



Lead Awareness Training

Revision A

be certain.

- » Lead and its properties
- » Health Effects of Lead
- » OSHA acceptable lead exposure levels
- » Housekeeping and work practices
- » Lead testing and MTS

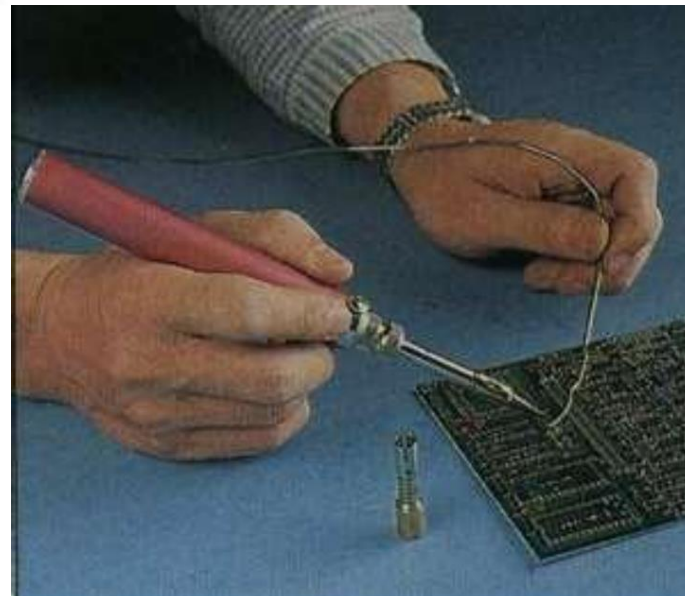
What is Lead?



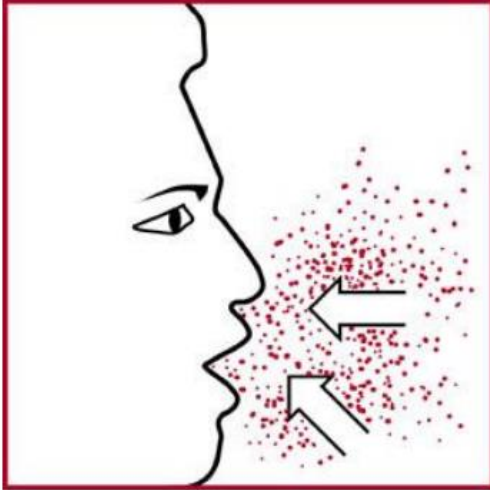
- » Heavy metal at room temperature
- » Bluish-gray
- » Low melting point (621 degrees f.)
- » Pliable
- » Corrosion resistant
- » Can form lead compounds

Where do you find lead?

- » Solder (Most common at MTS)
- » Ammunition
- » Fishing sinkers
- » Storage batteries
- » Pigments for paints, dyes and ceramic glazes



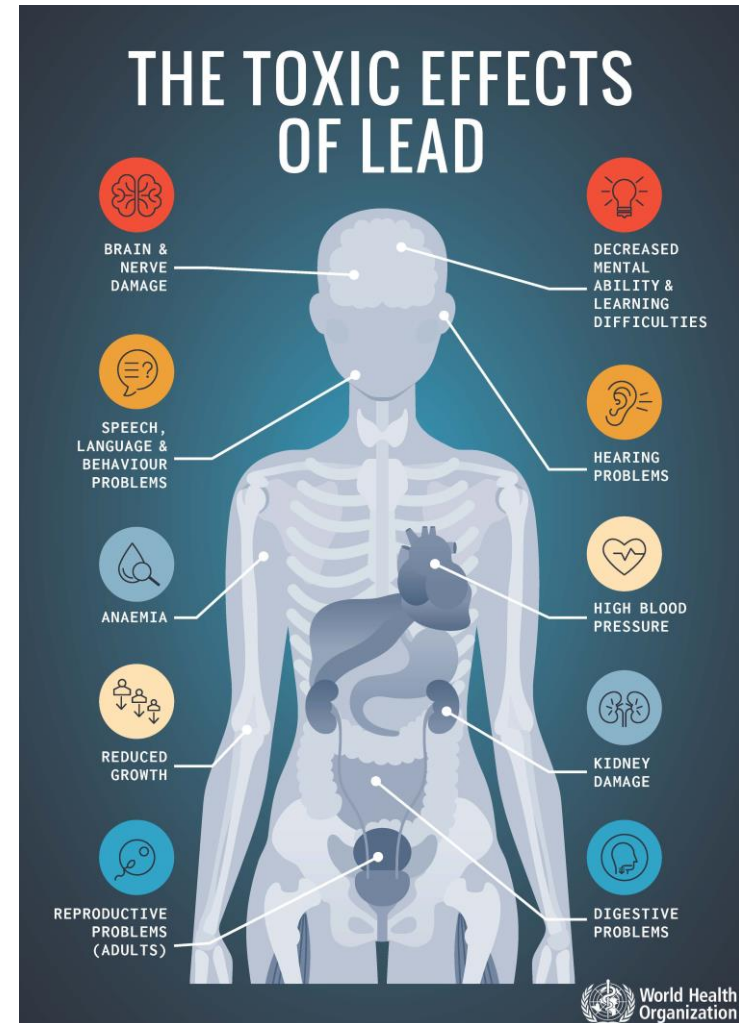
Ways in which lead enters the body



- » Inhalation – breathing lead fumes or dust.
- » Ingestion – swallowing lead dust via food or cigarettes, through hand to mouth contact.
- » Absorption – through the skin (more commonly seen with organic lead vs inorganic lead).

- » Lead which is inhaled or ingested enters the bloodstream.
 - Can be circulated throughout your body.
- » Some is excreted while some remains in organs and body tissues.
- » If exposure continues, the amount stored in your body will increase if you are absorbing more lead than your body is excreting.
- » Lead is usually not absorbed through the skin (usually a trait of organic lead compounds such as tetrethyllead or lead naphthenate).
 - However it can enter through cuts on the hands.

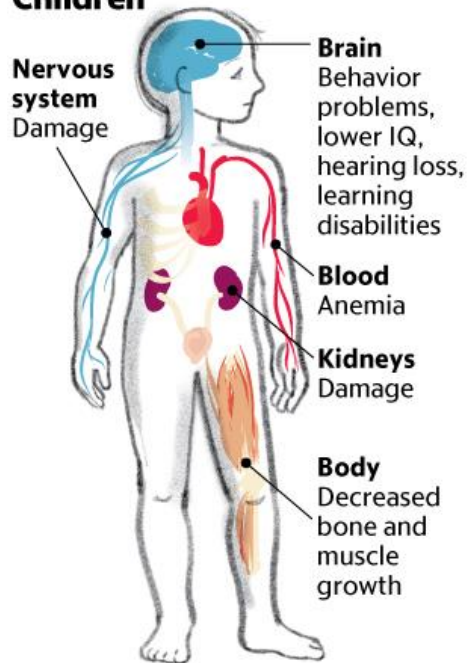
- » Reported acute (short term) health effects include: loss of appetite, nausea, vomiting, stomach cramps, constipation, difficulty in sleeping, fatigue, moodiness, headache, joint or muscle aches, anemia, and decreased sexual drive.
- » In rare cases; brain damage, coma and death have occurred.



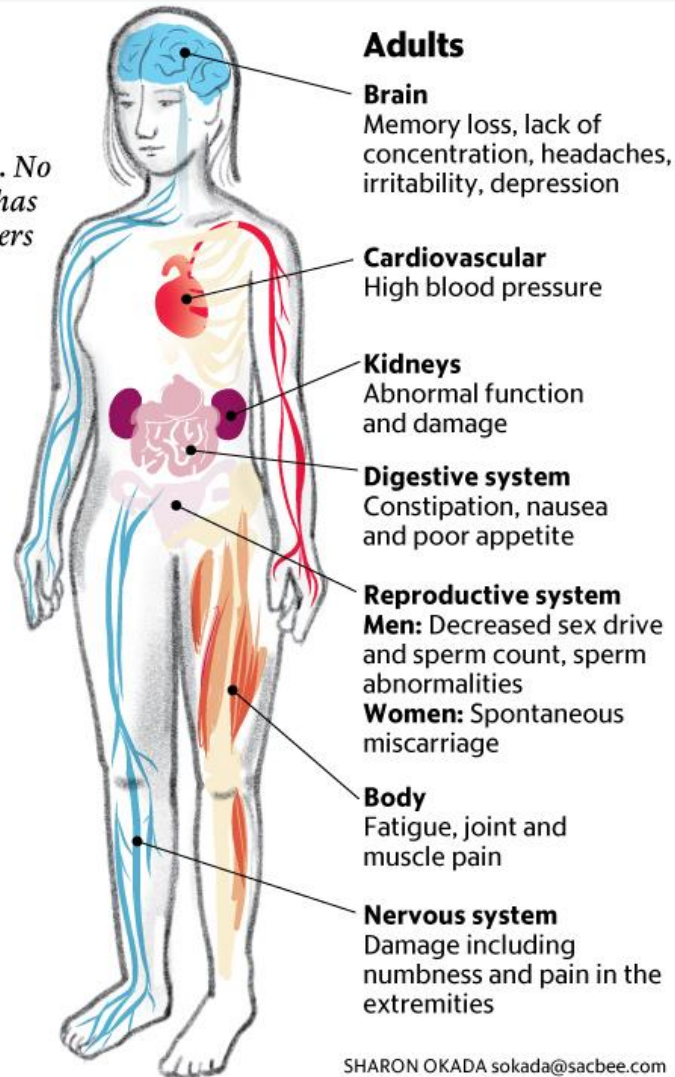
Lead exposure

Although often without obvious symptoms, lead exposure can affect nearly every part of the human body. No safe level of lead in the bloodstream has been determined by the federal Centers for Disease Control and Prevention.

Children



Sources: Centers for Disease Control and Prevention; National Institutes of Health

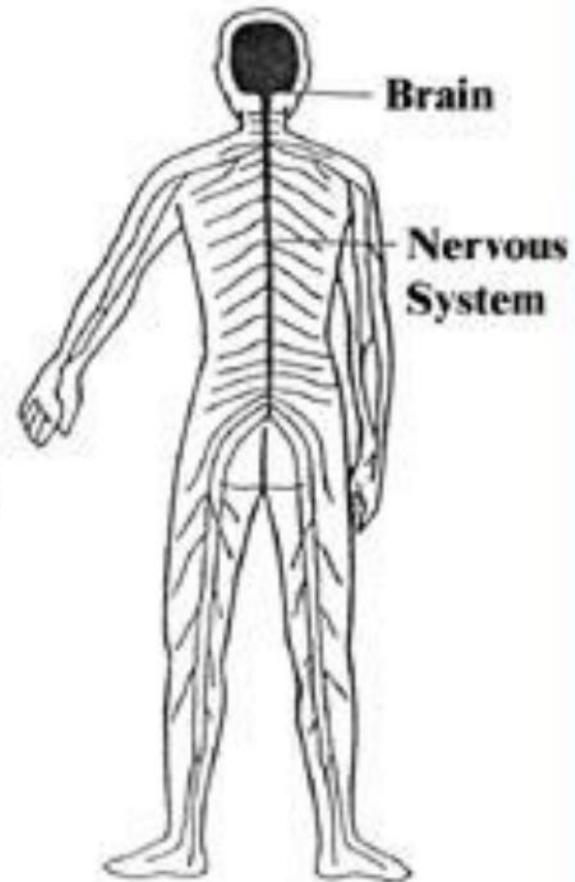


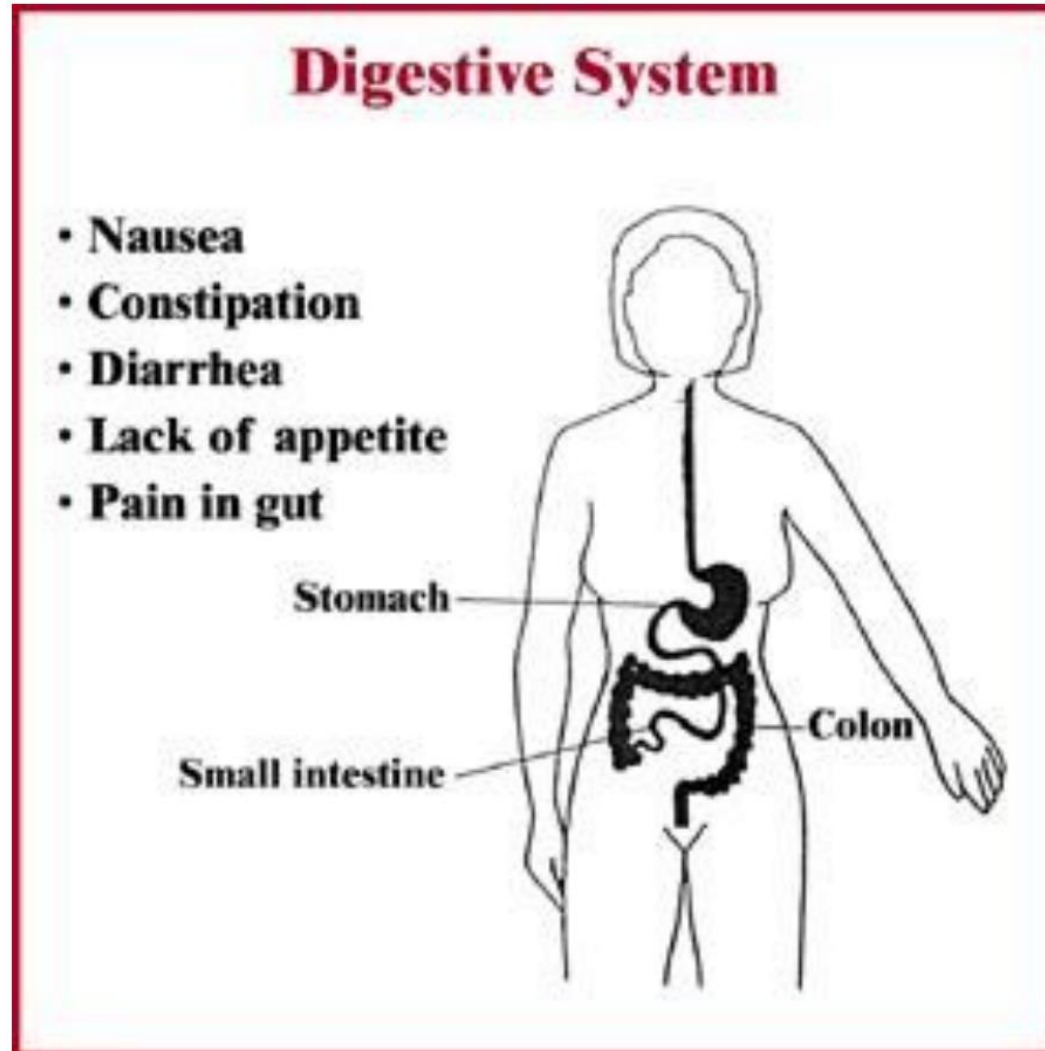
» During prolonged chronic exposure, many body systems can be affected by lead, including:

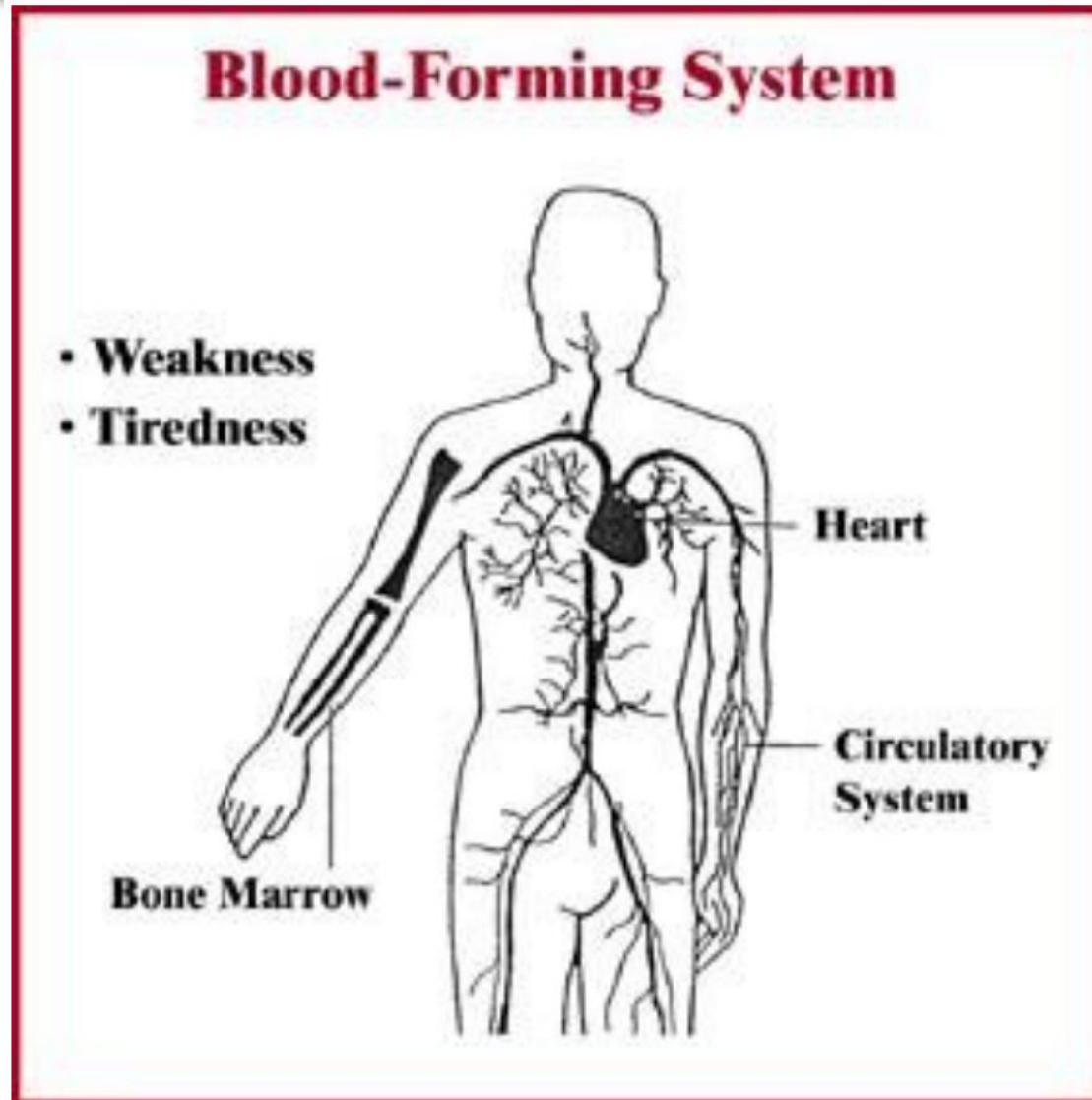
- Blood system – impairs production of “heme”, which carries oxygen to body tissues.
- Nervous system – damages the central nervous system and brain tissue.
- Urinary system – damages the kidneys.
- Reproductive system – sterility, decreased sex drive, impotence, miscarriages, menstrual disturbances, and lead can cross the placenta into the fetus in women.

Nervous System and Brain

- **Headaches**
- **Tired all the time**
- **Irritability**
- **Moodiness**
- **Poor concentration**
- **Memory loss**
- **Shakiness**
- **Weakness in arms and legs**

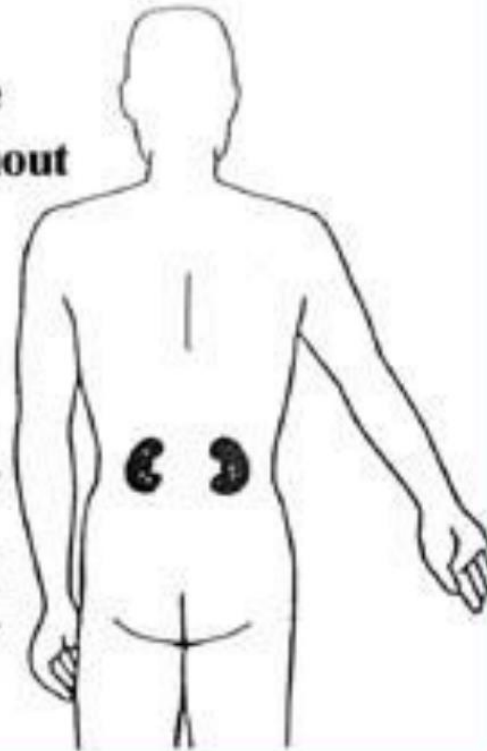






Kidneys/Reproductive System

- **High blood pressure**
- **Damage occurs without knowing it**
- **Kidney failure can cause death**
- **Men – Impotence, decreased sex drive, sterility**
- **Women – decreased sex drive, infertility**



- » The permissible exposure limit (PEL) for an 8 hour time weighted average (TWA) exposure to airborne lead is 50 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of air.
 - This is the concentration that an average worker can be exposed to for a working lifetime without adverse health effects in most of the population.

Comparing Measures of Lead Exposure

Permissible Exposure Limit (PEL)

- Legal limit for employee exposure
- Preventive measure that aims to prevent excess lead exposure
- OSHA's current PEL for lead is $50 \mu\text{g}/\text{m}^3$ averaged over an 8-hour period
- Once the PEL is reached, employers must begin engineering controls such as wet mopping and using a ventilator to reduce lead in the air

Action Level (AL)

- The air concentration of a substance that triggers certain controls
- The current AL for lead is $30 \mu\text{g}/\text{m}^3$ averaged over an 8-hour period
- When the AL is reached, employers must begin exposure monitoring and medical surveillance, which includes blood lead testing



Blood Lead Level (BLL)

- A measure of how much lead is in a person's bloodstream
- BLL gauges how much lead a person has been exposed to
- OSHA's regulations aim to keep workers' BLL below $40 \mu\text{g}/\text{dL}$
- In construction, a worker with a BLL of $50 \mu\text{g}/\text{dL}$ or higher must be medically removed from the job

The All-Important Action Level

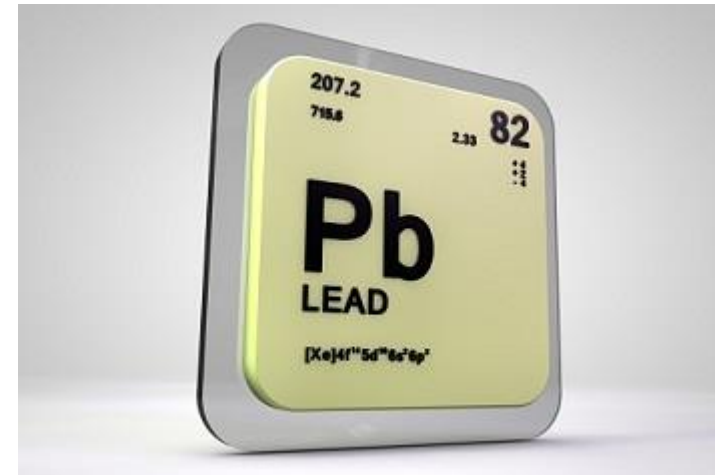
- » If lead is present in any quantity in your workplace, OSHA has directed that an “initial determination” must be made by taking air samples while workers are performing their job that may result in airborne lead exposure.
 - The OSHA Action Level for lead is 30 $\mu\text{g}/\text{m}^3$.
- » AL initiates several requirements for the standard such as exposure monitoring, medical surveillance and training and education.
- » If the air sample results are below the Action Level after 2 sessions of testing, no further monitoring is necessary for that job, and the workers are not considered to be significantly exposed to lead.



- » Use exhaust ventilation to capture dust/fumes whenever possible;
 - HEPA vacuum dust covered work surfaces; dry sweeping or compressed air is prohibited; **wet wiping methods are primarily used at MTS.**
 - Wipe down solder work area after solder operation is complete. Be sure to wipe down tools, keyboard, and hands afterwards.
- » Do not eat, drink, smoke or apply cosmetics in areas where lead is present;
 - Wash hands and face after lead soldering work and prior to eating.



- » OSHA Regulations state:
 - Where there is a potential exposure to airborne lead at any level, the employee must be informed of the contents of OSHA 29 CFR 1910.1025, Appendix A & B.
 - Because you may be exposed to lead, even in small quantities, the next two slides describe the contents of Appendix A & B.



- » Substance Identification
- » Health Hazard Data



The screenshot shows the OSHA website interface. At the top, there is a red header with the United States Department of Labor logo and a search bar. Below the header, there are navigation links for "A to Z Index", "En español", "Contact Us", "FAQs", and "About OSHA". The main content area is titled "Occupational Safety & Health Administration" and "We Can Help". There are several tabs for navigation: Home, Workers, Regulations, Enforcement, Data & Statistics, Training, Publications, Newsroom, and Small Business. The current page is "Regulations (Standards - 29 CFR) - Table of Contents". The main content area displays the following information:

- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** Z
- **Subpart Title:** Toxic and Hazardous Substances
- **Standard Number:** [1910.1025 App A](#)
- **Title:** Substance data sheet for occupational exposure to lead

I. SUBSTANCE IDENTIFICATION

A. Substance: Pure lead (Pb) is a heavy metal at room temperature and pressure and is a basic chemical element. It can combine with various other substances to form numerous lead compounds.

B. Compounds Covered by the Standard: The word "lead" when used in this standard means elemental lead, all inorganic lead compounds and a class of organic lead compounds called lead soaps. This standard does not apply to other organic lead compounds.

C. Uses: Exposure to lead occurs in at least 120 different occupations, including primary and secondary lead smelting, lead storage battery manufacturing, lead pigment manufacturing and use, solder manufacturing and use, shipbuilding and ship repairing, auto manufacturing, and printing.

D. Permissible Exposure: The Permissible Exposure Limit (PEL) set by the standard is 50 micrograms of lead per cubic meter of air (50 ug/m(3)), averaged over an 8-hour workday.

E. Action Level: The standard establishes an action level of 30 micrograms per cubic meter of air (30 ug/m(3)), time weighted average, based on an 8-hour work-day. The action level initiates several requirements of the standard, such as exposure monitoring, medical surveillance, and training and education.

- » Permissible Exposure Limit (PEL)
- » Exposure Monitoring
- » Methods of Compliance
- » Respiratory Protection
- » Personal Protective Equipment
- » Housekeeping
- » Hygiene Facilities
- » Medical Surveillance
- » Medical Removal
- » Training and Information
- » Signs
- » Record keeping



The screenshot shows the OSHA website page for 29 CFR 1910.1025 App B. The page title is "Regulations (Standards - 29 CFR) - Table of Contents". The breadcrumb trail is "Regulations (Standards - 29 CFR) - Table of Contents". The page content includes:

- Part Number:** 1910
- Part Title:** Occupational Safety and Health Standards
- Subpart:** Z
- Subpart Title:** Toxic and Hazardous Substances
- Standard Number:** [1910.1025 App B](#)
- Title:** Employee standard summary

This appendix summarizes key provisions of the standard that you as a worker should become familiar with.

I. PERMISSIBLE EXPOSURE LIMIT (PEL) - PARAGRAPH (C)

The standards sets a permissible exposure limit (PEL) of fifty micrograms of lead per cubic meter of air (50 ug/m(3)), averaged over an 8-hour work-day. This is the highest level of lead in air to which you may be permissibly exposed over an 8-hour workday. Since it is an 8-hour average it permits short exposures above the PEL so long as for each 8-hour work day your average exposure does not exceed the PEL.

This standard recognizes that your daily exposure to lead can extend beyond a typical 8-hour workday as the result of overtime or other alterations in your work schedule. To deal with this, the standard contains a formula which reduces your permissible exposure when you are exposed more than 8 hours. For example, if you are exposed to lead for 10 hours a day, the maximum permitted average exposure would be 40 ug/m(3).

II. EXPOSURE MONITORING - PARAGRAPH (D)

If lead is present in the workplace where you work in any quantity, your employer is required to make an initial determination of whether the action level is exceeded for any employee. This initial determination must include instrument monitoring of the air for the presence of lead and must cover the exposure of a representative number of employees who are reasonably believed to have the highest exposure levels. If

2015 Lead Air Monitoring Results at MTS (no further air monitoring is needed)

Sample No.	Location	Sample volume liters	Description	Lead Results ug/m3
MT-01	Transducer Manufacturing	575	Soldering	<7
MT-02	Transducer Manufacturing	574	Soldering	<7
MT-03	GRPF	530	Soldering	<7.5
MT-04	Open field blank	0		<4ug/filter
	OSHA Action Level			30
	OSHA PEL			50

2023 Post Cleaning Lead Wipe Sampling Results at MTS



3.1 Lead Wipe Sampling Results 1 ft² in solder area at MTS, after 1st shift on December 5th, 2023.

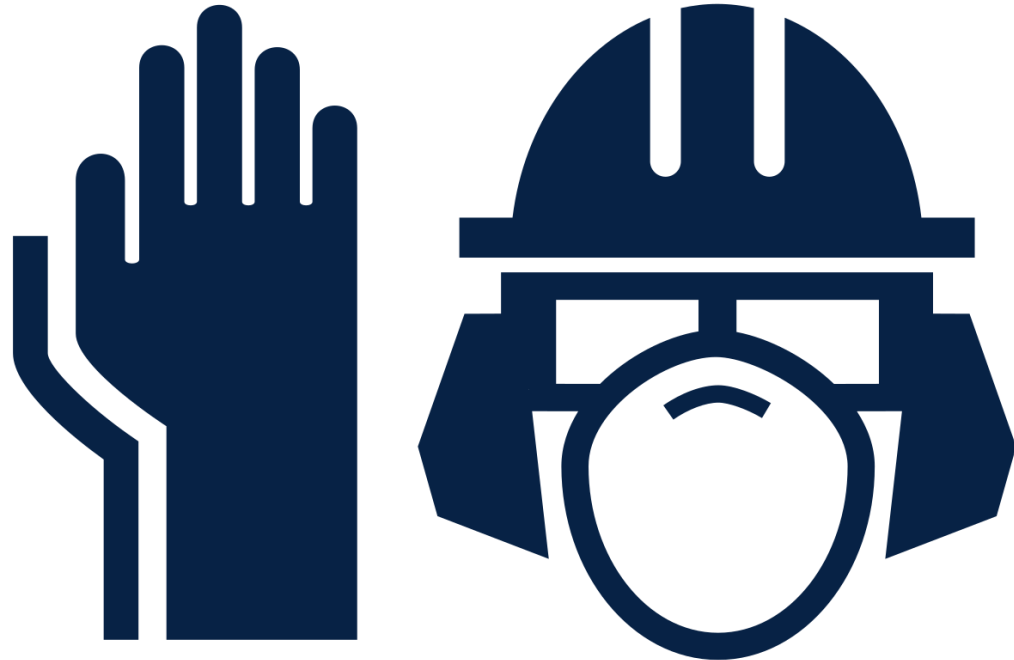
Sample Number and Description	Location	Sample Results µg/ft ² 2/2/22	Sample Results µg/ft ² 8/29/22	Sample Results µg/ft ² 01/12/23	Sample Results µg/ft ² 12/05/23
T-400 / Table- Electronic, [REDACTED]	Table	<10	--	24	<10
F-401 / Floor- Electronic, [REDACTED]	Floor	--	--	<10	<10
T-402 / Table- Transducer, [REDACTED]	Table	<10	--	<10	166.7
F-403 / Floor- Transducer, [REDACTED]	Floor	--	--	<10	49.6
T-404 Table - Transducer [REDACTED] extensometer services	Table	--	--	--	213.3
F-405 / Floor - Transducer, [REDACTED] extensometer services	Floor	--	--	--	280.6
T-406 / Table - IDF2 - Transducer	Table	225.7	80.8	64.7	<10
F-407 / Floor - IDF2, Transducer	Floor	51.9	45.2	107.0	44.7
T-408 / Table- Transducer [REDACTED] [REDACTED]	Table	<10	--	<10	<10
F-409 / Floor - Transducer - [REDACTED] [REDACTED]	Floor	203.3	20.5	26.9	118.3
T-410 / Table - Transducer, [REDACTED]	Table	--	--	134.4	<10
F-411 / Floor - Transducer, [REDACTED]	Floor	--	--	<10	10
B-412 / Open Field Blank		--	--	--	--
F-413/ Floor - Electronic Repair - 1st Desk	Floor	181.7	132.1	<10	--
F-414 / Floor - Electronic Repair - 2nd Desk, [REDACTED]	Floor	--	--	<10	<10
MDH and EPA limits for floors		10	10	10	10
MDH and EPA limits for indoor windowsills		100	100	100	100
EPA limits for window troughs		400	400	400	400

EPA- Environmental Protection Agency
MDH-Minnesota Department of Health

Lead Wipe Sample on Desk/Floor Example



- » **MTS employees must clean their soldering areas at the end of every soldering operation.**
 - Leaving the cleaning to the end of the day can increase the chances of cross-contamination and transferring lead to other areas that do not get cleaned.
 - Sampling for lead occurs annually, with re-tests occurring if elevated levels are detected. Re-tests occur randomly within 6 months of original test date to ensure corrective actions are implemented and effective.



- » Use the local exhaust ventilation at the soldering stations during soldering operations if available.
 - Make sure it is close enough to capture any vapors from soldering.
- » Wear disposable gloves when working with lead solder and/or wash hands after handling lead solder to help prevent ingestion, skin, or eye contact.
- » Clean lead soldering areas daily with the Fiberlock wet towel, alcohol wipes, mop, or use a HEPA vacuum to clean floors, tables, cracks, etc.
 - Wear disposable gloves when cleaning.
 - For very dirty areas, best practice would be to wear a disposable lab coat or paper Tyvek suit.
- » Place lead waste in safety waste cans located at the workstations

How you can protect yourself

- » Do **NOT** use air hose to clean dust and debris due to dust regeneration into the air.
- » Do **NOT** dry sweep dust and debris.
- » Do **NOT** eat in the lead soldering area.
- » If you go to lunch, or outside to smoke, wash hands first.
- » Although not required employees can voluntarily wear dust masks to further reduce lead exposure.

