. Floors coated with lead-based paint can be covered using vinyl tile or linoleum flooring.

The building owner, or other responsible person, should oversee the custodial and maintenance staffs and contractors with regard to all activities that involve enclosed or encapsulated lead-based paint. This will minimize potential inadvertent release of lead during maintenance, renovation, or demolition.

- **Substitution**

Zinc-containing primers covered by an epoxy intermediate coat and polyurethane topcoat are commonly used instead of lead-containing coatings.

Mobile hydraulic shears can be substituted for torch cutting under certain circumstances.

Surface preparation equipment, such as needle guns with multiple reciprocating needles completely enclosed within an adjustable shroud, can be substituted for abrasive blasting under certain operations. The shroud captures dust and debris at the cutting edge and can be equipped with a HEPA vacuum filtration system with a self-drumming feature. One such commercial unit can remove lead-based paint from flat steel and concrete surfaces, outside edges, inside corners, and pipes.

Chemical strippers used primarily on the exterior of buildings, surfaces involving carvings or molding, or intricate iron works, can be used in place of hand scraping using a heat gun. Chemical removal generates less airborne lead dust.

These strippers, however, can be hazardous and the material safety data sheets (MSDSs) for the products used must be reviewed by the employer for information on worker exposure hazards from the chemical ingredients and protective measures

recommended by the manufacturer.

- **Component Replacement**

Lead-based painted building components (i.e., windows, doors, and trim) can be replaced either with new components free of lead-containing paint or with the same components after the paint has been removed off-site. Replacement is a permanent solution.

- **Process/Equipment Modification**

Brush/roller application of lead paints or other lead-containing coatings is a safer method than spraying. (Note: There is a ban on the use of lead-based paint in residential housing.) This method of application introduces little or no paint mist into the air where the mist can present a lead inhalation hazard.

Non-silica containing abrasive (e.g., steel or iron shot/grit) should be used where practical instead of sand in abrasive blasting operations. The free silica portion of the dust presents a respiratory health hazard.

Blasting techniques that are less dusty than abrasive blasting and that can be effective under some conditions include: (1) hydro- or wet-blasting (using high pressure water with or without abrasive or surrounding the blast nozzle with a ring of water), and (2) vacuum blasting where a vacuum hood for material removal is positioned around the exterior of the blasting nozzle.

Heat guns used to remove lead-based paints in residential housing units should be of the flameless electrical softener type. Heat guns should have electronically controlled temperature settings to allow usage below 700 degrees F. Heat guns should be equipped with various nozzles to cover all common applications and to limit heated work area.

When using abrasive blasting with vacuum on exterior building surfaces, care should be taken that the configuration of the heads on the blasting nozzle match the configuration of the substrate so that the vacuum is effective in containing debris.

Since HEPA vacuum cleaners can be used to clean surfaces other than just floors,

operators should have attachments appropriate for use on unusual surfaces. The proper use of brushes of various sizes, crevice tools and angular tools, when needed, will enhance the quality of the HEPA-vacuuming process and help reduce the amount of lead dust released into the air.

- **Isolation**

Although it is not feasible to completely enclose and ventilate some abrasive blasting operations, it is possible to isolate many operations to help reduce the potential for exposure to lead. Isolation, in this instance, consists of keeping employees not involved in the blasting operations as far away as possible from the work area. By placing the employees at a greater distance from the source of lead exposure, their exposures will be reduced.

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HOUSEKEEPING AND PERSONAL HYGIENE PRACTICES

Lead is a cumulative and persistent toxic substance that poses a serious health risk. A rigorous housekeeping program and adherence to basic personal hygiene practices will minimize employee exposure to lead. In addition, these two elements of the worker protection program will help to prevent taking lead-contaminated dust out of the worksite and home to the workers' families, thus ensuring that the duration of lead exposure does not extend beyond the workshift and providing added protection to employees and their families.

Housekeeping

An effective housekeeping program involves at least daily removal of accumulations of lead dust and lead-containing debris. Vacuuming lead dust with high-efficiency particulate air (HEPA)- filtered equipment or wetting it with water before sweeping are effective control measures. Such cleaning operations should be conducted, whenever possible, at the end of the day, after normal operations cease. Furthermore, all persons doing the cleanup should be provided with suitable respiratory protection and personal protective clothing to prevent contact with lead.

In addition, all lead-containing debris and contaminated items accumulated for disposal should be collected and put into sealed impermeable bags or other closed impermeable containers. Bags and containers should be appropriately labeled as lead-containing waste. These measures are especially important as they minimize additional sources of exposure that engineering controls generally are not designed to control.

Personal Hygiene Practices

To minimize exposure to lead, special attention should be given to workers' personal hygiene. The employer must provide and ensure that workers use washing facilities. Clean change areas, and separate non-contaminated eating areas must also be provided. Cars should be parked where they will not be contaminated with

lead. These measures will reduce the worker's period of exposure to lead and the ingestion of lead, ensure that the duration of lead exposure does not extend beyond the workshift, significantly reduce the movement of lead from the worksite, and provide added protection to employees and their families.

Change Areas: The employer must provide a clean change area equipped with storage facilities for street clothes and a separate area with facilities for the removal and storage of lead-contaminated protective work clothing and equipment. This separation is essential in preventing cross contamination of the employee's clothing.

Clean change areas are to be used for taking off street clothes, suiting up in clean working clothes (protective clothing), donning respirators prior to beginning work, and dressing in street clothes after work. No lead-contaminated items should enter this area.

Work clothing must not be worn away from the job site. Under no circumstances shall lead-contaminated work clothes be laundered at home or taken from the worksite, except to be laundered professionally or properly disposed of following applicable Federal, state, and local regulations.

Showers: When there is potential for extensive contamination of the employees' skin, hair, and protective clothing, shower facilities must be provided if feasible so that exposed employees can wash lead from their skin and hair prior to leaving the worksite. Where showers are provided, employees must change out of their work clothes and shower before changing into their street clothes and leaving the worksite.

Workers who do not change into clean clothing before leaving the worksite may contaminate their homes and automobiles with lead dust. Other members of the household may then be exposed to harmful amounts of lead.

Personal Practices (eating, drinking, etc.): The employer must ensure that employees who work with lead either clean or remove their protective clothing and wash their hands and face prior to eating, drinking, smoking or applying cosmetics and that these latter practices are never permitted while in the work area or in areas subject to the accumulation of lead. HEPA vacuuming can be used to remove loose contamination from the work clothing prior to eating.

Washing Facilities: Adequate washing facilities shall be provided for employees. Such facilities shall be in near proximity to the worksite and provided with water, soap, and clean towels to enable employees to remove lead contamination from their skin.

Contaminated water from washing facilities and showers must be disposed of in accordance with applicable local, state, or federal regulations.

End-of-Day Procedures: Workers who are exposed to lead should follow these procedures upon finishing work for the day:

- Place disposable coveralls and shoe covers with the lead waste;
- Place lead-contaminated clothes, including work shoes, and personal protective equipment for laundering/cleaning (by the employer) in a closed container;
- Take a shower and wash hair; and
- Change into street clothes.

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PROTECTIVE CLOTHING

At no cost to employees, employers must provide workers who are exposed to lead above the PEL and for whom the possibility of skin contamination or skin or eye irritation exist, clean, dry protective work clothing and equipment. Appropriate changing facilities must also be provided. Appropriate protective work clothing and equipment used on construction sites can include:

- coveralls or other full-body work clothing;
- gloves;
- vented goggles or face shields with protective spectacles or goggles; and
- welding or blasting helmets, when required.

Disposable coveralls and separate shoe covers may be used, if appropriate, to avoid the need for laundering. Non-disposable coveralls shall be replaced daily. If an employee leaves the work area wearing protective clothing, the clothing should be cleaned with high-efficiency particulate air (HEPA) filter vacuum equipment to remove loose particle contamination; or as an alternative, the coveralls should be removed. Use work garments of appropriate size, and use duct tape to reinforce their seams (e.g., underarm, crotch, and back).

Contaminated clothing that is to be cleaned, laundered or disposed of shall be placed in closed containers. Containers shall be labeled with the following warning:

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.

Persons responsible for handling contaminated clothing shall be informed of the potential hazard in writing. At no time shall lead be removed from protective clothing or equipment by any means that disperses lead into the work area, such as brushing, shaking, or blowing.

At no time shall workers be allowed to leave the worksite wearing lead contaminated clothing or equipment, e.g. shoes, coveralls, or head gear.

All contaminated clothing and equipment shall be prevented from reaching the worker's home or vehicle. This is an essential step in reducing the movement of lead contamination from the workplace into a worker's home and provides added protection to employees and their families.

Gloves and protective clothing should be appropriate for the specific chemical exposure (e.g., solvents and caustics). Cotton gloves provide some protection against the contamination of hands and cuticles with lead dust. Workers should wear clothing that is appropriate for existing weather and temperature conditions under the protective clothing.

Heat stress: Workers wearing protective clothing can face a risk from heat stress. Additionally, heat stress may be an important concern when working in a hot environment or within containment structures. Heat stress is caused by a number of interacting factors, including: environmental conditions, type of protective clothing worn, the work activity required, and the individual characteristics of the employee.

In situations where heat stress is a concern, employers should use appropriate work/rest regimens and provide heat stress monitoring that includes measuring employee's heart rates, body temperatures, and weight loss.

A source of water or electrolytic drink shall be close to the work area (in a non-contaminated eating/drinking area) so that it will be used often. Workers should wash their hands and face prior to drinking any fluid. Frequent fluid intake throughout the day will replace body fluids lost to evaporation. If such measures are used to control heat stress, protective clothing can be safely worn to provide the needed protection against lead exposure. The possibility of heat stress and its signs and symptoms should be discussed with all workers.

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RESPIRATORY PROTECTION

Although engineering and work practice controls are the primary means of protecting workers, source control at construction sites is often not sufficient to control exposure, and airborne lead concentrations may be high or may vary widely.

OSHA's lead standard for the construction industry, §1926.62, requires the use of respirators in the following circumstances:

- Whenever an employee's exposure to lead exceeds the PEL of 50 µg/m³;
- In work situations in which engineering controls and work practices are not sufficient to reduce exposures to or below the PEL;
- Whenever an employee requests a respirator; and
- An interim protection for employees during assessment of exposure with respect to certain lead-related tasks [e.g., spray painting with lead paint, removal of lead containing coatings or paint, etc. - see §1926.62(d)(2)(i)].

To provide adequate respiratory protection, respirators must be donned before entering the work area and should not be removed until the worker has left the area, or as part of a decontamination procedure. Employers must assure that the respirator issued to the employee is properly selected and properly fitted so that it exhibits minimum facepiece leakage. Respirators must be supplied by the employer at no cost to employees. Employers must perform either qualitative or quantitative fit tests for each employee wearing negative pressure respirators. Fit testing is to be performed at the time of the initial fitting and at least semiannually thereafter.

RESPIRATOR PROGRAM: When respirators are provided, the employer must establish a respiratory protection program in accordance with the OSHA standard on respirator protection, 29 CFR 1910.134.

Minimum requirements for an acceptable respirator program for lead include the following elements:

- Written standard operating procedures governing the selection and use of respirators;
- Selection of respirators on the basis of hazards to which the worker is exposed;
- Instruction and training in the proper use of respirators and their limitations;
- Regular inspection and cleaning, maintenance and disinfection; worn or deteriorated parts must be replaced, including replacement of the filter element in an air-purifying respirator whenever an increase in breathing resistance is detected.
- Storage in a convenient, clean, and sanitary location and protection against sunlight and physical damage;
- Appropriate surveillance of work area conditions and degree of worker exposure or stress (physiological or psychological) must be maintained;
- Evaluation to determine the continued effectiveness of the program;
- Physician's determination that the employee is physically able to perform the work and wear a respirator while performing the work (respirator user's medical capacity to wear and work with a respirator should be reviewed annually);
- Use of Mine Safety and Health Administration/National Institute for Occupational Safety and Health (MSHA/NIOSH) certified respirators;
- Fit testing of negative-pressure respirators;
- Breathing air used for supplied-air respirators must meet the requirements prescribed in 1910.134(d)(1); and

- Standing permission for employees to leave the work area to wash their faces and respirator face pieces whenever necessary to prevent skin irritation associated with respirator use.

RESPIRATOR SELECTION: Lead concentrations may vary substantially throughout a workshift as well as from day-to-day. The highest anticipated work concentration is to be used in the initial selection of an appropriate respirator.

In addition, if exposure monitoring or experience indicates airborne exposures to contaminants other than lead, such as solvents or polyurethane coatings, these exposures must be considered when selecting respiratory protection. A reevaluation of the respiratory protection program is required when a worker demonstrates a continued increase in blood lead levels.

ABRASIVE BLASTING AND RELATED OPERATIONS:

NIOSH type CE respirators are required for use by abrasive blasting operators. Currently, NIOSH certifies both continuous flow and positive pressure respirators for abrasive blasting operations. The continuous-flow respirators are recommended by NIOSH only for airborne concentrations less than or equal to 25 times the OSHA PEL of 50 µg/m³. Positive pressure respirators are recommended by NIOSH for airborne concentrations less than 2,000 times the OSHA PEL (50 µg/m³). Furthermore, manufacturer's instructions regarding quality of air, air pressure, and inside diameter and length of hoses must be strictly followed. Use of longer hoses or smaller inside diameter hoses than the manufacture's specifications, or hoses with bends or kinks may restrict the flow of air to a respirator.

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Medical Surveillance

When a construction employee is occupationally exposed to lead at or above the action level of $30 \mu\text{g}/\text{m}^3$ on any one day in a calendar year, the employee must be provided initial medical surveillance consisting of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels. Blood lead levels are currently the best indicator of personal lead exposure. Workers potentially exposed to lead at or above the action level must be monitored for the presence of lead in the blood and the effects of lead on the blood-forming system. Full medical surveillance is to be provided to employees exposed to lead at or above the action level for more than 30 days per year. All medical examinations and consultations shall be performed by or under the direct supervision of a qualified physician and shall be provided to employees at no cost, without loss of pay, and at a reasonable time and place. A qualified physician is a doctor of medicine (M.D.) or osteopathy (D.O.) familiar with the objectives and requirements of a medical surveillance program for lead exposure.

The following conditions necessitate an immediate medical consultation including, as determined by the qualified physician, a physical examination and a blood sample for lead analysis (biological monitoring):

- whenever a worker develops signs or symptoms associated with lead toxicity; and
- before a worker restarts work following medical removal.

1. Biological Monitoring

The purpose of biological monitoring is to identify workers with elevated blood lead levels. The data from biological monitoring is objective evidence of a worker's body burden from lead exposure and this data can be used to follow changes in worker exposure.

Blood lead and zinc protoporphyrin (ZPP) or free erythrocyte protoporphyrin (FEP) shall be monitored for those workers exposed to lead. In general, workers in high-risk occupations should be monitored as often as needed to prevent adverse health effects.

Analysis of blood samples shall be conducted by a laboratory currently approved by OSHA. Employers should contact their local OSHA area office for a current list of approved labs.

2. Reproductive Hazard Issues

Lead is toxic to both male and female reproductive systems. Workers who are actively seeking to have a child or who are pregnant should contact qualified medical personnel to arrange for a job evaluation and medical follow-up. Employers who have been contacted by employees with concerns about reproductive issues should refer them to qualified medical personnel.

3. Written Medical Opinion

Employers must obtain a written signed opinion from the examining physician for each medical examination performed for each employee. This opinion should contain the results of the medical examination as they relate to occupational exposure to lead and must include:

- whether the employee has any detected medical condition which would place his/her health at increased risk from lead exposure;
- any special protective measures or limitations on worker's exposure to lead;
- any limitation on respirator use;
- results of blood lead determination; and
- a statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

Findings of lab results or diagnoses unrelated to the workers' exposure to lead must not be communicated to the employer or included in a written opinion.

Employees should be advised by each physician of any medical condition, occupational or non-occupational, which necessitates further medical evaluation or treatment. The employer should furnish the employee with a copy of the written medical opinion.

4. Chelation

The use of chelating drugs as a prophylactic measure (i.e., to prevent a detectable rise in blood lead) is an unacceptable medical practice. Chelation may be used by a qualified physician only for diagnostic or therapeutic reasons (that is, to diagnose or treat the signs and symptoms of severe lead toxicity).

5. Medical Removal

Medical removal will protect worker health both by stopping further occupational exposure and by enabling the worker to excrete the absorbed lead naturally. With good engineering, work practices, personal hygiene, and respiratory protection practices in place, very few employees should reach the medical removal trigger level specified in the OSHA standard.

OSHA's interim final standard for lead in construction uses a medical removal trigger level of 50 µg/dl. However, some authorities believe that medical removal should take place at lower levels.

Presently, 15 states require laboratories and health care providers to report cases of elevated blood lead concentrations to their state Health Departments. A list of the states that require such reporting, contact person, and the concentration that requires reporting for each state can be found in the NIOSH Alert: *Preventing Lead Poisoning in Construction Workers*.

When employees are removed, or otherwise limited, they must be placed in jobs that will not result in exposure to lead at or above the action level of 30 µg/m³. The employer may return the employee to his or her former job status when a qualified physician's medical determination is that the employee is no longer at risk from exposure to lead or when the employee's blood lead level drops below 40 µg/dl.

In the case of medical removal, records must include the following information:

- the name and social security number of the worker;
- the date of each occasion that the worker was removed from current exposure to lead;
- the date on which the worker was returned to his or her former job status;
- a brief explanation of how each removal was or is being accomplished; and
- a statement indicating whether or not the reason for the removal was an elevated blood lead level.

The employer must maintain this record for at least the duration of any worker's employment.

6. Recordkeeping

The employer must maintain any employee exposure and medical records to document ongoing employee exposure, medical monitoring and medical removal of workers. This data provides a base to properly evaluate the employee's health.

Employers must properly record cases on their OSHA form 200 when the worker:

- has a blood lead level that exceeds 50 µg/dl;
- has symptoms of lead poisoning, such as colic, nerve damage, renal damage, anemia, or gum problems; or
- receives medical treatment to lower blood lead levels or for lead poisoning.

In addition, employees or former employees, their designated representatives, and OSHA must be provided access to exposure and medical records in accordance with 29 CFR 1910.20.

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