

Lead Soldering – Safe Work Practices

Overview

Several of our operations rely on soldering to build product, develop prototypes or assess product quality. The solder typically used in our operations is a mixture of lead and tin around a rosin core. Other small amounts of metals may be found in solder.

The following information and safe work practices are provided to ensure that you are aware of the health hazards associated with lead solder used in our facilities. By following these safe work practices, you will be taking the proper steps to prevent overexposure to lead.

Where do we use lead solder?

- 116 Electronics Shop
- 153B Power Conditioning Electronics Shop
- 2602 Quantum Communications Lab
- 2636 Pulsed Power Development Lab
- 2640 Controls Electronics Shop
- 2650 Controls Electronics Shop
- 5001A EP Power Conditioning Annex
- 5008A Power Conditioning Workshop
- 5107 Electronics Shop

What is lead?

Lead is a bluish-gray, heavy metal with a relatively low melting point (621 °F) and a boiling point of 3,164 °F. It has been used in smelting, lead storage batteries, lead pigments in glass and paint, shipbuilding, car assembly and printing.

What are the health hazards of working with lead solder?

Acute (Short-Term) Effects

Lead is a potent systemic poison. In large enough doses, it can affect the brain; causing seizures, coma and even death. However, keep in mind that **short-term exposures of this magnitude are unlikely in typical workplace operations.**

Chronic (Long-Term) Effects

Overexposure to lead over a long period of time can result in a host of health problems:

- Damage to blood forming organs (e.g., anemia, weakness)
- Nervous system disorders (e.g., metallic taste, loss of appetite, anxiety, insomnia, headache, tremors, numbness, dizziness)
- Kidney disease
- Reproductive organ damage (e.g., sterility, decreased sex drive, birth defects)

What are the exposure limits for lead in the workplace?

The OSHA Permissible Exposure Limit (PEL) for lead is 0.05 mg per cubic meter (m³) of air, averaged over an 8-hour workday. OSHA also maintains an Action Level of 0.03 mg/m³ that triggers several requirements of the standard.

The goal of the OSHA standard is to keep blood lead levels of workers below 40 ug/100 g of blood. For male and female workers intending to have children, the levels should be below 30 ug/100 g of blood.

Am I exposed to lead during lead soldering?

In general, chemicals can enter your body through three main routes; skin absorption, inhalation (breathing) or ingestion (eating/drinking).

The lead found in solder is not absorbed through your skin.

Hand soldering operations typically operate at 500 - 800 °F; melting, but not boiling or vaporizing the lead. Based on this information, it is **unlikely that hand soldering would cause you to inhale lead fume**. This is typically only a concern when lead is heated to high temperatures such as in a solder pot.

Under the OSHA Lead Standard, air monitoring is required to determine if employees are overexposed to lead.

Air samples collected in LLE soldering areas show that employee exposures to lead are well below the OSHA exposure limits. In most cases, results were below the limit of detection for the sampling method.

The most likely route of lead exposure from our soldering operations would be **ingestion from contaminated food and drink**. Poor housekeeping, poor personal hygiene and storage of food near lead soldering operations can lead to ingestion of lead solder particles.

Contact the Safety Office (safety_office@lle.rochester.edu) for wipes specifically designed to remove lead and other toxic heavy metals from skin and surfaces without harsh chemicals.

If there is no airborne lead, what's in the fumes that I see during soldering?

Some solders contain colophony, a pine tree product that is 90% resin. This material is called rosin and it promotes the fusing of materials during the soldering process.

During soldering, the rosin breaks down and releases an irritating smoke. In some people, this smoke may provoke a more serious respiratory condition, such as occupational asthma.

How can I prevent exposure to lead and other components of solder?

The following safe work practices must be followed to minimize your workplace exposure to lead and related solder components.

- Use local exhaust or a fume extractor at each workstation to minimize exposure to irritating rosin smoke.
- Collect lead particles in a separate waste container
- Do not store food in your work area
- Clean your work surface during each shift using wipes specific to lead removal; DO NOT use an air hose, dry brush or dry cloth.
- Wash your hands with soap & water before breaks, lunch and at the end of your work shift.

What are the key elements of the OSHA Lead Standard?

The key elements of the OSHA Lead Standard are listed below. Because our operations involve lead soldering, and exposures are very low, many parts of the standard do not currently apply. Portions of the OSHA Lead Standard that do apply are shown in **bold type**.

- **Permissible Exposure Limit (PEL)** – discussed above
- **Exposure Monitoring** – discussed above
- Methods of Compliance
- Respiratory Protection
- Protective Work Clothing and Equipment
- **Housekeeping** – discussed above
- Hygiene Facilities and **Practices** – discussed above
- Medical Surveillance
- Medical Removal Protection
- **Employee Information and Training** – to be provided annually
- Signs
- **Recordkeeping**
- **Observations of Monitoring**

If you have further questions, please contact your supervisor or the LLE Safety Office (safety_office@lle.rochester.edu).

Once you have reviewed this information, email safety_office@lle.rochester.edu to report completion of this training