Carnegie Mellon University Environmental Health & Safety FIRE | LAB | WORK	**Environmental Health and Safety** **Soldering Safety - Guideline**
Date of Issuance: 10/02/2019	**Revision Date:** 5/12/2025
Revision Number: 1	**Prepared by:** EHS

1. Purpose

Carnegie Mellon University has developed this guideline to cover general procedures for the safe performance of soldering operations.

2. Scope

This guideline applies to all Carnegie Mellon faculty, staff and students that perform soldering operations.

3. Roles and Responsibilities

a. Carnegie Mellon University Environmental Health and Safety is responsible for:
   i. Developing the written Soldering Safety Guidelines and revising as necessary;
   ii. Developing a training program on safe soldering practices; and
   iii. Conducting routine inspections to ensure proper soldering operations.

b. Departments will be responsible for:
   i. Understanding and complying with the requirements of this guideline;
   ii. Purchasing materials associated with soldering in accordance with the EHS Hazardous Materials Purchasing Guideline;
   iii. Ensuring safe soldering operations;
   iv. Submitting "Permission to Work Alone Forms" when activities conducted are covered under the EHS "Working Alone in Research Laboratories, Shops, Studios and Work Areas Guideline"; and
   v. Contacting EHS if assistance is needed.

c. Users will be responsible for:
   i. Completing Soldering Safety Training prior to initial use. Training is provided online through SciShield/BioRAFT;
   ii. Complying with the procedures outlined in this Guideline; and
   iii. Informing their supervisor of any problems, defective equipment or any other issues relating to soldering operations and related equipment.

4. Risks

The risks addressed by this guideline include, but are not limited to, the following:

a. Fire Creation: The heated parts of the soldering unit can cause a fire if they come into contact with flammable and combustible materials.

b. Ingestion/Inhalation of Lead Solder or Flux/Rosin Solder: Potential ingestion of lead can be 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 worse. The fumes can also cause eye and upper respiratory tract irritation.

c. Electrical Hazards: Soldering units with frayed or damaged electrical wiring can cause electrical shock.

d. Exposure to Hot Surfaces: The soldering tip and items being soldered can reach temperatures of 400^0C and have the potential to lead to severe burns.

5. Exposure Controls

a. Substitution
   i. When practical and feasible, lead-free or low lead solder should be used.

b. Engineering controls
   i. Soldering operations should only be conducted in well-ventilated work areas.
   ii. Soldering operations should only be conducted in work areas having a dedicated exhaust or an appropriate air filtration system.
   iii. In the absence of ventilation/air filtration, soldering operations should be reviewed by EHS before proceeding. EHS will review information including, but not be limited to, type(s) of materials used, size of the area, operating parameters of the area ventilation system, and other factors.
   v. Ventilation controls must be turned on prior to soldering.

c. Administrative controls
    i. Follow the manufacturer's documentation for safe use of soldering unit.
    ii. Enter fluxes, rosins, solders, cleaning solvents, etc. in the appropriate groups' SciShield/BioRAFT ChemTracker page.
    iii. Consult Safety Data Sheets (SDSs) for all fluxes, rosins, solders, and cleaning solvents.
    iv. Clearly label all cleaning solvents, dross and waste containers.
    v. Conduct a pre-hot-work check prior to work to ensure that all equipment is safe and hazards are recognized and protected. At a minimum this pre-hot-work check shall include, but not be limited to, the following:
        1. Soldering unit is in satisfactory operating condition and in good repair.
        2. Areas adjacent to soldering operations are clear of combustibles and flammables.
        3. Appropriate fire extinguishers are present and in good condition.
    vi. Maintain a clean and dust free working area in rooms where soldering operations are conducted.
    vii. Avoid touching the element or tip of the soldering unit.
    viii. Hold wires to be heated with tweezers, pliers or clamps to avoid receiving burns from objects that are heated.
    ix. To the extent possible, conduct soldering on a solid, level surface and always return the soldering iron to its stand when not in use.
    x. Keep your head to the side and not above soldering operations.
    xi. Turn off unit when not in use.
    xii. Wash your hands thoroughly with soap and water after ceasing soldering operations and/or before eating, drinking, applying cosmetics, etc.
d. Training
    i. Soldering safety training must be conducted prior to soldering.
    ii. Fire extinguisher training must be completed by personnel performing soldering operations prior to soldering.
    iii. For additional information on training, please visit the EHS Training webpage for an index of training courses available.
e. Personal Protective Equipment (PPE)
    i. Eye Protection
        1. Safety glasses, goggles or face shields should be used when soldering and clipping wires.
    ii. Gloves

1. Heat-resistant gloves must be worn when there is the potential to come into contact with hot surfaces.

iii. Other

1. Long sleeve shirts and pants that are made of natural fibers (cotton) and closed-toe shoes should be worn.

f. Emergency Equipment

i. Appropriate fire extinguishers must be present in soldering operation areas.

ii. At a minimum, a first aid kit meeting American National Standards Institute (ANSI) Class A Type III specifications must be present in soldering operation areas.

6. Other Considerations

When purchasing a soldering unit, the following options/features must be considered when practical, feasible and available:

a. Soldering units listed by Underwriters Laboratory (UL) should be used.

b. Soldering units that are equipped with a grounding prong should be used to reduce the risk of electrical damage if a short circuit occurs.

c. A ground fault circuit interrupter (GFCI) should be used if contact with water is a potential. If the circuit isn't hardwired with a GFCI, a portable unit should be used.

d. Soldering stations that feature an automatic shut off should be used as they not only extend the life of tip, iron and station, but provide an additional measure of fire safety.

7. Waste Disposal

a. General

i. All solder, flux, dross and cleaning solvents must be treated as hazardous chemical waste and must be collected and disposed of accordingly.

ii. Please contact safety@andrew.cmu.edu for additional information.

8. Emergency Procedures

a. Personal Injury

i. For small burns, keep affected area clean and apply burn cream or antibiotic ointment if accessible and reach out to University Police at 412-268-2323 for additional medical help if needed. Contact EHS at 412-268-8182.

b. Small Fires (a fire the size of a typical household wastebasket)

i. Keep the exit at your back.

ii. Use the nearest fire extinguisher.

iii. Pull the pin to break the seal.
iv. Aim at the base of the fire.
v. Squeeze handle grips or trigger to release the extinguishing agent.
vi. Sweep the extinguisher, spraying side-to-side at the base of the flames.
vii. Ventilate the area after the fire is completely extinguished.
viii. Contact University Police at 412-268-2323 and EHS at 412-268-8182.

c. Large Fires (a fire larger than the size of a typical household wastebasket)
i. Activate the nearest fire alarm pull station and alert others.
ii. If safe to do so, assist others who may be in danger. However, do not put yourself at risk.
iii. Evacuate the area using the stairs and close doors behind you.
vi. Contact University Police at 412-268-2323 and EHS at 412-268-8182 to report location, injuries and other hazards.
v. Move away from the building exterior and assemble with floor marshal.
vi. Inform emergency responders of any hazards, injuries or locations of persons remaining inside.
vii. Remain outside the building until cleared for re-entry.

9. Revisions

Date	Documented Changes	Initials
10/27/2020	Updated Format	MAS
11/3/2022	Updated Section 5. F. to remove requirement for fire suppression systems and added requirement for first aid kits	AJL
3/11/2024	Reviewed and no revisions necessary	AJL
5/12/2025	Reviewed and repaired broken links	MAS

For additional questions or concerns please contact EHS: safety@andrew.cmu.edu