



CONN-OSHA Quarterly

CONNECTICUT DEPARTMENT of LABOR DIVISION of OCCUPATIONAL SAFETY and HEALTH

Lead Exposures in Municipalities

Lead is a naturally occurring chemical element represented by the notation Pb. It is a bluish-gray heavy metal at room temperature and pressure. It has been used extensively in products due to its low melting point, density, resistance to corrosion, and the ease with which it can be worked. It is ductile and malleable and can be easily rolled into sheets and formed into a variety of products including pipes and rods. It can also combine with various other substances to form numerous lead compounds. Lead can be found in products such as lead-based paint, lead solder, lead pipes, plumbing fixtures, ammunition, storage batteries, and many metal alloys. It can also be found in pottery glazes and stained glass.

In adults, the primary route of exposure to lead is via inhalation. Lead metal can become airborne through activities such as abrasive blasting, sanding, cutting, scraping, machining, grinding, or welding. These activities can disturb lead-based materials, such as paint, and break them down into particles known as dusts and fumes. These lead-containing particles can then be inhaled, absorbed through the lungs and upper respiratory tract, and enter into the bloodstream. Once in the bloodstream, lead can be circulated through the body, causing harmful effects. While some of the lead is filtered and excreted from the body, the remainder gets stored in bones and tissues. The stored lead can later be released back into the bloodstream and continue to cause harmful effects.

Employees can also be exposed to lead through ingestion, either through direct hand-to-mouth contact or indirectly from hand-to-mouth contact with contaminated foods, beverages, cigarettes, etc. A blood lead level test can be used to measure the amount of lead in the blood. A zinc protoporphyrin test is a useful blood test which measures the effect of lead on the body.

Lead can adversely affect numerous body systems as a result of either acute exposure or chronic overexposure. Long-term overexposure to lead may result in damage to the nervous system, the blood forming system, and the urinary and reproductive systems. Some symptoms associated with overexposure to lead include:

- Loss of appetite
- Constipation
- Abdominal pain
- Metallic taste in mouth
- Nausea
- Excessive tiredness, weakness
- Insomnia
- Headache
- Anxiety/Irritability
- Impaired concentration, memory problems
- Muscle and joint pain
- Fine tremors

Prolonged exposure also can lead to anemia, jaundice, high blood pressure, renal failure, seizures, coma, and reduced fertility.

Various tasks conducted by employees in the public sector can result in exposure to lead. These include, but are not limited to, repainting surfaces which contain lead-based paint, conducting renovations, auto body repair work, welding, soldering, and cleaning/maintaining firing ranges.

Lead-Based Paint

Lead-based paint may be found in schools, libraries, courts, and other municipal buildings. It has been used on walls, doors, window sills, stairs, railings, columns, porches, and trim. Although the federal government began regulating its use in residential settings starting in 1978, lead-based paint can still be found under layers of lead-free paint in many facilities.

High exposures to lead can occur during renovation and remodeling activities that involve scraping, sanding, cutting, drilling, and conducting other activities which result in the disturbance of lead-based paint. The replacement of old windows which may contain layers of old lead-based paint can also result in high exposures. In areas of deteriorating lead-based paint, lead particles can dislodge from surfaces, become airborne, and be inhaled. Settled lead dust on flooring and other surfaces can also become re-entrained in the air through normal movement, causing additional exposure.

Prior to beginning any renovation or remodeling projects, an evaluation should be conducted for the presence of lead-based paint in areas which may be affected by these activities. Any removal/disturbance of lead-based paint, including manual scraping of paint, must be conducted in compliance with the OSHA Lead Standard, 1926.62. Employers should also develop a plan to address any chipping or peeling lead-based paint in the workplace. Some methods of control for lead paint include enclosure, paint removal, and encapsulation. Note: Any removal or encapsulation of materials containing lead should only be conducted by trained personnel in compliance with the OSHA Lead Standard 1926.62. Other agencies which regulate lead abatement activities should also be consulted.

Lead in Firing Ranges

Law enforcement personnel, instructors, and employees who clean and maintain firing ranges may also be at risk of exposure to lead in both indoor and outdoor firing ranges. Conventional ammunition may contain lead in both the metallic form as well as in a compound form. It can be found in both the primer and in the core of lead-containing bullets.

Lead Exposures, cont.

Exposure to lead dust may occur during target shooting, gun cleaning, and during range maintenance activities. Poorly designed ventilation systems and the use of improper range cleaning practices, such as dry sweeping of settled lead-contaminated dust, can result in high airborne concentrations. The use of poor hygiene practices can result in additional exposures. Employees can also track lead dust on flooring of a firing range to areas outside of the range such as to their vehicles or homes. High concentrations of lead on surfaces and in the air have been found in firing ranges within the state. In one case, a lead concentration over 10,000 micrograms per square foot ($\mu\text{g}/\text{ft}^2$) was found on flooring at the 3 yard mark in a firing range. A lead concentration of 900 $\mu\text{g}/\text{ft}^2$ was found on flooring at the 10 yard mark and over 200 $\mu\text{g}/\text{ft}^2$ was found on a tabletop inside the range.

To minimize exposure to contaminants resulting from weapons firing, ensure that adequate ventilation is maintained in the range. The ventilation system should be in operation at all times while the range is in use as well as during clean-up. The range should be maintained under negative pressure relative to adjacent areas. Also, air should move downrange in as laminar (non-turbulent) a flow as possible.

An appropriate schedule and method of cleaning should be implemented to eliminate settled lead dust inside the firing range. Surfaces should be cleaned with a vacuum cleaner equipped with a high efficiency particulate air filter. Use of compressed air or a hand broom should be prohibited. Wet methods should be used to clean surfaces which cannot be cleaned adequately with a vacuum.

The consumption of food and beverage should be prohibited where working surfaces may be contaminated by lead dust. Good personal hygiene practices should be stressed. Employees should wash their hands upon leaving a range and prior to eating, drinking, or smoking.

Also, the use of jacketed bullets and/or lead-free bullets should be considered to reduce exposures resulting from the bullets themselves.

Lead in Ceramic Glazes

Ceramics instructors, custodians, and other employees who work in ceramics rooms may be at risk of exposure to lead from lead-containing glazes and stains used on pottery pieces. Ceramics studios often contain pre-molded pottery pieces and a variety of stains and glazes. Patrons select a pre-fired ceramic piece and decorate/color it with a stain and/or glaze. The glazed pottery is then baked in a kiln to vitrify the glazes. Acrylic stains and non-toxic glazes may be used. However, lead-containing glazes may also be used. Semi-opaque gloss, opaque gloss, and crystal glazes containing lead have been found in ceramics studios in the state. Surface contaminations with lead have been found in senior centers and other facilities where ceramic workshops are held. In one case at a senior center, a lead concentration of over 70,000 micrograms per square foot ($\mu\text{g}/\text{ft}^2$) was found on flooring near shelves where stains and glazes were stored. A lead concentration of almost 3,000 $\mu\text{g}/\text{ft}^2$ was found on a tabletop and a lead

concentration of 8,500 $\mu\text{g}/\text{ft}^2$ was found on a shelf in the room. Additionally, a lead concentration of 1,800 $\mu\text{g}/\text{ft}^2$ was found on flooring by the kiln. These results indicate high surface contamination with lead. It should be noted that food and drink are often permitted in ceramics rooms which could result in additional lead exposures via the ingestive route.

To minimize exposure to lead in ceramics rooms, consider the use of only lead-free glazes and stains. Material safety data sheets (MSDSs) for the glazes and stains should be reviewed to identify any glaze which contains lead. Lead-containing glazes should be replaced with lead-free glazes where possible. Also, consider having an evaluation conducted for surface contamination if lead-containing glazes have historically been used.

Lead in Drinking Water

Lead can pose an ingestion hazard when present in drinking water as a result of wear and corrosion of lead-containing materials in the water distribution and plumbing systems. Sources of lead include lead solder used in pipes, lead water pipes, and plumbing fittings and faucets made from brass or bronze which may contain lead.

Evaluations for lead in drinking water may be considered for facilities which have lead pipes or where there are signs of corrosion in old plumbing systems. Additional measures to take include flushing tap water prior to use and avoiding the use of hot tap water for food and drink preparation.

Other Sources of Lead Exposures

Due to the extensive use of lead in industry, there are numerous other occupational settings where lead exposures may occur including, but not limited to, bridge repair, plating operations, scrap metal recycling, furniture refinishing, machining lead-containing metals, and the manufacturing of batteries, leaded glass, ammunition, explosives, leaded dyes, inks, glazes, and pigments.

OSHA's General Industry Lead Standard

OSHA's general industry lead standard applies to all occupational exposure to lead with the exception of the construction industry and agriculture industry which are regulated separately. The standard is designed to protect workers from the hazards of lead exposure.

The standard established two threshold levels for exposure to airborne lead. The Permissible Exposure Limit (PEL) is the maximum concentration of lead that an employee can be exposed to averaged over an eight-hour period. The PEL for lead is set at 50 micrograms of lead per cubic meter of air (50 $\mu\text{g}/\text{m}^3$) as an eight-hour time-weighted average. Employers are required to ensure that no employee is exposed to airborne concentrations of lead over the PEL.

The action level (AL) for lead is set at 30 $\mu\text{g}/\text{m}^3$ as an eight-hour time-weighted average. The AL is the level which triggers additional requirements under the lead standard such as periodic exposure monitoring, biological monitoring, medical surveillance, and employee training.

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Lead Exposures, cont.

Each employer who has a workplace or work operation covered by the standard must perform an initial assessment to determine if any employee may be exposed to lead over the action level. Exposures above the action level (30 µg/m³) require exposure monitoring every 6 months, the institution of a medical surveillance program (for employees exposed above the action level for more than 30 days per year) and the institution of a training program. Exposures above the permissible exposure limit (50 µg/m³) require the implementation of a written compliance program; engineering, work practice & administrative controls; hygiene facilities and practices; respiratory protection; personal protective equipment and clothing; posting of warning signs, and exposure monitoring every 3 months.

Employees subject to airborne lead at any level must be informed of the content of Appendices A (“Substance data sheet for occupational exposure to lead”) and B (“Employee standard summary”) of the Lead Standard. Inadequately informed employees are unaware of the hazards the workplace may present to them, and therefore may not adequately protect themselves.

OSHA’s Construction Industry Lead Standard

OSHA’s lead in construction standard applies to all construction work where an employee may be exposed to lead. Activities related to construction, alteration, and repair, including painting and decorating, are covered under this standard.

Each employer who has a workplace or operation covered by this standard must initially determine if any employees may be exposed to lead at or above the action level. Until the employer performs an employee assessment as required under paragraph (d) of the standard and determines actual employee exposure, the employer must provide employees performing certain tasks which are identified in the standard (i.e. manual scraping/sanding of lead-based paint; abrasive blasting, welding, and torch burning on materials with lead-containing coatings; etc.) with interim protective measures. These measures include appropriate respiratory protection, appropriate personal protective clothing, change areas, hand washing facilities, and biological monitoring (blood sampling and analysis for lead and zinc protoporphyrin levels).

Interim protective measures for exposure to lead also include training as required under paragraph (l)(1)(i) of the standard regarding Hazard Communication; training as required under paragraph (l)(2)(ii)(C) of the standard, regarding use of respirators; and training in accordance with 1926.21, safety training and education.

For each employee who is subject to exposure to lead at or above the action level (30 µg/m³) on any day, based on the exposure assessment, the employer must also provide and assure employee participation in a training program in accordance with paragraph (l)(2) of the standard. The training must include:

- ◆ The content of the Lead Standard and its appendices;
- ◆ The specific nature of the operations which could result in exposure to lead above the action level;

- ◆ The purpose, proper selection, fitting, use, and limitations of respirators;
- ◆ The purpose and a description of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to lead;
- ◆ The engineering controls and work practices associated with the employee’s job assignment including training of employees to follow relevant good work practices described in Appendix B of the standard;
- ◆ The contents of any compliance plan in effect;
- ◆ 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.

It should be noted that most of the provisions of the lead standard are triggered by lead exposure levels. Exposures above the action level (30 µg/m³), in addition to the training requirements noted above, also require exposure monitoring and blood sampling every 6 months. Exposures above the permissible exposure limit (50 µg/m³) require the implementation of a written compliance program; engineering, work practice & administrative controls; hygiene facilities and practices; respiratory protection; personal protective equipment and clothing; posting of warning signs; and exposure monitoring every 3 months

CONN-OSHA Citations and Report of Hazards for Lead

In the public sector, CONN-OSHA has issued 270 citations and report of hazards for lead hazards under the Lead Standards, 1910.1025 and 1926.62. Of these, approximately 50% were issued for Public Safety Departments including Police, Fire, Corrections, and Courts. Forty-two citations and reports of hazards were issued for public schools and libraries and thirty were issued for general government offices. Additionally, twenty-three citations and report of hazards were issued to public works and transportation services and twenty-two were issued for maintenance garages. The remaining were in electric, gas and sanitary services as well as other public sector units.

Some recommendations for employers include:

- ◆ Identify areas where employees may be exposed to lead. Check for work processes which could generate lead dust or fume.
- ◆ Perform an initial assessment to determine if any employee may be exposed to lead at or above the action level. Appropriate protective measures, as identified in the Lead Standards, should be taken based on exposure levels.
- ◆ Maintain all surfaces in the workplace as free as practicable of lead accumulations. Develop a plan to address any chipping and peeling paint in facilities.
- ◆ You may also request a free consultation visit from CONN-OSHA to help address any concerns regarding lead exposures in the workplace. For more information regarding OSHA’s Lead Standards for General Industry and Construction Industry, visit OSHA’s web site at www.osha.gov.

Hazard Corner...Lead Exposure

Occupational lead exposure can occur in more than 100 industries and include operations such as battery manufacturing or recycling, scrap metal handling, ceramics or plastics manufacturing, metal radiator repair, demolition of old structures, renovating firing ranges, abrasive blasting, lead abatement, and welding on metal structures. In addition to being exposed at work, workers carry lead home on their body, clothes, shoes, or in personal vehicles. This "take-home" exposure endangers their family members.

Exposure to lead can adversely affect multiple organ systems and can cause permanent damage, including hypertension, renal dysfunction, cognitive dysfunction, and birth defects or miscarriages. Early symptoms are non-specific and include fatigue, headache, sleep disturbance, depression, hypertension, and central nervous system deficits. Children under 6 years of age and fetuses are especially sensitive to neurological damage. Lead exposure becomes a concern with a Blood Lead Level (BLL) of 10 µg/dL (micrograms of lead per deciliter of whole blood). For pregnant women, the level of concern drops to a BLL of 5 µg/dL. OSHA regulations require written notification and medical examination of employees with a BLL of 40 µg/dL; medical removal from exposure is required at a BLL of 60 µg/dL.

Case Study

A worker in scrap metal-recycling saw his personal physician for muscle pains of a few months' duration. His (BLL) was 37 µg/dL. He went home twice daily in his work clothes. When tested, his 10-month-old child's BLL was 26 µg/dL. The worker informed his employer; 16 co-workers were tested. In all, 10 of 17 workers had

BLLs \geq 40 µg/dL ($2 > 60$ µg/dL); 7 had BLLs ranging from 26 to 39 µg/dL. Five workers each had a child ranging in age from 8 months to 2 years with BLLs 14 to 26 µg/dL. In total, 22 individuals were identified with significant lead exposure.

The work involved cutting and bailing lead-sheathed cable. The company relied on initial air monitoring with low airborne lead levels of 2 micrograms per cubic meter (µg/m³) and did not implement a lead safety program. Repeat air-monitoring results were up to 240 µg/m³; all workers cutting cable were exposed to air levels above the OSHA Permissible Exposure Limit of 50 µg/m³.

While the toxic effects of lead exposures are well recognized, and despite regulatory requirements, many employers in industries with lead exposure do not provide routine blood lead testing for employees.

Sources:

<http://www.cdph.ca.gov/programs/olppp/Documents/medgdln.pdf>

http://www.cdph.ca.gov/programs/olppp/Documents/family_lead_poisoning.pdf

http://www.cdph.ca.gov/programs/olppp/Documents/adult_testing.pdf

<http://www.atsdr.cdc.gov/csem/csem.asp?csem=7&po=8>

CONNECTICUT-OSHA ~ Training Update...

Hazard Communication *December 13, 2011, from 10:00 to noon* This OSHA standard requires four elements to be covered in order to assure that employees are effectively protected from chemical injury or illness. A written program, MSDS's, Labeling and employee information and training. This class will discuss these elements.

OSHA Recordkeeping *December 14, 2011, from 8:30 a.m. to noon* At this workshop, you will learn how to fill out the OSHA 300 Log of Work-Related Injuries and Illnesses accurately and correctly.

Material Handling & Ergonomics *January 10, 2012 from 10:00 a.m. to noon* Confronted with making ergonomic improvements to an existing manufacturing process or office environment but have run out of ideas? Several manufacturing case studies will be reviewed that have improved worker safety and health with minimum cost. This session will help attendees develop a process for recognizing and quantifying risks, creating cost-effective solutions, and documenting the effectiveness of the results.

Workplace Violence *February 7, 2012, from 10:00 a.m. to noon* This workshop is designed to make you more aware of some of the issues related to the workplace and to provide tools to help manage, defuse and prevent it.

Construction Site Safety *February 15, 2012, from 9:00 a.m. to noon* Construction managers, first line supervisors, and construction employees will be provided with an overview of four areas of concern on the construction site. Program contents include: fall protection, scaffolding and ladders, electrical hazards, and trenching safety.

Breakfast Roundtable This discussion group meets the third Tuesday of every month from 8:15 am to 9:45 am. Pre-registration is required. To be placed on the e-mail distribution list, contact John Able at able.john@dol.gov

Classes are free and held at 200 Folly Brook Boulevard, Wethersfield, CT in Conference Room A/B. To register, contact John Able at able.john@dol.gov or Catherine Zinsser at zinsser.catherine@dol.gov. Pre-registration is required. A Photo I.D. is required to allow entry into a public building. For more training information, visit the CONN-OSHA web site www.ctdol.state.ct.us/osha/osha.htm