

Welcome to the Hard Hat Training Series!



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Welcome to the Hard Hat Training Series. Today, we will discuss a few principles regarding lead, including where it can be found, the threats it poses to the body, and how to avoid inhaling it.





During the height of the Roman Empire, metalsmiths discovered a substance that was produced when they smelted silver. The unique matter was as soft as gold and extremely dense, with a very low melting point. It was used to construct pipes and aquifers all over the empire, and had a sweet taste that made it a common artificial sweetener for wine. However, despite the convenience and usefulness of the product, its poisonous properties were destructive enough to Roman society that some historians blame it for the fall of the empire. The ancients called the metal plumbum; we call it lead.

Photo courtesy of wearechange



Following the monumental collapse of Rome, the use of lead was reduced until the Industrial Revolution, when it became a popular building material once more. Because of its durability and malleability, lead was used primarily in plumbing. Additionally, when added to paint, lead increased its resilience (particularly against moisture), enhanced its color, and helped it dry faster.

Photo courtesy of motherjones.com



During the late 19th century and throughout the 20th century, doctors began noticing the harmful effects of lead, with one physician noting that a third of his patients with gout were plumbers and painters. Despite this, the United States began implementing lead for another use. When added to gasoline, lead prevents the fuel from igniting prematurely or 'knocking.' However, many tons of lead have been poured into the atmosphere due to the incorporation of this technique.



During the late 20th century, the United States began regulating the use of lead in industry. In 1978, lead paint was banned, and regulations on its safe removal have since been established. Lead shot used for waterfowl hunting was also banned, and The United States Clean Air Act began to phase out leaded fuel. Today, there is no leaded fuel used in the U.S., and results in human health have been significant. Between 1976 to 1994, the portion of people with elevated blood lead levels dropped from 78 percent to only 4.4.

What is Lead?

Lead is a naturally-occurring and pure element with a higher density than most materials. However, most exposure is sourced from manmade provisions. Lead usually has a dark gray color, but can be bluish-white when freshly cut.

Plumbum
82

Pb

207.2



Useful Properties

We mentioned on the previous slide that lead was heavily used because of its unique nature. Understanding the characteristics of lead will provide you with an appreciation of why it was used so much and help you better identify potential sources in the workplace.

Photo courtesy of steren.com



Photo courtesy of wolfcrow.com

Lead is an element that is found throughout the world, often when mining and refining other elements, such as zinc, copper, and silver. Many current productions of lead come from recycling car batteries and other lead-containing products.





Although extremely dense, lead is very malleable and has a low melting point, which makes working with it very easy. Lead is also extremely ductile, allowing it to be stretched as needed.



Did you know?

Malleable: ability of a metal to be hammered or shaped without breaking

Ductile: in a metal, the ability to be stretched into wire



Photo courtesy of Arnold & heaps Ltd

Another unique property of lead is its high resistance to corrosion, meaning that it keeps itself from rusting. This makes lead very durable; so durable, in fact, that lead pipes made by the ancient Romans are still in use today.



Did you know?

Lead is a whitish-blue color naturally; however, when exposed to air, it tarnishes to a dark gray. When it tarnishes, a protective coating forms that prevents it from oxidizing further.



Photo courtesy of ancientorigins.com





Photo courtesy of Schott AG

One of the most significant properties of lead is its resilience to radiation. Because lead is so dense, it is ideal for blocking out various forms of energy, including x-rays, gamma rays, and even nuclear pollution. This, when combined with malleability, makes lead highly effective as shielding for x-ray machines in doctors' and dentists' offices.

Lead is a poor conductor of electricity. It was used as an insulator for high-voltage power cables and for solder on some electronics, but its application in both of these scenarios is being reduced in order to lessen the amount of lead in the environment.



While the unique properties and natural abundance of lead make it useful, it can cause a lot of harm to the body. Lead acts a neurotoxin, inhibiting communication between neurons. This can cause serious damage to adults; however, the effects of exposure are exponentially worse for children. Lead also can affect the gastrointestinal, urinary, and reproductive systems in the body.



Regulation

The Environmental Protection Agency (EPA) has banned the use of leaded gasoline for most commercial vehicles. The use of lead paint is banned in public and residential buildings by the Consumer Products Safety Commission. Although many lead products are still legal to use in some capacity, they have been largely phased out due to strict regulation and safer alternatives. Lead is also being increasingly restricted in the hunting industry, and bans are gaining ground on all forms of lead ammunition to avoid bio-accumulation in the food chain.



Photo courtesy of flickr



Photo courtesy of Wikipedia



Photo courtesy of Wikipedia



Photo courtesy of 1stdibs.com



Photo courtesy of Scott's dental Company

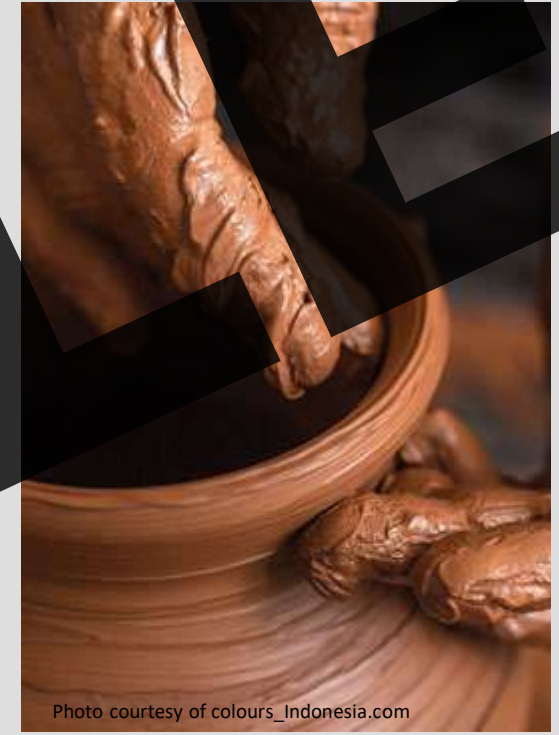


Photo courtesy of colours_Indonesia.com

Despite regulations, lead is often used today, most commonly for the manufacturing of lead-acid batteries. Lead is a central component in the batteries that power most automobiles, and is also often used in facilities with regular exposure to radiation, including medical and dental offices with x-ray machines. Other modern uses include reinforcing bullets, protecting underwater cables, and application to various hobbies. Lead paint is still used on bridges, ship building, and railways due to its durability.

Helpful Terms

Before proceeding, let's take the time to define a few terms that will be helpful as you navigate the course. The first is **permissible exposure limit (PEL)**. This is the legal limit to which a worker can be exposed to a particular substance.



Did you know?

Because of the dangerous nature of lead, the permissible exposure limit is $50\mu\text{g}$ per cubic meter of air during an eight-hour workday.



Regulated Areas: Areas that are marked off and designated by the employer where lead is or might be present. These zones should have appropriate warning signs. Only workers who have been properly trained should ever enter a regulated area.



Photo courtesy of irapa.com



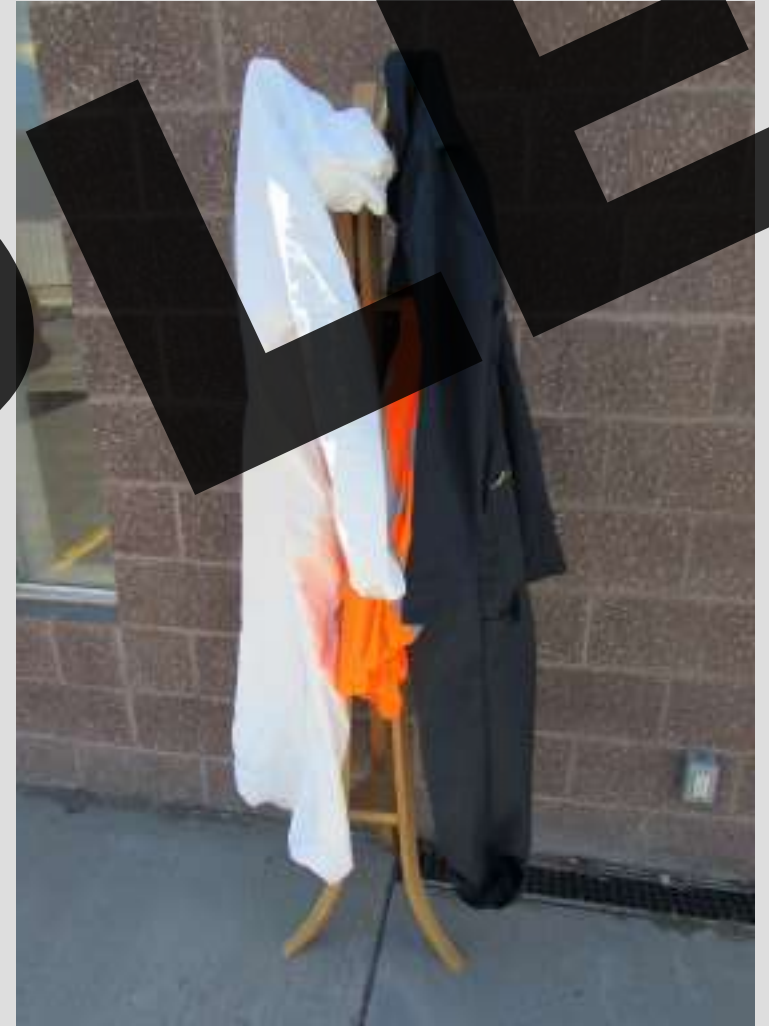
Competent Person: a person who is capable of recognizing lead hazards and has the authority to take immediate corrective measures to mitigate or eliminate them. A competent person needs to perform frequent inspections on worksites that contain lead. This is especially emphasized in construction work.



Photo courtesy of youngconstructionnorthiowa

Abatement: Refers to the process of removing lead from a building or workplace. Due to the hazardous nature of lead, abatement requires very stringent procedures. Regulation requires special training and accreditation by the EPA.

The last term to become familiar with is **PPE (Personal Protective Equipment)**. This term refers to any equipment or gear used to help keep you safe.



OSHA

SAE
INTERNATIONAL

ANSI

ASME

STANDARDS

- 1926.62- Construction regulations for lead
- 1910.1025- General Industry regulations for lead
- 1915.1025- Maritime regulations for lead
- 29 CFR 1910.134: requires employers to establish and maintain an effective respiratory protection program, worksite-specific procedures, respirator selection, employee training, fit testing, medical evaluation, and respirator use, cleaning, maintenance, and repair.
- Section 5(a)(1) of OSH Act of 1970 employers are required to provide their employees with a place of employment that is "free from recognized hazards that are causing or are likely to cause death or serious harm."

These are some of the main standards concerning lead. Of course, states may have additional standards, as do some industries. We have provided these as a guide, but it's your responsibility to know all federal, state, local, and company rules that apply to lead on your jobsite.





Training

The purpose of this presentation is to help you understand the hazards that lead presents and how to safely work when there is potential for exposure. Training on lead exposure is vital to ensuring workers' safety when jobs include lead. Workers should also be thoroughly trained on any duties that necessitate lead exposure. No matter what controls, procedures, and precautions are presented on a job, they will be worthless unless workers are trained on how to properly apply them.



We will cover numerous topics, including the various health effects and exposure routes of lead. We will also discuss monitoring and tests that should be conducted to help control exposure to lead.





The best way to determine whether a material contains lead is to send it to a lab. However, there are some simpler methods for achieving this end. We will go over such tests, as well as common lead-containing materials, later in this training.





We will also discuss how to safely work with lead. Despite the numerous dangers that it poses, lead is still often used in today's industries. However, with proper training and preparation, as well as safe work practices, employees can be kept safe from dangerous levels of exposure. Some types of work, particularly those in construction, require additional training and EPA accreditation to perform. We will go over this in greater detail later in the training.

We will spend time going over the PPE that you must wear while risk of exposure to lead is present. This will include instruction on proper procedures to care for your PPE and donning and doffing PPE in lead-contaminated worksites.





Photo courtesy of ECPlaza

Lead is dangerous, and most people are aware of the high risks associated with its use. However, despite this widespread awareness, thousands are knowingly exposed every year. Last year, a study estimated that over 800,000 workers were potentially exposed to lead in general industry, and another 840,000 in construction industry. Although lead can be found everywhere, with the proper precautions, procedures, and safe practices, you can keep yourself and your family safe from the harmful effects of this deadly material.

Exposure

SAMPLE



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