

SAFETY FIRST SAFETY FIRST

ECE DEPT. GENERAL SAFETY INFORMATION

ORIENTATION AND BASIC SAFETY TRAINING

1. Emergency procedures:

A. Emergency Phone:

- Dial 911 from anywhere on campus.
- Red phones by elevators on most floors have a direct line to Public Safety.

B. Fire:

- Evacuate area. Follow exit signs. Use stairways, do not use elevators. Rooms should have an evacuation plan affixed to the door.
- Fire alarms. Treat all fire alarms as the real thing and don't assume it is a drill. Building must be evacuated and you must stay in a group outside the building so people can be accounted for.
- Report fire (emergency phones) if not already reported.
- Fire extinguishers are located on the top of each floor's stairway. (To be used by trained personnel).

C. Accidents:

- Major – Go to emergency at Portage View Hospital (911 or 483-1000).
- Minor – Use the Portage Health Center located at the North end of the SDC (483-1860).
- Accident Report – An accident report needs to be filed for all accidents. See John Miller in room 727 for forms. If possible do that before getting medical attention. There are first aid kits in our shops in rooms 727 and SB12 for band-aids and other minor items. Also, most labs and the main office have a basic first aid kit. All injuries need to be reported, not to assign blame, but to correct the safety hazards.

2. Lab Safety:

A. Two-person rule:

- Two or more authorized people need to be present at all times if working in any undergraduate lab. No exceptions!

B. Housekeeping:

- Labs must be kept neat and aisle-ways unobstructed. **Put test leads away on their respective lead racks when finished.** Bring to the attention of the TA anything you observe that is unsafe. Nothing is to be stored in aisle-ways or hallways so as to prevent egress from the building in an emergency.

C. Clothing:

- No Sandals or bare feet in any lab.
- No ties or long hair around any rotating machinery.
- **No food or drink in any undergrad lab.**

3. Chemicals:

A. Labeling and storage:

- All Chemicals must be in original containers or in appropriate containers clearly marked with the original container information. No chemicals in mayonnaise jars, apple juice jugs, etc. All chemicals must be in appropriate containers and labeled with pertinent

chemical information, **even water bottles need to be labeled.** If chemicals come in concentrate form and must be mixed with water, or other chemicals, the new container must be an appropriate container, labeled accordingly, along with the percentage of concentrate. All chemicals are to be kept in appropriate storage. No chemicals are to be left overnight on benches. All chemicals marked flammable are to be stored in a flammable cabinet. All corrosive chemicals are to be stored in an acid/corrosive safety cabinet.

B. Safety glasses:

- Safety glasses must be worn when working with any chemicals. Chemical safety goggles (splash resistant) must be worn when working with liquid eye hazards.

C. MSDS:

- Each chemical in each room must have a MSDS filed in the folder mounted on the door to that particular room. This includes all chemicals and liquids from common alcohol and cleaning solutions to the more dangerous chemicals. The professor in charge of the lab or research area is responsible to have the MSDS on file. The MSDS can be obtained from Chemical Stores or downloaded from the Web. Look under the Chemical Company's web site and links to MSDS or simply do a search on MSDS. It is your responsibility to review information about the chemical you'll be working with from the MSDS.

D. Disposal:

- All chemicals must be properly disposed of before leaving the Department. See the Department safety liaison (John Miller) if you have questions.

E. Spills:

- For minor chemical spills of a non-toxic nature see John or Mike in room 727 for absorbent pads. For major toxic or flammable liquid spills, evacuate the area and call emergency 911. Warn others not to enter the area.

F. Hazard substances:

- Hazardous substances require special training. See the Safety Liaison (John Miller in room 727) or the professor in charge before using any hazard chemicals within the Department.

4. Electrical safety:

A. Lethal Voltage and Current:

- As little as 50 volts ac can kill under the right conditions. Generally anything above 25ma is considered dangerous since it can potentially cause the heart to go into ventricular fibrillation, which can happen in as little time as ¼ second. Currents in the range of 70ma to 300ma are potentially fatal without immediate first aid. With currents through the body of greater than 25ma you may not be able to "let go". You can use ohms law ($E=IR$) to calculate body current. Dry skin has a resistance from 100k to 600k ohms. With wet skin the resistance drops to around 1k ohm. With an open skin cut, the resistance drops between 100 and 500 ohms. Thus, one needs to be extremely careful with higher voltages. **120VAC can Kill!**

B. Tools and equipment:

- Always use double insulated tools. If tools are not double insulated an internal short and improper grounding may cause the tool case to be electrically hot.
- Use ground fault interrupters around water.

- Do not attempt to work with higher voltages (440vac and above) unless properly trained. Approved and tested insulated gloves and safety glasses are necessary. Along with the electrical shock hazard, burns and damaging flashes can be a serious result of high voltage accidents.

C. Electrical components:

- Electrical components can also be a cause of serious injury. A **resistor** that is operated over its wattage rating can burn causing a fire, or explode causing an arc and flying debris. **Capacitors** can “blow up” causing the end cap to shoot out with enough force to damage one’s eye. This will happen if a polarized or electrolytic capacitor is hooked up in the wrong polarity or connected to a voltage above its rating. Suddenly opening an **inductive circuit** can cause a large voltage spike, usually for a very short period of time, but may cause the heart to go into fibrillation, depending on conditions. Make sure you understand electrical components before using them.
- **Batteries** (mainly 12vdc car type batteries) can explode due to escaping hydrogen gas, which is very explosive. When a car battery explodes one is usually very seriously hurt. I have 15 pages of testimonies I downloaded from the web of people who had car batteries explode for no apparent reason (of course there is always a reason such as a loose terminal, cracked case, etc.) Many have life-long injuries (deaf, blind, etc.) Never produce a spark around a battery. It is easy to drop a wrench or screwdriver across the battery terminals. Use extreme care with tools around batteries. Always keep a cap or protective cover over the positive battery terminal. Work in well-vented areas and wear safety glasses and gloves. Always have a neutralizing agent, such as baking soda, available. If jumping a car battery make the last connection to a ground point well away from the battery. C and D cells can also explode, especially the rechargeable Ni-Cad batteries. Appropriate caution should be taken when working with them.

5. Soldering:

- Must have Safety glasses (splash resistant) and be done in accordance with your training. Care is to be taken not to burn benches or anything else, including your fingers. Prolonged breathing of solder vapors is harmful. If a vent hood isn’t available use a fan to blow the vapors away.

6. Rotating machines:

- All rotating machines must have safety guards in place.
- No long hair, ties, or other loose clothing around rotating machines.

7. Other electrical equipment:

- Always operate equipment in accordance with the operating manuals and observe safety cautions. Under no circumstances are you to remove protective covers or cases. If there are internal equipment malfunctions do not attempt to fix it yourself. Contact a TA or Electrical Maintenance.
- **Lasers:** Special training is required before using any laser equipment. Special safety glasses along with other handling procedures need to be followed depending on the class and type of laser. Training to be initiated by the professor or TA in charge of the particular laser lab.

8. Other safety information:

- **Wet floors:** Use caution, especially in winter, as floors are likely to have wet spots. No running in halls (MTU has had many wet floor related accidents).

- **Storage:** Do not store anything within 18 inches of a sprinkler head. Use a ladder to reach high items. Don't stand on swivel chairs.
- **Lifting:** No heavy lifting, get help (improper lifting is one of the biggest causes of accidents at MTU).
- **Details on all safety policies are located on MTU's Occupational and Safety's web site. You can also download the various forms, such as accident report forms.**

JM 8/07