

## LABORATORY SOLDERING SAFETY

Soldering is the process in which a metal alloy (solder) is melted to join together two or more other metals. Soldering operations commonly performed in laboratories include electronics assembly, repair, and prototyping. Even small-scale soldering operations present potential health and safety hazards that must be properly controlled.

### Potential Hazards

**Health Effects:** The process of soldering can generate fumes, gases, or vapors from both the solder itself and any flux material used. Exposure to these fumes, gases, and vapors can cause eye and respiratory irritation, headaches, dermatitis, and, with prolonged exposure, possible respiratory or neurological effects.

**Thermal Burns:** Contact with heated soldering irons, molten solder, or hot surfaces may cause burns.

**Eye Injuries:** Solder splatter or flux residues may cause eye irritation or injury.

**Fire Hazards:** Hot tools and molten solder may ignite combustible materials near the work area.

**Electric Shocks:** Contact with damaged cords, exposed wiring, or energized components may result in electric shock.

**Ergonomic Injuries:** Repetitive motions, sustained gripping, and poor workstation setup may result in strain to the hands, wrists, neck, or back.

## SAFE WORK PRACTICES

### Substitution

- Use **lead-free** solder and **rosin-free flux**, whenever possible.

### Engineering Controls (Ventilation)

- **Local exhaust ventilation (LEV) must be used** for soldering to control fume exposure at the source.
- **Hard-ducted local exhaust systems are preferred** and should be positioned to capture fumes as close as possible to the soldering point, without drawing fumes across the individual's breathing zone.
- **Labs must purchase stand-alone or portable fume extraction snorkels** if hard-ducted systems are infeasible. These systems must **include BOTH**:
  - **HEPA filtration** (for particulate capture), and
  - **Activated charcoal filtration** (for flux and vapor control).
- Filters must be maintained and replaced by the laboratory according to manufacturer specifications.

### Administrative Controls

- All soldering irons and electrical devices used in the setup must be listed by an OSHA [Nationally Recognized Testing Laboratory \(NRTL\)](#).
  - If an [NRTL](#)-listed product is not available, contact [EHS](#) for approval before purchase.
- Ensure personnel are trained in proper techniques and hazard awareness, including review of relevant [Safety Data Sheets \(SDS\)](#).
- Keep combustible and flammable materials away from the soldering area and maintain a clutter-free work area.
- Maintain clear access to emergency equipment, including fire extinguishers, shower/eyewash stations, and circuit breaker panels.
- Inspect soldering irons, power cords, and ventilation equipment before use.
- Conduct work on appropriate fire-resistant or noncombustible surfaces.
- Turn off, unplug, and cool equipment completely before storage.

- Wash hands after doffing gloves.
- Practice good ergonomics by adjusting bench height, tool placement, and seating to minimize strain.
- Damp wipe soldering areas upon completion.

### **Personal Protective Equipment (PPE)**

In addition to standard [Laboratory PPE](#) per Yale Policy [4303 Personal Protective Equipment](#):

- **Eye Protection:** Safety glasses with side shields must be worn to protect against splatter and particulates.
- **Hand Protection:** Use heat-resistant gloves when handling hot components, as appropriate.
- **Body Protection:** Wear clothing that covers exposed skin to prevent burns.