HARVARD
Campus Services
ENVIRONMENTAL HEALTH & SAFETY

SOLDERING SAFETY GUIDELINE

This guideline addresses the use of electric soldering irons and the hazards of leaded and non-leaded soldering of electrical components.

If you are using other equipment such as a soldering torch or butane-fired soldering iron, contact ehs@harvard.edu or refer to ehs.harvard.edu/programs/hot-work for more details on the additional training requirements and hot work procedures.

HAZARDS

	**Lead Exposure from Surface Contamination** • The World Health Organization's International Agency for Research on Cancer classifies lead is a Group 2A Carcinogen, which means it is Probably Carcinogenic to Humans. • The primary route of exposure to lead from soldering is ingestion of lead due to surface contamination. • Skin contact with lead is, in and of itself, harmless, but lead dust on your hands can result in it being ingested if you don't wash your hands before eating, smoking, etc. This is why we recommend not eating, drinking, or storing food and beverage containers in soldering areas. Hand-to-mouth gestures also increase potential exposure. • *Health effects from short-term overexposure to lead*: Abdominal pain, digestive problems, fatigue, headaches, irritability, loss of appetite, memory loss, pain or tingling in hands or feet. • *Health effects from chronic exposure to lead:* Reproductive problems, digestive problems, memory and concentration problems, muscle and joint pain, depression, irritability, and nausea. • To avoid these health effects, it is important to keep work surfaces as clean as possible to avoid ingestion.
	**Respiratory Irritants** • Solder flux containing rosin (also called colophony), generates visible fumes. Rosin's boiling point range starts as low as 100°C and generates solvent vapor when heated to soldering temperatures. • Rosin exposure can cause asthma or make existing asthmatic conditions worse. The fumes can also cause eye and upper respiratory tract irritation. • Lead-free solder requires higher soldering iron temperatures, as well as higher acidity fluxes which are more likely to volatilize and become inhalation hazards.
	**Burns** • The soldering iron is a source of heat when on. The temperature of the heated tip can reach 400°C and will cause severe burns. The tip can also cause serious damage to loose clothing, hair, electrical wires, and the surrounding workspace. • The joints that you solder are also very hot – allow them time to cool before handling.
	**Electric Shock** • Touching a hot iron to power cords can melt through the insultation and cause electric shock.

PRECAUTIONS

Setting up the work:

- It is very important that you locate and review the manufacturer's Safety Data Sheet for the specific materials you are using. Additional chemical information can be found at http://www.ehs.harvard.edu/safety-data-sheets-sds.
- Make sure you are familiar with general University emergency procedures in the EHS Emergency Response Guide.
- Identify the location of the nearest eyewash and shower and verify that they are accessible.
- Make sure your Printed Circuit Board (PCB) materials and electronic components can withstand higher temperatures if using lead free solder, which melts at a higher temperature than lead solder.
- Select a fire-resistant surface to work at.

Before starting work:

- Put on safety glasses, which must be worn while soldering since air pockets or impurities can pop and scatter solder.
- Ensure local snorkel exhaust hood, benchtop fume extractor, or fan is present and turned on to remove the solder fumes from your breathing zone.
- Check condition of the soldering tip and replace if damaged.
- Ensure tip is 'tinned' & free from waste build-up. Wipe tip on damp sponge to clean once iron has warmed up.
- Ensure that the cord does not create a slip/trip hazard.
- Leave soldering iron in the stand when warming up. Always allow the soldering iron to reach the desired temperature before starting your work. This can take several minutes.

During work:

- AVOID INGESTION! DO NOT EAT or DRINK in areas where lead soldering is performed.
- AVOID INHALATION! The smoke formed as you melt solder is mostly from the flux and can be irritating. Avoid breathing it by keeping your head to the side of, not above, your work.
- AVOID CONTACT! The soldering iron and newly soldered joints are extremely hot. Keep fingers clear.
- Avoid prolonged use. This could overheat the tip element causing it to fail or oxidize.
- Ensure electrical cords are well clear of the soldering iron tip throughout the soldering process.
- Keep the cleaning sponge damp during use.
- Always return the soldering iron to its stand when not in use, and never leave the soldering iron unattended when turned on or still hot. Leave unplugged when not in use.

After completing the work (decontamination and waste disposal procedure):

- Physical contact with lead dust from lead soldering operations is the most common form of potential exposure to lead in the university research setting. Therefore, it is important to ensure lead dust does not remain on your hands or on your clothes. Make sure to wipe down surfaces and wash your hands when you are done soldering.
    - Wet-wipe all lead solder contaminated surfaces with soapy water and paper towels, or a lead removal product. Dispose of clean-up materials as hazardous waste.
- Never use an air gun or any other form of compressed air to clean lead contaminated work surfaces. Do not use a broom to sweep the contaminated area. This will cause settled lead dust to become airborne.
- Dispose of both waste liquids and solids (wet wipes and other debris) as hazardous chemical waste. Use the EHS Waste pick-up tool to set up a satellite accumulation area for your lead soldering station and/or to request a waste pick-up.
    - Hazardous Waste Classification: Toxic

EMERGENCY PROCEDURES

- If an accident occurs, report immediately to the lab supervisor or other appropriate staff member.
- Seek medical attention as necessary.
- Contact the University Operations Center at (617) 495**-5560** [HMS/HSDM (617) 432-1901]

FIRE

- Always know the location of the nearest fire extinguisher. In case of fire, use the fire extinguisher only if you have been trained and it is safe to do so. Fire extinguisher training can be found on the Harvard Training Portal.

SKIN CONTACT

- If there is a burn, immediately cool the affected area under cold water for 15 minutes. Do not apply any creams or ointments. Cover with a band-aid.

EYE CONTACT

- Using eyewash, flush eyes while holding eyelid open.

INHALATION

- If irritating fumes are inhaled, immediately move to get fresh air.

INGESTION

- Do not induce vomiting.