CONTROLLING LEAD HAZARDS

Jim Newton, P.E., BCEE, ENV SP

COURSE SUMMARY

- Lead facts
- Lead uses
- Lead health issues
- Lead in the environment
- Regulatory requirements for lead
- Investigating lead issues
- Lead remediation techniques

Lead Facts

Lead Facts

- Chemical element with a symbol of Pb and atomic number of 82
- A soft, malleable ductile and heavy metal
- Been in use since ancient times (lead beads dating to 7000-6500 BC)
- Romans used lead
- Melting point of 621.4 ° F
- Most produced in U.S., Australia and China
- Usually found mixed with other metals and must be refined

Lead data

- Symbol: Pb
- Boiling point: 1,740°C
- Melting Point: 327.5°C
- Color: bluish-white
- Density of solid: 11340 kg/m^3 at 20°C
- Classification: Metallic
- Solubility: Not soluble in water
- Atomic number: 82
- Atomic weight: 207.2
- Conditions to avoid: Heat, flames, ignition sources and incompatibles
- Stability: stable under ordinary conditions of use and storage

Current Lead Sources

- Mining
  - Extracted together with Zn, Ag and Cu
  - Extracted as Galena (PbS), cerussite ($PbCO_3$) and anglesite ($PbSO_4$)
  - Galena is 87% lead
- Metal recycling
- Recycling auto batteries

2015 Lead Mining Statistics

Country	Output (tons)
China	2,300,000
Australia	633,000
United States	385,000
Peru	300,000
Mexico	240,000
Other Countries	226,000
India	130,000
Russia	90,000
Bolivia	82,000
Sweden	76,000
Turkey	54,000
N. Korea	45,000
S. Africa	40,000
Poland	40,000
Kazakhstan	38,000
Ireland	33,000

Lead Chemistry

- Characteristically blue in color
- Has 82 electrons
- Slightly easier to oxidize than hydrogen
- Lead can dissolve in acids
- Powered lead burns with a bluish flame
- Normally not attacked by sulfuric acid
- Does react with hydrochloric and nitric acid
- Commonly reacts with sulfur

Uses of Lead

Why was lead used?

- It prevents corrosion
- It kills mold and mildew
- It is easy to shape
- It is strong
- It blocks radiation
- It blocks sound
- It helps paint dry faster
- It adds color to and brightens paint

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Where is lead found?

- Paint
- Dust
- Air
- Soil
- Gasoline
- Industrial releases
- Food
- Water
- Hobbies
- Other

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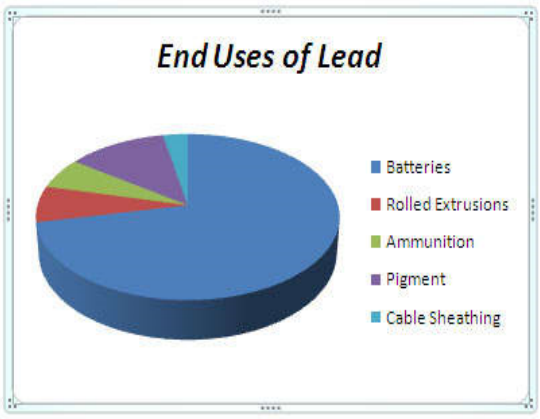
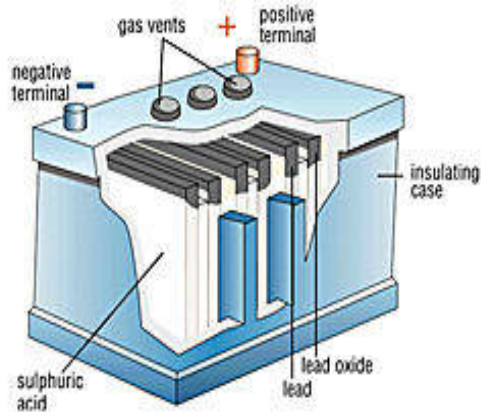
Lead Uses

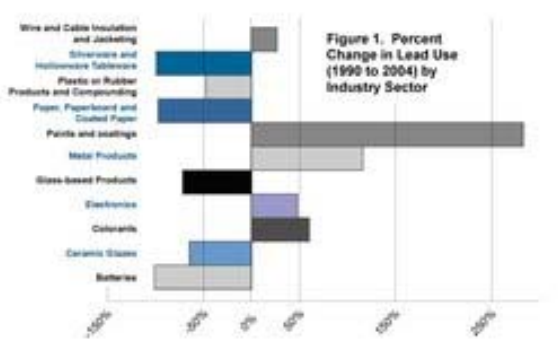
- Electrodes in car batteries
- As a paint additive (pigments)
- Used in construction
  - Roofing
  - Cladding
  - Gutters
  - Glazing bars for stained glass
- Piping
- In sailboat keels and as scuba belt weights
- Sculpting
- Ammunition
- Radiation shields for x-ray equipment
- Electrical wiring (shielding against sound, vibrations and radiation)
- Electrical solder

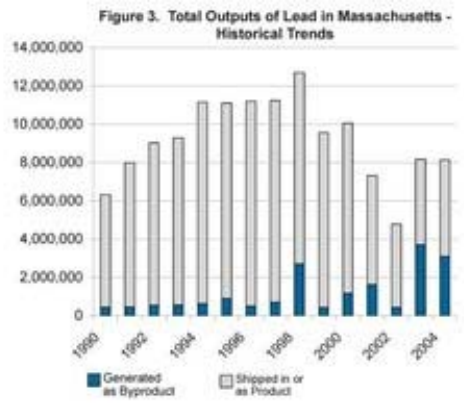


Lead Use in U.S.

Use	U.S. 2005 Consumption (million pounds)	Percent
Storage Batteries	2,580.0	88.4
Ammunition	122.6	4.2
Misc. Uses	65.8	2.3
Sheet lead	58.0	2.0
Casting metals	39.0	1.3
Oxides	8.2	1.0
Solder	16.7	0.6
Billots, ingots	4.2	0.1
Extruded products	2.4	0.1
Bearing metals	2.4	0.1
Totl	2,919.3	100







Lead-based paint is . . .

"Paint, varnish, shellac, or other coating on surfaces that contain 1.0 mg/cm^2 or more of lead or 0.5% (5,000 ppm) or more lead by weight."

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The Lead Problem in the U.S.

- About 38 million homes contain lead-based paint—
  - 87% of homes built before 1940
  - 24% of homes built between 1960-1979
- Paint containing more than 0.06% lead cannot be used in homes, on furniture, or on toys

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Jobs and Hobbies with Lead Exposure

- Jobs
  - Construction trades (e.g., lead abatement workers, carpenters, plumbers, remodelers/renovators, painters, etc.)
  - Industrial trades (e.g., lead miners, lead smelter workers, lead crystal makers, etc.)
  - Other trades (e.g., firing range employees, police officers, artists, car mechanics, printers, etc.)

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Lead in History

Lead in History

- Lead beads produced in 7000-6500 BC
- Egyptians used lead
  - As sinkers for fishing nets
  - In glazes
  - In glasses and enamels
- Lead mines were worked in 2000 BC
- Lead poisoning was listed as a possible reason for the decline of the Roman Empire
- Used by the Romans as a preservative for food and drink and plumbing
- Used as coinage

- Lead plumbing used in Western Europe and Rome
- Used in wine adulteration and subsequently forbidden in 1498 by the Pope
- Used in the printing press
- Great lead production occurred in 18th century as a part of the Industrial revolution
- By 1900 U.S. led in mining
- U.K. offered first attempts to decrease lead usage in 1870's
- Last major lead usage was tetraethlylead used in gasoline in the 1920's (phased out in 2000)

Lead and Health

Routes of Exposure to Lead

- Eating (Ingestion)
  - Lead particles on hands transferred to food, drinks, cigarettes
- Breathing (Inhalation)
  - Lead particles in the air

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Heavy metals

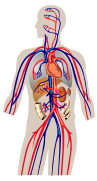
- Chemicals: arsenic, beryllium, cadmium, chromium, lead, mercury
- Uses: wide variety of industrial and commercial uses
- Target organs: blood, cardiopulmonary, gastrointestinal, kidney, liver, lung, CNS, skin

Heavy metals (Page 2)

- Health effects: toxicity to kidney, decreased mental ability, weakness, headache, cramps, anemia, brain damage, cancer
- Monitoring: Search for history cluster of symptoms, including anemia, gastrointestinal symptoms, lab measurements of metal concentrations, CBC, measurement of liver and kidney function, chest x-ray, pulmonary function testing

How Lead Can Harm Your Body

- Heart and Blood System
  - Lead attaches to red blood cells
  - Prevents cells from carrying oxygen
  - Damages the red blood cells
  - Reduces ability to make more red blood cells
  - May cause high blood pressure



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How Lead Can Harm Your Body

- Kidneys
  - 65% of lead in blood is filtered in kidneys
  - Lead can damage kidneys
  - Often damage is not detected until it's too late
  - Can cause kidney failure

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How Lead Can Harm Your Body

- Nervous System
  - Most affected by lead
  - Damage can be permanent
  - Lead can damage the brain and destroy brain cells
  - Damage can result in depression, irritability, forgetfulness, clumsiness, learning disability
  - High exposure can result in hallucinations, coma, and even death

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How Lead Can Harm Your Body

- Bone Tissue
  - Lead from blood is deposited in bones
  - Prevents calcium release into blood
  - Blocks production of new blood cells
  - Bones and teeth store 95% of lead in body
  - Stored in bone tissues for over 30 years
  - Under stress, lead is released from bone tissue

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How Lead Can Harm Your Body

- Female Reproductive Health & Pregnancy
  - Reduces fertility
  - Affects menstruation and menopause
  - During pregnancy, body absorbs blood lead more quickly (50% of inhaled/ingested lead)
  - Lead passes through placenta to fetus
  - May cause brain damage to fetus
  - May cause miscarriage or premature birth
  - May be released from bones back to blood

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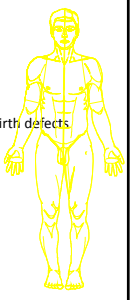
How Lead Can Harm Your Body

- Male Reproductive System
  - Decreased libido
  - Infertility
  - Damage to sperm, decreased motility
  - Increases spouses chance of miscarriage, premature birth, and birth defects in child



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How Lead Can Harm Your Body

- Children
  - Small doses of lead are dangerous
  - Toddlers (1-3 years) especially at risk because they crawl on floors and put things in mouth
  - May affect ability to learn
  - Poor muscle and bone development
  - Coordination problems
  - Speech and language problems

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Signs of Lead Poisoning

- Tiredness
- Sleep problems
- Dizziness
- Irritability
- Nervousness
- Headaches
- Difficulty concentrating
- Depression
- Forgetfulness
- Hyperactivity (children)
- Numbness
- Wrist or foot drop
- Weakness
- Clumsiness
- Joint and muscle pain
- Vomiting
- Loss of Appetite
- Stomach aches
- Constipation
- Metal taste in mouth
- Problems having healthy children

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Lead poisoning symptoms in children

- The signs and symptoms of lead poisoning in children may include:
  - Developmental delay
  - Learning difficulties
  - Irritability
  - Loss of appetite

Lead poisoning symptoms in children

- Weight loss
- Sluggishness and fatigue
- Abdominal pain
- Vomiting
- Constipation
- Hearing loss

Lead poisoning symptoms in newborns

- Babies who are exposed to lead before birth may experience:
  - Learning difficulties
  - Slowed growth

Lead poisoning symptoms in adults

- Although children are primarily at risk, lead poisoning is also dangerous for adults. Signs and symptoms in adults may include:
  - High blood pressure
  - Abdominal pain
  - Constipation
  - Joint pains
  - Muscle pain
  - Declines in mental functioning

Lead poisoning symptoms in adults

- Pain, numbness or tingling of the extremities
- Headache
- Memory loss
- Mood disorders
- Reduced sperm count, abnormal sperm
- Miscarriage or premature birth in pregnant women

Health Effects of Lead Poisoning

- Anemia
- High blood pressure
- Damage to blood cell formation
- Kidney disease
- Brain damage
- Nerve damage
- Decreased fertility
- Premature births
- Miscarriages

Some health effects of lead poisoning are reversible (such as kidney damage, others are permanent (such as wrist drop).

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Testing for Lead in the Body

- Blood lead level - amount of lead in the blood
  - Blood lead level (BLL) test
  - Zinc protporphyrin (ZPP) test
- BLL test shows exposure within last 6-8 weeks (µg/dL)
- ZPP is produced when lead blocks formation of blood (not as accurate as BLL test)

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- **Treating higher levels**
  - For more-severe cases, your doctor may recommend:
    - **Chelation therapy.** In this treatment, you take a medication that binds with the lead so that it's excreted in your urine.
    - **EDTA therapy.** Doctors treat adults with lead levels greater than 45 mcg/dL of blood with one or more of three drugs, most commonly a chemical called ethylenediaminetetraacetic acid (EDTA). Depending on your lead level, you may need more than one treatment. In such severe cases, however, it may not be possible to reverse damage that has already occurred.

Adult Reactions to Lead

Blood Lead Level	Possible Health Effects
15 µg/dL 25 µg/dL	Increase in blood pressure; harmful effects on fetus; joint and muscle aches
40 µg/dL	Reproductive problems
60 µg/dL	Kidney damage; damage to blood formation
80 µg/dL and over	Anemia; nerve damage; constipation; stomach pains; irritability and fatigue; memory and concentration problems; clumsiness; sleep problems
	Blue line on gums; uncontrollable shaking of hands; wrist and foot drop; hallucinations; brain damage; coma; death

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Child Reactions to Lead

Blood Lead Level	Possible Health Effects
10 µg/dL	Slight loss in IQ; hearing and growth problems
20 µg/dL	Moderate loss in IQ; hyperactivity; poor attention span; difficulty learning; language and speech problems; slower reflexes
40 µg/dL	Poor bone and muscle development; clumsiness; lack of coordination; early anemia; decreased red blood cells; tiredness; drowsiness
50 µg/dL	Stomach aches and cramps; anemia; destruction of red blood cells; brain damage
100 µg/dL and over	Swelling of brain; seizures; coma; death

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Where Can Lead be Found?

- At home
- At schools and childcare facilities
- In products
- In drinking water
- In outdoor air
- In soil
- In dust

Lead Exposure Causes

- **Lead in paint**
  - The use of lead-based paints for homes, children's toys and household furniture has been banned in the United States since 1978. But lead-based paint is still on walls and woodwork in many older homes and apartments. Most lead poisoning in children results from eating lead-based paint chips.

Lead Exposure Causes

- **Water pipes and imported canned goods**
  - Lead pipes, brass plumbing fixtures and copper pipes soldered with lead can release lead particles into tap water. Although lead solder in food cans is banned in the United States, it's still used in some countries.
  - About 10-20% of lead exposure to children comes from drinking water

Lead Exposure Causes

- Lead in the Air
  - Ore and metal processing
  - Piston-engine operating on leaded aviation fuel
  - Lead acid battery manufacturing
  - Lead smelting

- **Prenatal exposure.** Lead crosses the placenta. A newborn typically has a blood-lead concentration level similar to his or her mother's.
- **Soil and water.** Lead particles from a gasoline additive or paint can settle on soil and last for years, and lead and copper pipes soldered with lead can release particles into tap water.
- **Lead paint.** The use of lead-based paints for homes, children's toys and household furniture has been banned in the United States since 1978. However, lead-based paint is still on walls and woodwork in many older homes and apartments, which can result in children eating lead-based paint chips.
- Glazes found on ceramics, china and porcelain also can contain lead, which leaches into food. Lead-based paint may be found in toys and other products produced abroad.

- **Children's products.** Lead may be found in children's jewelry or products made of vinyl or plastic, such as bibs, backpacks, car seats and lunch boxes. A child can absorb lead found in these products by mouthing or chewing on them or can inhale lead if the product is burned, damaged or deteriorating.
- **Household dust.** Household dust can contain lead from paint chips or soil brought in from outside.
- **Food.** Food can be contaminated with lead during production, processing, packaging, preparation or storage. For example, vegetables may be grown in soil that contains lead, or exposed to exhaust from fuel that contains lead. Lead can leak into canned foods from tins manufactured with lead solder. And some food containers and pots contain lead, such as lead-glazed pottery and leaded crystal glassware.
- **Folk or home health remedies and certain cosmetics.** Some traditional remedies, such as the indigestion treatments azarcon and greta, may contain lead. Also, some types of paints and pigments used in makeup and hair dye contain lead.
- **Artificial athletic fields.** Artificial turf made of nylon or a nylon and polyethylene blend may contain unhealthy levels of lead dust, which could be inhaled or ingested by a child.

Traditional remedies

- Some cases of lead poisoning have been traced to the use of certain traditional medicines, including:
  - **Greta or azarcon.** This fine orange powder — also known as coral calcium and sea coral — is a Hispanic remedy taken for an upset stomach, constipation, diarrhea and vomiting. It's also used to soothe teething babies.
  - **Litargirio.** Also known as litharge, this peach-colored powder is used as a deodorant, especially in the Dominican Republic.
  - **Ba-baw-san.** This Chinese herbal remedy is used to treat colic pain in babies.
  - **Ghasard.** A brown powder, ghasard is used as a tonic in India.
  - **Daw tway.** A digestive aid used in Thailand, daw tway contains high levels of lead and arsenic.

Other sources of lead exposure

- Lead can also sometimes be found in:
  - **Soil.** Lead particles that settle on the soil from leaded gasoline or paint can last for years. Lead-contaminated soil is still a major problem around highways and in some urban settings. Soil close to walls of older houses may contain lead.
  - **Water.** Copper plumbing soldered with lead is a source of contamination of household drinking water.
  - **Household dust.** Household dust can contain lead from lead paint chips or from contaminated soil brought in from outside.

Other sources of lead exposure

- **Pottery.** Glazes found on some ceramics, china and porcelain can contain lead that may leach into food.
- **Toys.** Lead is sometimes found in toys and other products produced abroad.
- **Traditional cosmetics.** Kohl is a traditional cosmetic, often used as eyeliner. Testing of various samples of kohl has revealed high levels of lead.

Risk Factors

- Factors that may increase your risk of lead poisoning include:
  - **Age.** Infants and young children are more likely to be exposed to lead than are older children. They may chew paint chips, and their hands may be contaminated with lead dust. Young children also absorb lead more easily and sustain more harm from it than do adults and older children.
  - **Living in an older home.** Although the use of lead-based paints has been banned since the 1970s, older homes and buildings often retain remnants of this paint. People renovating an older home are at even higher risk.

Risk Factors

- **Certain hobbies.** Making stained glass requires the use of lead solder. Refinishing old furniture may put you in contact with layers of lead paint.
- **Country of origin.** People who live in developing countries are at higher risk of lead poisoning because those countries often have less strict rules regarding exposure to lead. American families who adopt a child from another country may want to have the child's blood tested for lead poisoning.

Risk Factors

- Lead can harm an unborn child, so pregnant women or women likely to become pregnant should be especially careful to avoid exposure to lead

Testing

- Testing recommended at ages 1 or 2
- Blood sample analyzed for lead
  - A level of 5 micrograms per deciliter(mcg/dL) mcg/dL or higher indicates your child may have unsafe levels of lead in their blood and should have their blood tested periodically.
  - If levels become too high — generally 45 mcg/dL or higher — your child should be treated.

Regulating Lead

- Occupational Safety
- Air
- Solid waste
  - Hazardous waste
  - Lead based paint
- Water
  - Drinking water
  - Wastewater
- Toxic Substances Control Act

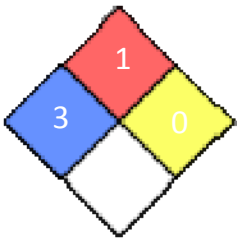
OSHA

- Permissible Exposure Limits (PELs)
- OSHA 1910.1025 (work place)
- OSHA 1926.62 (Construction)
- Permissible Exposure Limit (8-hr) 50 ug/m^3
- OSHA Action level 30 ug/m^3

Other Occupational Limits

- NIOSH Recommended Exposure Level (REL) for an 8-10 time-weighted average exposure = 0.10 mg/m^3
- NIOSH IDLH = 100 mg/m^3
- ACGIH Threshold limit Value = 0.5 mg/m^3

NFPA



1910.1025 Requirements

- Permissible Exposure Limits
- Exposure monitoring
- Employee notification
- Compliance program
- Respiratory protection program
- Protective clothing
- Medical monitoring and records
- Training
- Signs

1926.62 Requirements

- Permissible Exposure Limits
- Lead containing paint operations
- Exposure monitoring
- Employee notification
- Compliance program
- Respiratory protection program
- Protective clothing
- Medical monitoring and records
- Training
- Signs

When does lead-based paint become a hazard?

- There is lead in the dust equal to or greater than the EPA levels
  - Dust level on floors 40 µg/ft²
  - Dust level on window sills 250 µg/ft²
- There is lead in the soil equal to or higher than the EPA levels
  - 400 parts per million (ppm) in a play area
  - Average of 1,200 ppm in the rest of the yard

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Air Regulations

History of the NAAQS for Lead (Pb), from 1978 to 2014

Final Rule/Decision	Primary/Secondary	Indicator[1]	Averaging Time	Level[2]	Form
1978 43 FR 46246 Oct 5, 1978	Primary and Secondary	Pb-TSP	Calendar Quarter	1.5 µg/m³	Not to be exceeded
Feb 21, 1991	Agency released multimedia "Strategy for Reducing Lead Exposures"				
2008 73 FR 66964 Nov 12, 2008	Primary and Secondary	Pb-TSP	3-month period	0.15 µg/m³	Not to be exceeded

1. Pb-TSP = Lead in toal suspended particles

2. Units of measure are micrograpms per cubic meter of air (µg/m3).

Current NAAQS

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3 month average	0.15 µg/m³ (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb (2)	Annual Mean
Ozone (O_3)		primary and secondary	8 hours	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	$PM_{2.5}$	primary	1 year	12.0 µg/m³	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m³	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m³	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 µg/m³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.

NESHAP

- National Emissions Standards for Hazardous Air Pollutants (NESHAP)
- Limit toxic air pollutant emissions based on specific industrial sources
- For lead
  - Primary Lead Smelting
  - Secondary Lead Smelting

Lead in Drinking Water

About 10-20% of lead exposure comes from drinking water

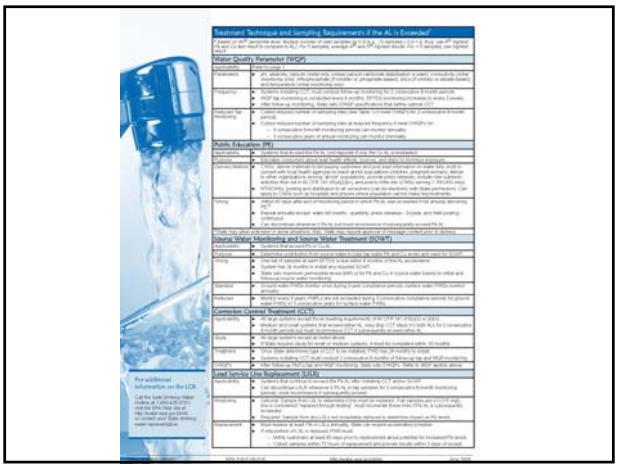
National Primary Drinking Water Standards

Maximum Contaminant Level Goal:
0 mg/L

Maximum Contaminant Level:
Lead is regulated by a treatment technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For lead, the action level is 0.015 mg/L

Lead and Copper Rule

- June 1991, 40 CFR 141.80-.91
- Establishes Action Level of 0.015 mg/L
- Specific monitoring requirements
  - Monitor at taps in homes/buildings
  - Monitor at points where water enters distribution system
  - Based on size of service area (population or connections)
- Must provide results to consumers
- Annually by July 1, must issue a consumer confidence report



If Exceed Action Level

- Must educate consumers about lead health effects
- Must determine contribution from source water
- Must address corrosion control treatment
- Must replace at least 7% of the lead service lines annually

Lead as a Solid Waste

- Hazardous waste is TCLP level exceeds 5.0 mg/L
- Lead acid batteries must be recycled

Lead in Wastewater

- NPDES
  - Based on effluent discharge limits by industry or treatment facility
    - Direct discharges
    - Discharges to POTWs
    - Specifies test methods
  - Can be technology based or water quality based
  - Pretreatment
    - Specific industry limits (categorical pretreatment standards)
    - Prohibitions
    - Local limits

Testing Lead in Water

- 40 CFR Part 136, Appendix C
- Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)

- Biosolids
  - 40 CFR Part 503
  - Land Application limits

Ceiling Concentration	840 mg/kg
Cumulative pollutant Loading Rate	300 mg/kg
Monthly Average Concentration	300 mg/kg
Annual Pollutant Loading Rate	15 kg/hectare/365 days

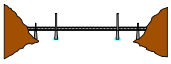
Lead-Based Paint

- Toxic Substances Control Act (TSCA)
- Lead Based Paint Poisoning Prevention (40 CFR 745)
  - Lead Based Paint Hazards
  - Residential Property Renovation
  - Disclosure Requirements
  - Lead Based Paint Activities
- Limited to homes with paint containing more than 1 mg/cm^2 of lead or 0.5 % by weight
- Typical measurement is using an x-ray fluoroscope

Where is LBP Found?

- Public and private buildings constructed before 1978, including
  - Homes
  - Schools
  - Libraries
  - Hospitals
- Bridges and other steel structures





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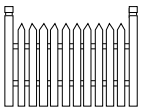
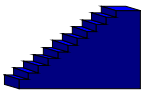
Where is LBP Found In Homes?

◆Pre-1978 homes
- ✓Exterior
- ✓Interior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Inspections

◆Checking for LBP
- ✓Surfaces tested include
  - Painted
  - Stained
  - Varnished
  - shellacked

◆Done by certified lead inspector or risk assessor

◆Check your State laws!

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Ways to test for LBP

◆Paint chip analysis
◆XRF
◆ASV
◆Wet chemical field test kits

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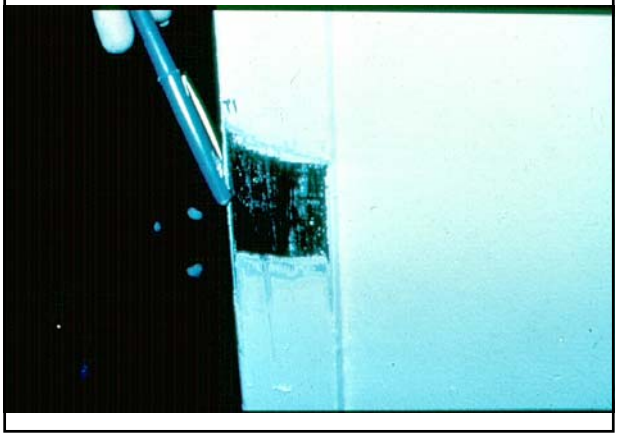

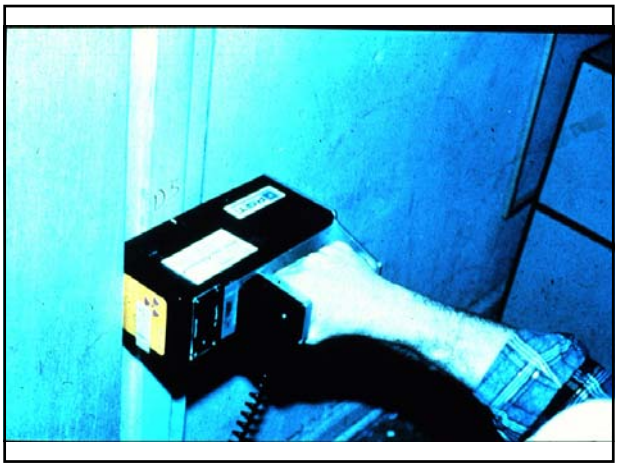


LEAD

Restrictions on the Use of Lead

- European Union restricts lead content in products to less than 0.1% by weight
- Consumer Products Safety Commission (CSPC) banned the use of most lead coatings containing more than 0.06% lead in furniture, toys and other articles intended for use by children
- CSPC has banned any toy or article intended for use by children that could pose a hazard

Lead in Schools Resources

- EPA Programs and Partnerships
  - 3T's for Reducing Lead in Program Drinking Water
  - Drinking Water in Schools & Child Care Facilities
  - Sensible Steps for Healthier School Environments
  - HUD's Office of Healthy Homes and Lead Hazard Control
  - Center for Disease Control and Prevention
- National Organizations
  - National Clearinghouse for Educational Facilities' Lead Safety in Schools resource list
  - Campus Environmental Resource Center
  - University of California-Berkeley Lead-Safe Schools Project

Lead in Drinking Water Resources

- Center for Disease Control and Prevention
  - About lead in drinking water
  - Prevention tips for lead in water
  - CDC page on lead
- Agency for Toxic Substances & Disease Registry (ATSDR)
  - Public health statement for lead
  - ToxFAQs for lead
  - ATSDR page on lead

Lead in the Home

- Gets into home drinking water through piping, typically after public treatment
  - Corrosion of pipes and appurtenances
  - Reaction between the water and lead pipes or lead solder
  - Factors include low dissolved oxygen, low pH, and low mineral content
  - Grounding electrical equipment to metal pipes (accelerates corrosion through electrical current) Age of some homes may have a effect, with plumbing installed before 1930 most likely contains lead piping
  - Lead solder used in copper piping may also contribute some lead

Testing of Drinking Water

- Can get water tested by an approved lab for $20-$100.
- Testing may be more important in high rise buildings
- Water utility may be able to provide testing as well
- Labs may send a certified technician to collect a sample
- Lab should follow EPA's collection and testing procedure
- Test first flush after having water off for 6 hours
- Test a fully flushed sample also

Controlling Lead

- Exposure Prevention
- Lead Removal
- Lead Treatment

Actions to take

- **Remove lead from the environment**
- **Seal lead in**
- **Avoid exposure with low levels**

Exposure Prevention

- You can take some simple measures to help protect you and your family from lead poisoning. These may include:
  - **Wash hands and toys.** To help reduce hand-to-mouth transfer of contaminated dust or soil, wash your children's hands after outdoor play, before eating and at bedtime. And wash their toys regularly.
  - **Clean dusty surfaces.** Clean your floors with a wet mop and wipe furniture, windowsills and other dusty surfaces with a damp cloth.

- **Run cold water.** If you have older plumbing containing lead pipes or fittings, run your cold water for at least a minute before using. Don't use hot tap water to make baby formula or for cooking.
- **Prevent children from playing on soil.** Provide them with a sandbox that's covered when not in use. Plant grass or cover bare soil with mulch.
- **Eat a healthy diet.** Regular meals and good nutrition may help lower lead absorption. Children especially need enough calcium and iron in their diets.

- **What you can do at home**
- **Check your house.** Homes built before 1978 are most likely to contain lead. Professional cleaning, proper paint stabilization techniques and repairs done by a certified contractor can reduce lead exposure.
- Be sure to protect your family and belongings while lead issues are being addressed. Before you buy a home, have it inspected for lead. Before you sign a lease, ask the landlord about lead.
- **Keep children out of potentially contaminated areas.** Don't allow your child near old windows, old porches, bare soil, dirt next to an old home, or areas with chipping or peeling paint as well as old window putty that is flaking or chipping.

- If possible, lay sod on areas of bare soil or cover bare spots with grass seed, mulch or wood chips. If your home contains chipping or peeling paint, clean up chips immediately and cover peeling patches with duct tape or contact paper until the paint can be removed.
- **Filter water.** Ion exchange filters, reverse osmosis filters and distillation can effectively remove lead from water. If you don't use a filter and live in an older home, run cold tap water for 15 to 30 seconds before using it.
- Use cold tap water for cooking, drinking or making baby formula. Hot water absorbs lead more quickly than does cold water.
- **Take precautions in the kitchen.** Store food in glass, plastic or stainless steel containers — not open cans. If you're not sure if pottery has a lead glaze, use it only for decoration.

- **Keep your home clean.** Regularly wipe floors and other surfaces with a damp mop or sponge.
- **Encourage good hygiene.** Make sure your child washes his or her hands and face after playing outside or with pets and before eating and sleeping. Also, regularly wash children's toys, which may become contaminated from soil or household dust.
- **Avoid traditional remedies and certain cosmetics.** If you're not sure if a traditional remedy or cosmetic contains lead, don't allow your child to use it.
- **Promote a balanced diet.** Eating a diet high in iron and calcium may decrease a child's absorption of lead.

- **Tips for at work or play**
  - **Avoid certain children's products and toys.** Avoid buying nonbrand toys, old toys, and toys from discount shops or private vendors — unless you can be sure that the toys have been produced without lead or other harmful substances.
  - Don't give costume jewelry to young children. Regularly check lead recall lists, and keep in mind that commercial lead test kits may not be reliable.
  - **Take precautions around artificial athletic fields.** Don't allow your child to eat on an artificial field, and keep drinking containers — when not in use — in a bag or covered container. After leaving the field, have your child remove his or her clothes and turn them inside out to avoid tracking contaminated dust from the play area.

- If clothing can't be removed, have your child sit on a towel or blanket in your vehicle. Wash contaminated clothing, towels and blankets separately. Have your child bathe with soap and water after playing on the field.
- Keep shoes worn on the field outside of your home. Ideally, remove all shoes when you enter the house and wear no shoes inside or use house slippers indoors.
- **Take precautions after working with lead.** After working with lead, change your clothes and shoes and take a shower. Keep contaminated clothing in the work area or wash your work clothing — separately — as soon as possible.
- Also, keep materials used for hobbies that may involve lead, such as ceramics making, away from children and areas where they spend time.

Home Renovation

- If you're doing minor remodeling or touch-up work in an older house with lead-based paint, take precautions.
  - **Don't attempt to remove the lead paint by sanding.** Sanding surfaces painted with lead is hazardous because it generates large amounts of small particles.
  - **Don't use an open-flame torch to remove paint.** The flame produces lead particles small enough to inhale.

- **Cover old paint.** Removing old lead paint may not always be possible. If the paint is on tight, without many chips, you can paint over it. You can also use paneling, drywall or encapsulation, which is similar to a very thick coat of paint.
- **Wear protective equipment and clothing.** Change your clothes, take a shower and wash your hair before leaving the job. Don't shake out work clothes or wash them with other clothes.
- **Be careful where you eat.** Don't eat or drink in an area where lead dust may be present.

Lead Treatment

- Change to a different water source
- Renovate or remove pipes that contain lead
- Treat water with
  - Ion exchange
  - Approved Calcite or cartridge filters
  - Distill Water

End