

DRI Lead Soldering Safety Guideline

This guideline provides safety precautions for lead soldering operations, although the majority of information will also apply to operations using other types of solder.

Introduction

Lead (Pb) is a known neurotoxin and can pose other significant chronic health effects, such as reproductive problems, digestive problems, memory and concentration problems, muscle and joint pain, therefore, solder that contains lead is considered to be toxic. If lead-containing soldering material is not safely handled, workers may be inadvertently exposed. However, when the solder is handled and treated appropriately, there is minimal hazard to any person working with the solder.

Potential exposure routes from soldering include ingestion of lead due to surface contamination. The digestive system is the primary means by which lead can be absorbed into the human body. Skin contact with lead is, in and of itself, harmless, but getting lead dust on your hands can result in it being ingested if you don't wash your hands before eating, smoking, etc. An often overlooked danger is the habit of chewing fingernails. The spaces under the fingernails are great collectors of dirt and dust. Almost everything that is handled or touched may be found under the finger nails. Ingesting even a small amount of lead is dangerous because it is a cumulative poison which is not excreted by normal bodily function.

Soldering with lead (or other metals used in soldering) may produce fumes that are hazardous. In addition, using flux containing rosin (also called colophony) produces solder fumes that, if inhaled, can result in occupational asthma or make existing asthmatic conditions worsen. The fumes can also cause eye and upper respiratory tract irritation.

It is not expected that occasional soldering activities that take place within areas that are well ventilated or have additional local exhaust ventilation will pose an occupational hazard to the employee. However, it is prudent to implement best practices regardless of the frequency and duration of soldering. For additional information or if you have exposure concerns, contact the Environmental Health & Safety (EH&S) Office at x 7329.

General Safety Precautions

1. Soldering Iron Safety

- Never touch the element or tip of the soldering iron. It is very hot (about 400°C) and will burn.
- Hold wires to be heated with tweezers, pliers or clamps to avoid receiving burns from objects that are heated.
- Keep the cleaning sponge wet during use.

DRI Lead Soldering Safety Guideline

- To the extent possible, conduct soldering on a solid, level surface and always return the soldering iron to its stand when not in use. Never put it down on your workbench.
- Turn unit off or unplug the iron when not in use. Soldering stations that feature an automatic shut off not only extend the life of tip, iron and station, but provide an additional measure of fire safety.

2. Working with Solder, Flux and Cleaners

- Follow manufacturer's instructions and read and understand the Material Safety Data Sheets for all materials before beginning work.
- Wear eye protection. Solder can "spit".
- Use lead free (preferable) or low lead solder whenever possible
- Keep cleaning solvents in dispensing bottles to reduce inhalation hazards.
- Always wash your hands with soap and water after soldering.

3. Reduce Risk of Personal Exposure

- Avoid ingestion of lead surface contamination by keeping soldering areas clean and properly managing lead soldering waste (see below). Do not forget to clean your work area daily. Wiping your desk down with a wet rag or cleaning the desk surface with Windex and a Kimwipe will go a long way in minimizing ingestible lead contamination from your work surfaces. Do not eat or drink in soldering areas and wash hands after completing soldering work.
- Use the following Personal Protective Equipment (PPE) to prevent inadvertent contact
 - Protective Clothing – To prevent burns from splashing hot solder, long sleeve shirts and pants that are made of natural fibers (cotton) and closed-toe shoes should be worn during soldering activities. Heat resistant gloves may also be prudent.
 - Eye Protection – Safety glasses, goggles, or face shields should be used when soldering and clipping wires. Hold leads so when cutting they do not fly away.
- Avoid inhalation of soldering smoke/fumes. The smoke formed during soldering is mostly from the flux. Inhalation of flux fumes during soldering may cause irritation and damage of mucous membranes and respiratory system. Eyes may become irritated from contact with smoke from soldering. To reduce exposure
 - Conduct work in a well-ventilated area.
 - Avoid breathing fumes/smoke by keeping your head to the side of, not above, your work. The addition of a small fan that blows from behind the

DRI Lead Soldering Safety Guideline

worker across the work area can help move fumes away from the breathing zone.

- A benchtop fume extractor may be necessary to remove harmful fumes caused by solder and flux from the soldering workstation by filtering the air.
- For work situations where soldering is continuously conducted, industrial hygiene monitoring is highly suggested to ensure exposures to soldering fumes are within acceptable exposure limits. When industrial hygiene monitoring indicates that ventilation is not sufficient, a NIOSH-approved respirator may be required until engineering controls are put in place. The use of respirators, whether they are used on a voluntary basis or are mandated, must be consistent with the DRI Respiratory Protection Program, which includes the requirements for the user to obtain a medical clearance and attend training and fit testing annually.

4. Reduce Risk from Electricity

- Soldering units should be UL (or equivalently) listed.
- It is a best practice to use a soldering iron equipped with a grounding prong to reduce the risk of electrical damage if a short circuit occurs in the equipment.
- A ground fault circuit interrupter (GFCI) should be employed if contact with water is a potential. If the circuit isn't hardwired with a GFCI, a portable unit should be used.
- Examine equipment for frayed or cracked cords or missing ground prong before each use. Immediately lock out any equipment that is not in good working order.
- Prevent damage to electrical cords during soldering. Keep them away from heated tips. Grasp the plug not the cord when unplugging the unit.

5. Fire Prevention

- Conduct work on a fire-proof or nonflammable surface that is not easily ignited.
- Wear nonflammable or 100% cotton clothing that covers your arms and legs to help prevent burns.
- Be sure the iron is secure in the stand so it cannot inadvertently dislodge onto the work surface.
- Know where your fire extinguisher is and how to use it.

6. First Aid for Burns

- Immediately cool the affected area under cold water for 15 minutes.
- Do not apply any creams or ointments. Cover with a band-aid.
- Seek medical attention if the burn covers an area bigger than 3 inches across.

DRI Lead Soldering Safety Guideline

7. Hazard Communication Requirements

The following OSHA requirements must be implemented

- Inventory—Solder wires and fluxes must be included on the laboratory's chemical inventory and entered in the CHEMTRACKER™ database.
- Material Safety Data Sheets (MSDSs) must be on file in the work area. Request these from your supplier if they were not provided at the time of purchase.
- Training and education of employees working with hazardous materials must be documented.

8. Waste Management

- Lead soldering waste¹ is considered hazardous. Discard lead solder and dross in a container with a lid. The EH&S Office will supply an approved collection container (metal containers that are pre-labeled).
- The generator must inspect the containers weekly and ensure compliance with the following:
 - **Storage** – Only one dross container is allowed at each soldering location.
 - **Labeling** -- The dross container must be properly labeled. The approved labels will be supplied by the EH&S and include the following information:

**Solder Dross/Residues
Potential for Silver and/or Lead contamination
Hold for Recycle/Disposal**

- **Closure** -- All dross containers must be closed at all times except when adding waste.
- **Removal** -- Full containers must be dated and promptly removed from the soldering station. Please contact the EH&S for removal of the full container by using our [on-line pickup request form](#).
- Used solder sponges and contaminated rags must be disposed of as hazardous waste. Contact EH&S for information on how to package and label for pick up.

¹ Other metal-containing solder dross, such as that from silver soldering, will need to be managed in a similar manner.