



## **SOLDERING SAFETY GUIDELINES**

### **I. Lead Soldering Safety Guidelines**

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

### **II. 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 and Safety (EHS) Office at 372-3227.

### **III. General Safety Precautions**

#### **a. Soldering Iron Safety**

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

- b. Working with Solder, Flux and Cleaners
  - i. Follow manufacturer's instructions and read and understand the Safety Data Sheets (SDS) for all materials before beginning work.
  - ii. Wear eye protection. Solder can "spit."
  - iii. Use lead free (preferable) or low lead solder whenever possible.
  - iv. Keep cleaning solvents in dispensing bottles to reduce inhalation hazards.
  - v. Always wash your hands with soap and water after soldering.
- c. Reduce Risk of Personal Exposure
  - i. Avoid ingestion of lead surface contamination by keeping soldering areas clean and properly managing lead soldering waste (see below). 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.
  - ii. Use the following Personal Protective Equipment (PPE) to prevent inadvertent contact:
    - 1. Protective Clothing – To prevent burns from splashes of hot solder, long sleeve shirts and pants that are made of natural fibers (cotton) and closed-toe shoes should be worn. Heat resistant gloves may also be prudent.
    - 2. 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.
  - iii. 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:
    - 1. Conduct work in a well-ventilated area.
    - 2. 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 worker across the work area can help move fumes away from the breathing zone.
- d. Reduce Risk from Electricity
  - i. 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.
  - ii. 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.
  - iii. Examine equipment for frayed or cracked cords or missing ground prong before each use.
  - iv. Immediately remove from service any equipment that is not in good working order.

- v. Prevent damage to electrical cords during soldering. Keep them away from heated tips. Grasp the plug, not the cord, when unplugging the unit.
- e. Fire Prevention
  - i. Conduct work on a fire-proof or nonflammable surface that is not easily ignited.
  - ii. Wear nonflammable or 100% cotton clothing that covers your arms and legs to help prevent burns.
  - iii. Be sure the iron is secure in its stand so it cannot inadvertently dislodge onto the work surface.
  - iv. Know where your fire extinguisher is and how to use it.
- f. First Aid for Burns
  - i. Immediately cool the affected area under cold water for 15 minutes.
  - ii. Do not apply any creams or ointments on a burn. Cover with a band-aid.
  - iii. Seek medical attention if the burn covers an area bigger than 3 inches across.
    - 1. Refer to the [TTU Accident Reporting Procedure](#) and Human Resources for forms and information on reporting accidents.
- g. Hazard Communication Requirements
  - i. The following OSHA requirements must be implemented:
    - 1. Inventory—Solder wires and fluxes must be included on the laboratory's chemical inventory.
    - 2. Safety Data Sheets (SDSs) 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.
- h. Waste Management
  - i. Lead soldering waste is considered hazardous. Discard lead solder and dross in a container with a lid. The collection container should be metal and -labeled.
  - ii. Other metal-containing solder dross, such as that from silver soldering, will need to be managed in a similar manner.
  - iii. Labeling: The dross container must be properly labeled. The approved labels will be supplied by EHS.
  - iv. All personal managing the waste must be trained on the [Hazardous Waste Disposal and Satellite Accumulation Area Guide](#).
    - 1. Training must be documented as per the guide.
  - v. Closure: All dross containers must be closed at all times except when adding waste.
  - vi. Used solder sponges and contaminated rags must be disposed of as hazardous waste.

#### **IV. References**

OSHA Lead Standard (CFR 1910.1025)

[TTU Chemical Hygiene Plan](#)

Lawrence Berkeley National Laboratory Safe Soldering Work Practices

Carnegie Melon University Lead Soldering Safety Guidelines