

## Safety in the Lab and in the Field

Laboratories are full of potential health and safety hazards. Your chief protection against these hazards is in always being **awake, alert and prepared** when you enter the lab. Common sense and a little safety knowledge will go a long way in ensuring that your lab experience is a safe one. In general, if a health, safety or security emergency occurs you should immediately notify your instructor and **dial 100** to get help. Do not try to remedy the emergency yourself, dial 100 and get help from professionals trained to deal with the particular emergency at hand.

**It never hurts to be too careful in the lab.** If you have any safety questions or concerns about a particular laboratory procedure, bring them to the attention your instructor *before* you carry-out the procedure. If your lab partner or any other student is not acting in a safe, responsible fashion notify your instructor immediately. Don't forget, you should **NEVER WORK ALONE** in the lab. Someone should always be nearby, ready to help in the event of an emergency.

You should quickly familiarize yourself with the layout of the lab. Note the location of the doors, the windows, the phone, the first-aid kit and the layout of the aisles and workbenches. Note also the locations of the nearest fire alarms and security phones and the routes to the nearest exits from the building. This is important information when you have to act fast in an emergency.

Here are some tips on specific types of emergencies:

**Fire:** Evacuate the lab and building and pull the fire alarm as you exit. Do not try to put out the fire yourself. If you pulled the alarm then you should wait, safely outside, for the firemen and campus police to arrive so you can tell them the location of the fire. Fire alarms are the little red boxes located in the hallway, they are not in the lab.

Be aware of the things in the lab that could cause fires and be aware of the things in the lab that are flammable. Make sure those two classes of items never come in close contact. The soldering iron and the heat gun are two tools that could easily start fires. Never use these tools near any flammable materials (e.g. paper, solvents). Always make sure they are turned off and cool before putting them away. Don't throw hot objects (e.g. molten solder globs, a hot chip that was just shorted-out) into the waste bucket, wait until they are cool before throwing them away.

**Electrocution:** We will be using a lot of electrical equipment in our lab so it is wise to be aware of electrical safety. Included in this handout is a detailed discussion of electrical safety published by the MIT Safety Office. Read and understand this

information, if you have any questions or concerns, see the instructors. The bottom line in electrical safety is that small currents (10's of milliamps) passing through your body can be lethal. In general you do not want to make your body an element in an electrical circuit. You should be especially careful when handling electrical equipment around water. Wet skin has a lower resistance than dry skin so the shock hazard is greater for a given voltage exposure (Ohm's law). It is best to use low-voltage battery-powered equipment when working around water. Also, any plug sockets located near water (such as those at the Sailing Pavilion) should be equipped with ground fault interrupters. This device shuts off the power to the plug socket if it detects a small current flowing to ground.

Note that fuses and circuit breakers are designed to blow at currents that would fry a person. The point of a fuse or a circuit breaker is to prevent a large current from flowing when a short circuit occurs in a piece of equipment. Such high currents cause a great deal of heating and could easily start a fire. Fuses and circuit breakers protect buildings not people. The aforementioned ground fault interrupters are the proper devices to use for protection against electrocution from exposure to 110VAC. Note that no device offers 100% protection, you should always use caution and good safety practices whenever and wherever you work.

**Injury:** If a major injury occurs, notify your instructor and dial 100 to get medical help. In general do not try to help the injured person, your help may compound the injury. We have a first-aid kit that can be used to treat very minor injuries (e.g. little cuts) but it should not be used to treat major injuries, instead you dial 100 and get medical help ASAP.

The power tools in this lab (drill press, belt sander, band saw) could cause major and possibly lethal injury if used improperly. Power tools should only be used by students who have been trained in their use. Always wear eye protection when using power tools. Included in this handout is information on the safe use of power tools published by the MIT Safety Office. Read and understand this information, if you have any questions or concerns, see the instructors.

Almost all of the hand tools can cause cuts if used improperly. You should be especially careful of the tools designed specifically to cut: Xacto knives, saws, wire cutters, etc. Discarded sharp objects should not be simply thrown into the waste basket. They pose a huge injury hazard to the maintenance staff. We have a special Sharps Box in which to dispose of sharp objects such as knife blades, needles, broken glass, etc.

Be very careful of the soldering iron. It's hot, about 700 deg. F and you could potentially get a bad burn. Never touch the tip of a hot iron and be careful not to come in contact with the molten solder. Always allow enough time for a solder joint to cool prior to touching or working with it. The same cautions also apply to the heat gun.

**Chemicals:** We will use some toxic chemicals in our work. Examples of such chemicals include solder, solder flux and various glues. In general you should wear gloves when

gluing or handling toxic chemicals. We have latex gloves in the lab for handling chemicals. We usually don't wear gloves when we solder but you should always wash your hands after soldering because one of the major components of solder is lead. Also, you should not inhale the solder smoke and fumes. When using volatile glues or paints you should always work in a well-ventilated area.

**Drowning:** We will be testing various systems in the Ocean Engineering Testing Tank, the Alumni pool, and/or other locations. Both are deep enough to cause drowning under the right circumstances. Everyone in this course should know how to swim. Note that you could drown in a shallow body of water if you were unconscious when you fell in. Always work cautiously and responsibly when working near water; no horsing around! Don't forget to be especially careful when handling electrical equipment around water, see the above discussion on electrical safety.

**Walkman, iPod, etc.:** Do not wear a Walkman or other personal audio device while working in the lab. If you have your ears covered and are listening to music then you are more likely to be unable to hear an emergency siren or a call for help from a fellow student. A big part of safety in the lab is being aware of your surroundings, and wearing a Walkman lessens your awareness. Also, the wires dangling from your head are a potential safety hazard, especially around power tools. The wires could, for example, get snagged by the drill press and drag your head into the drill.

**Security:** If you see an unfamiliar person in the lab then immediately bring that person to the attention of your instructor. If someone is causing trouble of any kind in the lab then leave the lab and dial 100 to call the campus police on an emergency phone or on a phone in a nearby office or lab. **DO NOT** try to confront a suspicious or troublesome person, call the campus police. Do not leave personal items in the lab, they may get stolen.