

Hazards Associated with Soldering and General Use of the Physical Computing Lab

Gases, Fumes and Dust

Soldering "smoke" is a mixture of very fine particles (fumes) and gases. Many of the substances in smoke (e.g., antimony and silver) are toxic and are respiratory irritants. Inhalation of solder smoke should be avoided. Fume extractors should be used and soldering should only take place in well-ventilated areas. In the absence of a fume extractor, a NIOSH-approved respirator with 3M 60923 Organic Vapor and Acid Cartridges may be used. Circuit boards are made from fiberglass and other composite materials that can produce hazardous dust when cut or drilled. As such they should not be cut or drilled within the classroom.

Hazardous Metals

Circuit boards, electrical assembly materials and products may contain harmful metals or chemicals. Lead is commonly used in circuit assembly techniques and the flux used to make solder connections also contains harmful chemicals. Students should wash hands after handling electrical components, printed circuit boards and wire, and after every class. Students should always wash their hands before eating whenever they have been present in the lab.

Heat

The intense heat of the soldering iron tip can cause burns. Molten solder is dangerous and can come in contact with the eyes or skin if not handled correctly. The soldering iron tip should never be used to pry or force anything, as this could result in a sudden forceful release of momentum causing molten solder to fly off of the iron tip. Eye injuries and or burns can occur from contact with the iron itself or with molten solder. Eye protection and appropriate clothing is recommended to prevent contact between molten solder or the iron and the user's or a bystander's body.

Fire

The heat generated by the soldering iron is enough to start a fire. Soldering should never occur in the immediate vicinity of flammable gases or liquids. Soldering shall only be performed in areas that are free of combustible materials including trash, wood, paper, textiles, chemicals, flammable dusts, liquids and gases. Fire extinguishers shall be nearby.

Electrical Hazards

Almost all physical computing projects require electricity in some capacity. Whenever possible, students will be using low voltage electricity (under 24 volts DC) for their projects. All low voltage electricity must be converted from the 120 volt supplied by the wall sockets into low voltage electricity using UL-Rated power supplies. Any modification of a power supply or converter must be done with prior instructor consent and under instructor supervision. Approved power supplies include computer USB ports and both the wall-mount and variable power supplies specified by the instructor. Any work on projects requiring the use of electricity at a voltage of 24 volts or higher must take place only under the direct supervision of the instructor and in accordance with instructor specified safety procedures. No student, at any time, shall modify or plug in any project to the wall that does not utilize a UL-Approved voltage converter. High voltage electricity supplied from wall sockets (120 volts or higher) can be fatal and must be respected. Low voltage electricity (under 24 volt) can be hazardous as well. Do not touch exposed electrical circuits when they are turned on. Rubber soled shoes must be worn at all times within the classroom. Open liquid containers are not

permitted within the classroom and any spills must be promptly cleaned up. Flammable liquids are not permitted within the classroom.

General Safety Precautions

- \$ Soldering irons will be turned off AND unplugged after each use and remain unplugged;
- \$ During and after use, all irons must be placed within an iron stand and never placed directly on any table top or surface;
- \$ All soldering irons must be returned to the workbench area after use;
- \$ Only solder provided by the instructor will be used;
- \$ All power supplies shall be turned off AND unplugged after use;
- \$ Keep work area clean. Combustible materials shall be removed from the work area prior to soldering activities;
- \$ Follow operating instructions on all equipment;
- \$ Keep a fire extinguisher in work area;
- \$ Fume extractors must be used when soldering and in accordance with instructor demonstrated setup;
- \$ In the absence of a fume extractor, a NIOSH-approved respirator with 3M 60923 Organic Vapor and Acid Cartridges may be used;
- \$ Do not wear sandals or open-toed shoes;
- \$ No food or drink is allowed in the classroom during lab time;

AGREEMENT

I, _____ (students name) have read and agree to follow all of the safety rules set forth in this contract. I will cooperate to the fullest extent with my instructor by closely following all oral and written instructions in order to ensure my own safety, and that of my fellow students. I further acknowledge that the hazards of working with electricity and soldering equipment, along with warnings about heat, gases and the need for personal protective equipment have been reviewed.

I am aware that any violation of this safety contract that results in unsafe conduct, may result in being removed from the classroom and/or dismissal from the course.

Student Signature _____

Date _____