Lead Identification Testing and Protection – Quick Tips

Background

The final rule on occupational exposure to lead in general industry was issued in November 1978. The standard, Title 29 Code of Federal Regulations (CFR) 1910.1025, established the permissible exposure limit (PEL) for lead at 50 micrograms per cubic meter ($\mu g/m^3$) averaged over an eight-hour workday. This standard however, did not cover the construction industry (29 CFR 1926.62), and it wasn't until over a decade later that the construction industry established its own lead exposure standard. For more information on the construction standard, see Quick Tips # 165: Construction Lead: Identification, Remediation and Personal Protection, 29 CFR 1926.

Lead Identification

Lead exposure occurs in a variety of industries including primary and secondary lead smelting, automotive manufacturing, shipbuilding and repair and solder manufacturing. Although the Occupational Safety and Health Administration (OSHA) PEL is 50 µg/m3, the standard also implements an action level for lead of 30 µg/m3, above which the employer is required to fulfill certain requirements of the standard such as exposure monitoring, medical surveillance and training and education, but not others. For example, if initial monitoring reveals lead levels above the action level but below the PEL, the employer is required to repeat monitoring every six months; if lead is detected above the PEL, the employer would be required to repeat monitoring quarterly (every three months). 1910.1025(d)(6).

How Lead is Absorbed into the Body

When lead is absorbed into the body in doses above the action level or PEL it can be toxic. Although there are some immediate effects that could occur from exposure to lead in those doses, some of the most serious toxic effects may not become apparent until several years after initial exposure.

There is a common misconception that lead can be absorbed through skin; lead itself is not absorbed through the skin (except for certain organic compounds not covered by this standard such as tetraethyl lead). Lead is absorbed into the body through inhalation (breathing) and ingestion (eating). When lead is present in the air as a dust, fume or mist, it can be inhaled through your lungs and upper respiratory tract. The most common source of lead absorption in the industry is inhalation. Generally, lead that is absorbed through ingestion stems from contaminated hands, food, water, cigarettes or clothing. Lead entering the respiratory and digestive systems is

released to the blood and distributed throughout the body.

Effects of Lead Absorbed into the Bloodstream

Once lead is absorbed into the bloodstream, it circulates throughout the body and is stored in bones, various organs and body tissue. While some of the lead is excreted, some will stay in the organs and body tissue. As the exposure to lead continues, the amount stored in the body increases, while the amount excreted decreases. Lead stored in the tissues slowly causes irreversible damage to the individual cells, then to the organs and eventually to all body systems.

In large enough doses, lead can cause immediate health problems and possibly even death. A condition affecting the brain called acute encephalopathy can be deadly in a matter of days if a person inhales or ingests a large enough dose of lead. This condition progresses from seizures to coma to death by cardio respiratory arrest. The chance of a dose large enough to cause immediate problems occurring in the industry is unlikely but not impossible; it is more likely however, that a person who is exposed to lead in small doses over an extended period of time could develop problems such as acute encephalopathy. Chronic overexposure to lead could also damage blood-forming, nervous, urinary and reproductive systems. Kidney disease and failure are also common.

Common symptoms of prolonged overexposure to lead include abdominal pain, constipation, depression, distraction, forgetfulness and nausea. People with prolonged exposure to lead may also be at risk for high blood pressure, heart disease, kidney disease and reduced fertility. If certain levels of lead are reached in the bloodstream, an employee may have to be removed from the work area until the blood lead level returns to normal. Refer to 1910.1025 Appendix C, Table 2 for more information on blood lead levels requiring employee removal.

Lead Testing

If lead is present in the workplace in any quantity, OSHA requires the employer to make an initial determination of whether the action level of lead is exceeded for any employee. This initial determination must include monitoring of the air for the presence of lead and must cover the exposure of a representative number of employees who are reasonably believed to be exposed to the highest lead levels. If any employee has reported symptoms of lead overexposure, or if there are any observations or indications that conditions suggest lead overexposure, the employer must include this information in the initial determination.

OSHA does not require that each individual employee be tested; rather it requires the employer to test a representative number of employees and job types. The air samples taken must be representative of each employee’s regular, daily exposure to lead. Enough sampling must be done to make sure that each employee’s exposure level is reasonably represented by at least one full-shift (at least seven hours) sample. If the results of the monitoring indicate a presence of lead greater than the PEL (without regard to the use of respirators) the employer is required to notify the employee in writing and provide a description of the action which will be taken to protect the employee from lead hazards.

Lead levels must be rechecked every six months if the exposure level exceeds the action level and every three months if it exceeds the PEL. Monitoring can stop if the employer has monitored for lead twice, testing at least two weeks apart, with results lower than the action level.

Lead exposure monitoring can be done in the following ways:

1. Determination of air concentrations. (Follow NIOSH testing method 7082or an equivalent.) Two pieces of equipment are needed for this, a personal air sampling pump and a membrane filter. These can be attached to an employee for personal monitoring or used for area monitoring.
2. Determination of water concentration. Obtain a water test kit or submit a sample to an analytical laboratory of your choice.
3. Determination of soil concentration. Obtain a soil test kit or submit a sample to an analytical laboratory of your choice.
4. Determination of blood lead level. Determined by a blood sample taken by a physician.
   NOTE:OSHA's exposure level for lead in blood is 50 micrograms per deciliter (µg/dl).
5. Determination of surface lead level. Can be determined by convenient test kits.
   NOTE: Once the lead level is determined, it should be compared with the recommended level.

Lead Protection

The employer is required to provide respiratory protection and protective clothing for those exposed to lead levels above the PEL. If an employee requests respiratory protection at any time, the employer must provide the protection even if the employee's exposure is below the PEL. Common reasons for an employee requesting respiratory protection when they're below the PEL would be if they received medical advice that required them to lower their lead exposure levels or if they would like to have children in the near future. For more information on respiratory protection, please refer to 29 CFR 1910.1025(f). For personal protective clothing information, refer to 1910.1025(g).

Safe Lead Work Practices

When working with lead, these safe practices apply (29 CFR 1910.1025):

1. Provide exhaust ventilation.
2. Use only high-efficiency particulate absolute (HEPA) vacuums for cleanup.
3. Use National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA)-approved respirators. (The type will be determined by the exposure level.)
4. Do NOT eat, drink or smoke in lead-contaminated areas.
5. Use proper protective clothing, shoe covers and gloves.
6. Wash hands thoroughly before eating.
7. Shower and change into clean clothes before leaving worksite.

Lead Prevention Training

OSHA guidelines require comprehensive training for everyone who may be potentially exposed to lead. (29 CFR Part 1910.1025(l).

Lead Signs and Labels

Signs must be posted in each work area where the PEL is exceeded. These signs must be illuminated and cleaned as necessary to ensure legibility (29 CFR Part 1910.1025(m)).

OSHA has updated the language for workplace signs to incorporate guidance from the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). The update is effective June 1, 2016 for signs.

The language for signs required after June 1, 2016 is:

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 legend in lieu of that specified above:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

Per the protective work clothing and equipment cleaning and replacement guidelines (1910.1025(g)(2)(vii)(A)), as of June 1, 2015, employers are required to label bags or containers of contaminated protective clothing and equipment with the following:

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 have elected to include the following information on bags or containers of contaminated protective clothing and equipment in lieu of the labeling requirements outlined 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.

For more information about GHS, please refer to Globally Harmonized System.

Commonly Asked Questions

Q: Is lead poisoning reversible?

A: Some health effects of lead poisoning are reversible but others are permanent. This is why lead exposure prevention is so important.

Q: What are some common sources of lead?

A: Some common source of lead are lead-based paints (pre-1978), battery manufacturing, radiator repair, construction, soldering, recycling, demolition, scrap metal recycling, working with stained glass, pottery making, target shooting and casting fishing weights.

Q: When measuring airborne concentrations of lead in the workplace, what degree of accuracy is required?

A: Employers must use a method of monitoring and analysis which has an accuracy to a confidence level of 95% of not less than plus or minus 20% for airborne concentrations of lead equal to or greater than 30 ug/m ^{3}.

Sources

Coalition to Prevent Lead Poisoning: Lead-Safe Work Practices

29 CFR 1910.1025, Lead Toxic and Hazardous Substances

National Institute for Occupational Safety and Health (NIOSH)
Workplace Safety and Health Topics – Lead

EPA: Lead in Paint, Dust and Soil

Source: Grainger Know How – https://www.grainger.com/know-how