

Environmental Health Newsletter

March 2010

Lead

Lead is a common environmental health issue especially for contractors who perform renovations and repairs of older structures that contain lead based paints. Lead can also be found in some industrial processes such as welding or in metalworking operations where alloys such as brass are used. There are various laws and regulations pertaining to lead abatement and when renovation, repair and painting activities are performed where lead based paints may be present. It is important to recognize where lead may be present and what controls are necessary to ensure employees and the public are adequately protected.

Uses

Lead has found wide use because it is soft, has high density and a low melting point. Its low melting point in conjunction with tin makes it an excellent soldering agent. It is also alloyed with other metals to make brass and bronze. Lead was widely used as a paint pigment in the past and was used to boost octane in gasoline. Lead is also used in lead acid batteries, glass, plastics and ceramics. Because lead provides excellent corrosion resistance to some chemicals and to gamma and x-rays, it is used to line chemical reaction vessels and as shielding material where radiation is present. Operations involving smelting, scrap recovery, automobile radiator repair, construction and demolition may result in significant employee exposure to lead.

Hazards

Lead exposure causes anemia, colic, anorexia, pain, tremors, insomnia, lassitude, and

reproductive effects. Lead affects a number of enzyme systems in the body but the most sensitive to lead exposure are the enzymes associated with red blood cell (heme) synthesis. Because the membranes in the lungs are thin and the lungs have a very high surface area (about the size of a tennis court), inhaled lead goes directly into the bloodstream very easily. Ingestion exposure is not as efficient but is higher in children and pregnant women. Once in the bloodstream, lead travels throughout the body and is stored in bone. Even after exposure to lead ceases, the reserve of lead in the bone continues to slowly be released back into the bloodstream where it can impact other organs. Monitoring of blood lead levels is an important indicator of exposure. Studies have shown no adverse health effects when blood lead levels are kept below 40 µg/dl (micrograms per deciliter) in males and 30 µg/dl in women. Children have a much higher risk for lead related health effects. Lead leaves the bloodstream and affects the brain and nervous system. As a consequence, the CDC lead guidelines for children are to keep the level below 10 µg/dl. The best way to evaluate exposure to lead is by measuring the concentration in the blood stream. Everyone has some lead in their body. The amount varies due to environmental factors such as where they live, their occupation and whether they smoke or not.

- U.S. Background Level- 2.8 micrograms per deciliter of blood (µg/dl)
- 10 µg/dl- CDC guidelines for children
- 30 µg/dl- Psychological, psychomotor, nerve

conduction changes occur (ACGIH Limit)

- 40 µg/dl- OSHA Limit
- 80 µg/dl- Classic symptoms of lead poisoning

The background blood level was higher in the past and has been dropping since leaded gasoline has stopped being used.

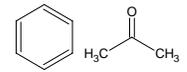
The OSHA PEL (Permissible Exposure Limit) and ACGIH (American Conference of Governmental Industrial Hygienists) TLV (Threshold Limit Value) for airborne lead as an eight-hour TWA were established at 0.05 mg/m³ to keep blood levels below these limits. OSHA has a specific lead standard with an Action Level of 0.03 mg/m³. The standard should be consulted for details pertaining to air monitoring, medical surveillance, recordkeeping, training and personal hygiene practices.

Ingestion can also be a significant route of exposure and strict personal hygiene practices are needed wherever lead or lead containing materials are present.

Lead Based Paint



Statistics show that lead based paints are present in many older buildings and on many exterior painted metal structures. The white pigment used in the past



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contained lead and lead containing paints provided superior resistance to corrosion on exterior metal surfaces such as bridges. According to (HUD) Department of Housing and Urban Development, 57 million homes in U.S. contain lead. NIOSH (National Institute of Occupational Safety and Health) estimates 90,000 bridges in the U.S. have lead based paint. They also estimate that 936,000 construction workers in the U.S. are exposed to lead.

The most common exposure to lead in the construction industries is from lead based paint in buildings and other painted structures. Older homes built before 1978 are much more likely to contain lead based paints and EPA estimates that 74% of homes built before 1980 contain lead based paints. Higher concentrations of lead were used in paints for outdoor structural steel.

Many different types of construction workers may have potential exposure. Some include:

- General contractors
- Painters
- Plumbers
- Electricians
- HVAC contractors
- Plaster & drywall contractors
- Floor contractors

Operations where surface coatings are disturbed or are applied can release lead. The exposure varies according to the type of disturbance and the amount of lead in the paint. Hot work such as welding or torch cutting raises the temperature well above the boiling point of lead so that the lead is vaporized causing much higher exposure levels. Dry practices have higher exposure than wet practices

where the water reduces dusts. Power tool methods also result in higher exposures than manual methods of paint removal. Sand blasting methods to remove lead based paint result in the highest exposures due to the high levels of dust generated by the process. Enclosures and dust collection systems are used for paint removal on bridges to control the large amount of contaminated dust that is generated.

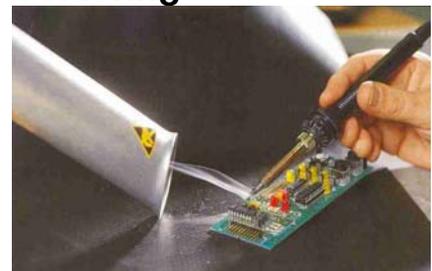
An analysis of the lead hazard should be performed for each job. The locations of lead hazards and the scope of the hazard should be determined. Older buildings probably contain lead based paint. If the paint is peeling and in poor condition there is a higher exposure potential. There are a number of ways painted surfaces can be tested for lead content. They include use of X-ray fluorescence machines, collection of paint chips which are sent to a laboratory for analysis or simple screening kits. X-ray fluorescence equipment can give immediate results but the cost of the equipment is very high. Paint chips can be collected and sent to a lab for analysis. This is much cheaper than x-ray fluorescence but it will take several days to get results. If immediate results are needed this may be a problem. With good planning ahead of the job, this is often the best method for determining the lead content of paint. There are a number of cheap screening methods using test kits that can be used. These kits have to be used correctly and if there are multiple layers of paint special procedures are required. They do not give actual lead concentrations in the paint. They just identify if lead is present or not. If quantified levels

of lead are required, then the other testing methods must be used.

Proper personal hygiene is required to prevent accidental ingestion of lead as well as to prevent lead from being spread to other areas. Common hygiene controls include:

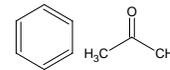
- Do not eat, drink or use tobacco products in dusty areas
- Wash hands & face before eating, drinking, and using tobacco products
- Change clothes and shower before leaving at the end of the shift

Soldering



Soldering is a process of joining metals together where the base metal does not become molten. Filler metal (solder) acts as a glue holding the two metal surfaces together. Soldering temperatures are below 840°F. Many different types of solder are available for specific applications. Some contain lead and some do not. It is important to have a clear understanding of the soldering process and type of solder employed. MSDSs should be consulted if necessary.

Soldering can be conducted with irons or torches or by dipping parts in solder pots or by wave solder machines where parts are



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soldered as they move over a flowing bath of molten solder.

Fluxes are applied to the areas to be joined. Fluxes provide a chemically clean area for solder adhesion when they are heated and are the sources of the smoke and fumes observed during soldering. Even though most commonly used solder is a lead-tin alloy, airborne lead exposure during soldering is not a significant health concern because the temperatures are below the 900°F threshold where lead vapor pressure becomes significant. Ingestion of lead due to poor hygiene practices such as eating and drinking at work areas and lack of hand washing facilities pose a more significant route of lead exposure during soldering.

Cleaning wave solder machines can be a significant inhalation concern due to dusts containing lead. Protective clothing that provides dermal protection and respirators should be worn when cleaning wave solder machines.

Lead Abatement



Lead abatement activities are regulated by the EPA. Lead abatement is defined as the removal of lead based paint and dust, the permanent encapsulation of lead based paint, the replacement of lead painted surfaces and removal of lead contaminated soils and the preparation, cleanup, disposal and post abatement clearance activities for these measures.

The EPA has established training and certification for all individuals engaged in lead based paint risk assessment, inspection and abatement. They also have performance standards for certifying individuals who supervise lead abatement projects and conduct clearance examinations. EPA's regulations are implemented through individual state programs in most cases. All abatement contractors must be certified to perform this type of work and all abatement employees must be trained and certified.

Abatement does not include renovation, remodeling and other activities that are not designed to permanently eliminate the lead based paint hazards.

Renovation, Repair and Painting (RRP)

Common renovation activities like sanding, cutting, and demolition can create hazardous lead dust and chips by disturbing lead-based paint, which can be harmful to adults and children. To protect against this risk, on April 22, 2008, EPA issued a rule requiring the use of lead safe practices and other actions aimed at preventing lead poisoning. Under the rule, beginning in April 2010, contractors performing renovation, repair and

painting projects that disturb lead-based paint in homes, child care facilities, and schools built before 1978 must be certified and must follow specific work practices to prevent lead contamination.

Any contractors who is paid to perform work and disturbs paint is covered by the rule. These may include but are not limited to:

- General Contractors
- Painters
- Carpenters
- Plumbers
- Electricians

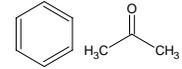
Requirements of the new regulations include:

- Firms must be certified
- Renovators must be trained
- Lead-safe work practices must be followed.

Examples of lead-safe work practices include use of work-area containment to prevent dust and debris from leaving the work area, prohibition of certain work practices like open-flame burning and the use of power tools without HEPA (High Efficiency Particulate) exhaust control and thorough clean up followed by a verification procedures to minimize exposure to lead-based paint hazards.

Minor repairs and maintenance activities that disturb 6 square feet or less of paint per room inside or 20 square feet or less on the exterior of a home or building are not subject to the rule. It should be noted that EPA does not consider window replacement as a minor repair.

The training, certification, and work practice requirements do not apply where the firm obtained a signed statement from the owner that all of the following are met:



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- The renovation will occur in the owner's residence
- No child under age 6 resides there
- No woman who is pregnant resides there
- The housing is not a child-occupied facility; and
- The owner acknowledges that the renovation firm will not be required to use the work practices contained in the rule.

Contractors who perform renovation, repairs, and painting jobs in pre-1978 housing and child-occupied facilities must, before beginning work, provide owners, tenants, and child-care facilities with a copy of EPA's lead hazard information pamphlet [Renovate Right- Important Lead Hazard Information for Families, Child Care Providers and Schools](#).

To become certified, renovation contractors must submit an application and fee payment to EPA.

Contractors who perform renovation, repairs, and painting jobs should also:

- Provide a copy of the EPA or state lead training certificate to the client.
- Tell the client what lead-safe methods will be used to perform the job.
- Ask the client to share the results of any previously conducted lead tests.
- Provide the client with references from at least three recent jobs involving homes built before 1978.
- Keep records to demonstrate that workers have been trained in lead-safe work practices and that lead-safe

work practices are followed on the job.

It should be noted that contractors and training providers working in Wisconsin, Iowa and North Carolina must contact the state to find out more about its training and certification requirements. These states are authorized to administer their own RRP programs in lieu of the federal program.

OSHA's Lead in Construction Standard

OSHA's Lead in Construction Standard 29 CFR 1926.62 applies to all construction work where an employee may be exposed to lead. Employees must do risk assessments to determine employee exposures. This is usually done by performing personal exposure monitoring (air testing). If the initial assessment indicates that no employee is exposed above the AL (Action Level) of 0.03 mg/m³, the employer may discontinue monitoring. If the initial assessment indicates that an employee is exposed above the AL but below the PEL (0.05 mg/m³), the employer has to have a continuing air monitoring program.

Until the employer performs the 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.

Exposures assumed between PEL and 10 times PEL include:

- Spray painting with lead-based paint
- Manual demolition
- Manual sanding/scraping
- Heat gun applications
- Power tool cleaning with dust collection system

This is the lowest category of potential respiratory hazards so a respirator with a protection factor of 10 can be used.

Exposures between 10 times the PEL and 50 times the PEL include:

- Using lead containing mortar
- Lead burning
- Rivet busting
- Power tool cleaning without dust collection
- Clean-up of expendable abrasives
- Moving /removing blasting enclosures

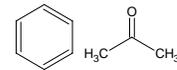
This category of potential lead respiratory hazards is higher so a respirator with a protection factor of 50 is required for these activities.

Exposures above 50 times the PEL include:

- Abrasive blasting
- Welding
- Cutting
- Torch burning

This is the highest potential lead exposure category so a respirator with a protection factor above 50 is required.

The standard requires employers to minimize exposure through engineering controls, good work practices, training, and use of personal protective clothing and equipment, including respirators, where required. The employer needs to designate a competent person capable of identifying existing and predictable lead hazards and who is authorized to



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take prompt corrective measures to eliminate such problems. For 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 employer must provide personal protective equipment where employees are exposed to lead above the PEL. They must also provide showers and change rooms, where feasible, and ensure employees use the facilities.

Food, beverages, tobacco products, and cosmetics are prohibited in all areas where employees are exposed to lead regardless of respirator use. Employees must wash their hands and face prior to eating, drinking, smoking or applying cosmetics in eating area. Employees are prohibited from entering these areas when wearing personal protective clothing or equipment unless surface lead dust has been removed. Employees must wash their hands and face at the end of the work shift. The employer must provide adequate hand washing facilities - including an adequate supply of water, soap, and clean towels - for employees. These facilities must be as free as practicable from lead contamination and be easily accessible to all employees.

The standard also has medical monitoring provisions which include a detailed work and medical history including past lead exposures, personal habits and focusing on hematological, cardiovascular, gastrointestinal, renal, reproductive and neurological systems. If an employee's airborne lead level is at or above the AL for more than 30

days in any consecutive 12 months, the employer must perform blood lead analysis under the direction of the medical provider. The standard also includes provisions for temporary job removal from exposure when blood lead levels exceed 50 µg/dl or when the physician's opinion indicates a health condition placing the employee at increased risk from lead exposure.

Employers must also institute an information and training program and ensure that all employees subject to exposure to lead or lead compounds at or above the action level on any day participate.

Evaluating Potential Lead Exposures



This is a picture of an old painted door being made into a headboard for a bed.



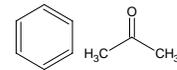
This is a picture of some old painted ceiling tin which is being made into various home decorative pieces.

Loss Control staff need to be aware of potential lead exposures from

both a Worker's Comp as well as product liability perspective. Consumer items such as the bed headboard and the decorative painted tin pose a product liability hazard. Some of the products made by this company included furniture for children, which is a severe liability exposure. Loss Control staff should be on the lookout for these types of unusual products.

The greatest potential for Worker's Comp exposures for the types of risks insured by General Casualty is from construction related exposures to lead based paint. Renovation and demolition activities in older commercial and residential buildings are common potential exposures. In large commercial projects lead assessments are typically done to identify areas with lead based paint. Lead may also be remediated from certain areas. In other situations lead based paint may not be identified. Contractors performing work in pre 1978 buildings should assume lead is present. Silica, asbestos, fiberglass and other hazardous dusts could be present in addition to lead and respirators should be worn for all tasks that create dust as a precautionary measure.

In a number of situations contractors we insure have been involved in projects where lead was identified after the job was started or lead was not addressed at the bid stage. The accounts have questions on how to proceed to ensure the safety of their employees. In these cases, the insureds need to follow the OSHA Construction Lead Standard respirator provisions. As an example, if the contractor was



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performing demolition, employees need to wear a respirator with a protection factor of at least 10. This would include half-face cartridge or disposable respirators. They would also need to comply with OSHA's other provisions of the standard.

Another potential exposure to lead relating to construction pertains to contractors who install lead lined drywall for x-ray rooms in medical facilities. The sheets of drywall are the same as regular drywall except that the back side has the sheet lead glued to it. The lead plated sides of the sheets are cut with a utility knife. No saws or other power tools are normally involved in the process. The sheets are then screwed to the metal studs of the walls with screw guns. We have done air monitoring for these operations in the past and airborne exposures are well below exposure limits. The main exposure issues have to do with personal hygiene practices such as eating and drinking in these work areas, installing hand washing facilities and establishment of restricted areas to prevent other contractors from coming into the area where the drywall is being installed.

In manufacturing operations, lead is usually not an issue unless operations involve brass, bronze or another unusual alloy. One exception we recently encountered was a spring manufacturer. In some wire mills molten lead is used to temper spring wire to the desired hardness and strength. The wire alloy itself does not contain lead but there is a potential for lead surface contamination of incoming wire. Personal exposure monitoring for lead was conducted and airborne lead exposures were below applicable limits. Surface wipe

samples of incoming coil wire stock, lunchroom tables, office area desks and floors throughout the facility were also collected along with a wipe sample from an employee's boots.

There are no specific OSHA regulations pertaining to surface lead contamination levels but OSHA considers more than 200 $\mu\text{g}/\text{ft}^2$ (micrograms per square foot) on employee personal items and on surfaces such as desks, lunch room tables, etc. to be a health hazard.

The source of the lead was found to be the coils of raw wire which had lead contamination as high as 2500 $\mu\text{g}/\text{ft}^2$. The highest surface lead sample was found on the soles of an employee's boots (5500 $\mu\text{g}/\text{ft}^2$). Most employees wore their boots home after work and this potentially spreads lead contamination to the employee's vehicles and homes. The locker room floor had a lead contamination level of 1400 $\mu\text{g}/\text{ft}^2$. This indicated that employees leaving the production floor to access the room, which includes the restrooms, were transporting lead on the soles of their shoes.

Even though lunch rooms and office areas in the facility had lead surface levels that were below the 200 $\mu\text{g}/\text{ft}^2$ OSHA threshold, employees should still be aware of personal hygiene issues and practices to limit accidental lead ingestion.

As a result of this data, it was recommended that all employees leave their work boots at the facility and wear separate shoes to and from work to limit this exposure. It was also recommended that the floor of the locker room be cleaned on a more regular basis to reduce the contamination in this area. In

addition it was recommended that employees be trained in the hazards of lead and in personal hygiene practices to limit exposure. These include hand washing before breaks; before eating, drinking or smoking; before using the restroom and when leaving at the end of the day. The employer has implemented these recommendations and is working with the wire supplier to limit the lead surface contamination of the raw stock. They are also doing some of their own wipe testing to verify the effectiveness of the new controls.

Loss Control staff should also work with the contractor accounts they service to ensure they are up to date with the new EPA Renovation, Repair and Painting regulations that go into effect in April, 2010. If contractors need assistance with lead control programs, we have a model Lead in Construction Safety Program that we can give them along with training materials such as PowerPoints in the Loss Control Library.

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