SAFETY FIRST!

Basic Safety for Support Staff and Students

Department of Mechanical Engineering

Lab Specific Safety

Last updated on Decemebr 2015

UVic Occupational Health And Safety Policy # 3250 states:

2.2 Students Shall:

2.2.1 Comply with the University's safety policies and procedures, and departmental regulations associated with all of their University-related activities;

2.2.2 Seek guidance from their instructors or supervisors concerning safety-related knowledge and skills required to ensure safe performance in their University-related activities;

2.2.3 Attend safety training programs and meetings as instructed;

2.2.4 immediately report to their instructor or supervisor any accident, near accident, hazardous practice or condition with respect to their University-related activities; and

2.2.5 Comply with the health and safety policies and procedures of other institutions when they are engaged in University-related activities in these other institutions.

1. GENERAL

Familiarize yourself with the location of the exits, fire extinguishers, emergency shower station, and handicapped refuge areas on each floor that you use. Read this booklet and study the red and white maps/signs on each floor of the building, as well as the maps in the Appendix of this booklet. After entering the lab for the first session, locate the basic safety utilities such as: the exit, the fire extinguisher, the first aid kit, and the telephone.

Additional information on safety can be located at the www2.worksafebc.com site and others

2. FIRST AID

For simple cuts or minor first aid, use the First Aid Kits available in each room. The University Health Services may also be contacted at **8492**. All injuries to students should be reported to the instructor and/or technician. For medical emergencies call **911 and** Traffic and Security at **7599**.

3. MECHANICAL HAZARDS

Several mechanical hazards exist in most of the laboratories and the Machine Workshop, mostly associated with the use and handling of tools, demonstration and laboratory equipment, and machinery. They include:

- Displacement machinery (eg: Robot Arms, Links, etc.)
- Air sucking and blowing fans and pumps (eg.: Air Lines, Wind Tunnels)
- Fluids pumping machinery (eg: Oil Pumps, Air Lines, Water Flume)

- Heat and gas producing equipment (eg: Diesel engine, Steam Generators, Ranges)
- Rotating machinery (eg: Lathes, Mills, Drills, Motors)

Follow basic safety procedures to minimize potential safety hazards:

1. Plan your activities and discuss safety concerns as a group before running an experiment. If unsure of the correct operating procedure, request assistance from your instructor.
2. Read the lab manual thoroughly, and observe specific safety concerns mentioned.
3. In general, do not turn on any mechanical equipment without:
   a) The presence of an assistant, supervisor or a TA.
   b) Anticipating the motion reach of any moving equipment and staying well clear of it.
   c) Knowing beforehand how to turn the equipment "OFF".
4. Recognize sources of heat and avoid coming in contact with hot surfaces.
5. When operating machinery wear a lab coat, safety goggles, and if necessary, ear protectors. Make sure there are no dangling ties, gloves, or hair that can be sucked in or become tangled in machinery.
6. Immediately report any equipment malfunctions or unusual occurrences such as undue vibrating or heating of equipment to the TA and/or technician. If possible, switch the power off immediately.
7. Ensure that all equipment is powered-off at the end of each experiment.
8. Certain equipment can be turned "on" or used **only** by qualified operators. This equipment and respective qualified operators include:

- **Equipment** in the **Machining Facility** ELW B103/111; Rodney Katz
- **Equipment** in the **Advanced Manufacturing Lab** ELW B127; Minh Ly
- **All equipment** in the **Model Making Workshop** ELW B123; Rodney Katz

Specifics:

- **MTS/Laser Welder** in ELW B111; Rodney Katz.
- **Impact Tester** in ELW A135; trained Teaching Assistant.
- **Diesel Engine** in ELW A144; trained Teaching Assistant.
- **Robot Arm** in EOW 121; trained Teaching Assistant.
- **CNC Machines** in ELW B119; Minh Ly/Rodney Katz

4. ELECTRICAL HAZARDS

1. When handling electric wires, never use them as supports and never pull on live wires.
2. Report and do not use equipment with frayed wires or cracked insulation and equipment with damaged plugs or missing ground prongs.
3. Report and do not use receptacles with loose mountings and/or weak gripping force.

4. Avoid pulling plugs by the cord and avoid rolling equipment over power cords.
5. Be sure that line-powered equipment has three-wire grounding cords and that you know how to use the equipment properly. Ask for help and instruction when needed.
6. Any electrical failure or any evidence of undue heating of equipment should be reported immediately to the instructor and/or technician. If you smell over-heated components or see smoke coming from any circuit or equipment, switch the power off immediately.
7. Ensure that all equipment is powered-off at the end of each experiment.
8. If serious electrical shock occurs, **dial 911** immediately. Cardiopulmonary resuscitation (CPR) will often revive the victims of high-voltage shock. Only qualified people should attempt CPR.

5. FIRE

If a **Fire Alarm sounds**:

1. Secure any equipment you are using and switch off the power.
2. Close windows and doors behind you as you leave. Do **not** lock doors.
3. Evacuate the students from the lab.
4. Check that no one is left in the lab.
5. Leave building using recommended exits with reasonable speed.
6. Assist individuals with mobility disabilities to an Emergency Evacuation Site.
   - Follow the instructions of your emergency coordinators (see Appendix A).
   - **DO NOT** use elevators for evacuation.
   - **DO NOT** re-enter the building until allowed to do so by the Fire Department.
7. Move to your Department's evacuation site.

If you discover a fire, smoke or witness an explosion:

1. Shout for assistance.
2. Activate the nearest fire alarm pull station.
3. Call **911** and Campus Security 7599.
4. If it is a small fire, attempt to put it out with available fire equipment. **Do not endanger yourself.**
5. If the fire is out of control or it is too large to handle with one fire extinguisher, isolate the fire by closing the doors and windows behind you as you leave. Do **not** lock the doors.
6. Leave building using recommended exit with reasonable speed.
7. Assist individuals with mobility disabilities to an Emergency Evacuation Site.
   - Follow the instructions of your emergency coordinators (see Appendix A).
   - **DO NOT** use elevators for evacuation.
   - **DO NOT** re-enter the building until allowed to do so by the Fire Department.

8. Move to your Department's evacuation site.
9. Stand by to identify yourself and provide information to fire personnel.

6. CHEMICAL HAZARDS – SPILLS – FUEL STORAGE

1. When handling any chemicals, be sure to wear eye protection and gloves.
2. After handling the chemical replace the lid or cap and place it back in its designated cabinet.
3. The storage of automotive fuels such as gasoline, diesel fuel, are allowed only in the special designated lab room: ELW B130b
4. Report any spill to the TA, or follow these steps for **CHEMICAL SPILL** :
   - Tend to any injuries if safe to do so, call **911 and** Traffic and Security at **7599, and** identify yourself to Traffic and Security.
   - Secure the area and close the door.
   - Pull the fire alarm to evacuate the building. Direct people away from the spill area.

7. EARTHQUAKES

IF INDOORS:

Take action at the first indication of ground shaking.

1. Duck, cover, and hold. Crouch low to the ground, protect head with your arms, seek cover and hold onto heavy furniture. Stay inside; move away from windows, shelves, heavy objects and furniture that may fall. Take cover under a table or a desk, or in a strong doorway (anticipate that doors may slam shut).
2. In halls, stairways or other areas where no cover is available, move to an interior wall. Turn away from windows, kneel alongside the wall, bend your head close to your knees, clasp your hands firmly behind your neck covering the sides of your head with your elbows.
3. Elevators must **not** be used. They are extremely vulnerable to damage from earthquakes. Ground shaking may cause counterweights and other components to be torn from their connections, causing extensive damage to the elevator cabs and operating mechanisms.
4. When the shaking stops, Floor Emergency Coordinators (see Appendix A) direct people in evacuating the building. When exiting a building, move quickly through exits and away from buildings. Parapets and columns supporting roof overhangs may fall.
5. Assemble away from gas, sewer and power lines.

IF OUTDOORS:

1. Assemble at the Department's Emergency Evacuation Site, or at an open space away from buildings, trees and overhead power lines.
2. Lie down or crouch low to the ground (legs will not be steady) and constantly survey the area for additional hazards.

8. EYE AND FACE PROTECTION

(extract fromWorkSafeBC)

8.14 Safety eyewear

(1) A worker must wear properly fitting **safety** eyewear appropriate to the conditions of the workplace if handling or exposed to materials which are likely to injure or irritate the eyes.

(2) Properly fitting **safety** eyewear appropriate to the conditions of the workplace must be worn if a worker

(a) has 20/200 or less vision in either eye, or is blind in either eye, or

(b) is working on or testing electrical equipment energized at a potential greater than 30 volts.

8.15 Prescription safety eyewear

(1) Prescription **safety** eyewear must meet the requirements of *CSA Standard CAN/CSA-Z94.3-92, Industrial Eye and Face Protectors.*

(2) Bifocal and trifocal glass lenses must not be used if there is danger of impact unless they are worn behind impact rated goggles or other eye protection acceptable to the Board.

(3) If the use of polycarbonate or plastic prescription lenses is impracticable, due to the conditions of the workplace, and there is no danger of impact, workers may use prescription lenses made of treated **safety** glass meeting the requirements of *ANSI Standard Z87.1-1989, Practice for Occupational and Educational Eye and Face Protection*.

[Amended by B.C. Reg. 312/2003, effective October 29, 2003.]

8.16 Side-shields

Safety eyewear must be fitted with side-shields when necessary for the **safety** of a worker.

8.17 Face protection

(1) If there is a risk of face injury, suitable face protection must be worn.

(2) Face protectors and non-prescription **safety** eyewear must meet the requirements of

(a) *CSA Standard CAN/CSA-Z94.3-92, Industrial Eye and Face Protectors*, or

(b) *ANSI Standard Z87.1-1989, Practice for Occupational and Educational Eye and Face Protection.*

(c) Repealed. [B.C. Reg. 312/2003, effective October 29, 2003.]

* See also section 4.4 of the OHS Regulation.

[Amended by B.C. Reg. 312/2003, effective October 29, 2003.]

8.18 Contact lenses

Adequate precautions must be taken if a hazardous substance or condition may adversely affect a worker wearing contact lenses.

9. PERSONAL CLOTHING AND ACCESSORIES

(extract from WorkSafe BC)

(a) the clothing of the worker must fit closely about the body,

(b) dangling neckwear, bracelets, wristwatches, rings or similar articles must not be worn, except for medical alert bracelets which may be worn with transparent bands that hold the bracelets snugly to the skin, and

(c) cranial and facial hair must be confined, or worn at a length which will prevent it from being snagged or caught in the work process.

(d) Open-toed shoes and sandals must not be worn in the facility.

10. HARASSMENT

UVic Occupational Health And Safety Policy # 3250 states:

2.1 The University of Victoria does not condone harassment and seeks to prevent harassment of all members of the University community.

2.2 Harassment is defined as the abusive, unfair, or demeaning treatment of a person or group of persons that has the effect or purpose of unreasonably interfering with a person's or group's status or performance or creating a hostile or intimidating working or educational environment when:

a. such treatment abuses the power that one person holds over another or misuses authority; or

b. such treatment has the effect or purpose of offending or demeaning a person or group of persons on the basis of race, colour, ancestry, place of origin, nationality, religion, family or marital status, physical or mental disability, age, sex, sexual orientation, or conviction for a criminal charge.

If a situation arises that person becomes a victim of verbal or physical harassment the person should immediately cease work, and report the abuse to the Department Chair. A written, email report of the incident is highly encouraged.

Mech Undergraduate Laboratories

Safety Regulations and Hints

GENERAL REGULATIONS

- Computers in Mechanical Engineering laboratories are loaded with licensed software. Unauthorized software is not allowed, and will be removed.
- It is unlawful to tamper with the lab security system, computers, or facilities.
- Keep lab doors closed at all times.
- Consumption of food or drinks is not permitted in any of the labs.
- First aid kits and fire extinguishers are available in every laboratory.
- Report any problems or shortcomings with the designated lab support personnel or to the Laboratory Manager: Art Makosinski, EOW 553, tel 6041. Email: art@me.uvic.ca

COMPUTATIONAL /DESIGN LABORATORY - ELW B228

Shared by all ME students on a 24 hour basis. There are 40+ workstations, and they should be used in a considerate and professional manner.

- Computers should not be tampered with, or used for non-course related tasks.
- Software not licensed for use in this lab must not be installed on any machine.
- Afternoon lab use is prioritized reserved for scheduled course sessions.
- Windows should be kept closed as much as possible.
- Lab support person is Minh Ly, ELW A214, tel 8893. Email: mly@me.uvic.ca

CAM LABORATORY - ELW B119

Used in MECH 460. The CNC lathe and CNC mill in this lab can be operated **only** by, or with the presence of the lab support person; Minh Ly, ELW A214, tel: 8893. Email: mly@me.uvic.ca, or Rodney Katz, ELW 111, tel 8667. Email: rkatz@me.uvic.ca

INSTRUMENTATION LABORATORY - ELW B232

Used for the following courses; MECH 455 Instrumentation, MECH 330 Machine Dynamics, MECH 458 Mechatronics, Mech 380 Controls, and MECH 285 Properties of Materials. Dangers in the lab include:

- Burns from the heating elements, glass vials and molten lead (Mech 285).
- Electric shock.
- Lab support person is Pat Chang, ELW A216, tel 6032. Email: pchang@me.uvic.ca

SOLID MECHANICS LABORATORY - ELW A135

Used for Mech 220 and Mech 320 Solid Mechanics courses. The most dangerous piece of equipment there is the IMPACT TESTER. The mass of the swinging pendulum is high and will cause permanent injury to anything in its way. It should **only** be operated by TA's who have been trained and are experienced in its use, and understand its safety aspects. During its demonstrations, all students must stay well outside of the chained perimeter. Watch for:

- Being brushed or impacted by the Impact Tester's pendulum.
- Dropped weights on hands and feet.
- Lab support person; Rodney Katz, ELW 111, tel 8667. Email: rkatz@me.uvic.ca

THERMODYNAMICS LABORATORY - ELW A144

Used for MECH 395 Heat Transfer, and MECH 390 Energy Conversion courses. It contains the **Diesel Engine,** Sterling Engine, Air Conditioning Experiment, and the Rankine Cycler Experiment. It also contains a small amount of Diesel fuel in appropriate containers, locked in a metal cabinet.

The Diesel Engine and its regenerating generator, is connected to the main power line and must be started and used according to manufacturers specifications.

The Rankine Cycler includes a boiler which is powered by a propane gas tank. The Air Conditioning Demonstrator also has a boiler which is electrically heated. Protective eyewear must be worn at all times by those who use the Rankine Cycler. Everyone is required to wear ear protection when operating the Diesel Engine.

All equipment in this lab should be operated only by TA's who were trained in the equipment's use. To watch for:

- Burns from the exhaust lines while the Diesel Engine is running.
- Diesel fuel spills from the external tank.
- Burns from the boiler on the Air Conditioning Demonstrator and the Rankine Cycler.
- Lab support person; Rodney Katz, ELW 111.

FLUIDS MECHANICS LABORATORY - ELW A140

Used for MECH 345 Mechanics of Fluids I, and MECH 392 Mechanic of Fluids II, and Mech 395 Heat and Mass Transfer. The lab contains large equipment to monitor fluid flow. Most dangerous is the wind tunnel. Keep well away from the intake fan. Watch for:

- Hair, clothes, being sucked into the Wind Tunnel.
- Water flowing over the top of the tank, in the Water Flume.
- Correct valve adjustments in the Oil Line.
- Lab support person; Rodney Katz, ELW 111, tel 8667, Email: rkatz@me.uvic.ca

MECHANISM LABORATORY - ELW A229

Used in the past for MECH 335 Theory of Mechanisms, and MECH 485 Mechanism and Manipulator Synthesis courses. It contains electronic instrumentation, a variable speed multi-link mechanism, and a opened auto transmission. The link mechanism is dangerous when in motion, should be operated only by a trained TA. Watch for:

- Getting caught in the link mechanism. Stay away from the link when it is operating.
- Getting pinched by the transmission. Do not examine gears or shift mechanisms if anyone is close to the gear shifter.
- Lab support person; Art Makosinski, EOW 553, tel 6041. Email: art@me.uvic.ca

MECHATRONICS / MEMS LABORATORY - ELW A243

Used for MECH 466, Micro-electro-mechanical Systems, and ENGR 466 - Integrated Mechatronics and Embedded Systems Project. It contains electronic instrumentation, and electro-mechanical apparatus. Watch for:

- Electric shock.
- Rotating equipment.

DESIGN FACILITY - ELW B103/B111

This is a working area consisting of the Machine Shops in B111, and B103. Both rooms containing major power and tools, which can present a very real physical danger when not used properly. The Shop in B111 is for use ONLY by support staff. It also houses the MTS machine, used to demonstrate fracture to students in the Mech 220 Solids Lab.

Room B103 is for use by students taking the Mech 200, 350, and 400, and some 499 courses, but **only** after taking a **Shop Safety Seminar**, where he/she has shown proficiency in the use of the hand tools, shop machinery, and basic safety aspects.

Protective eyewear must be worn at all times by those who use the Facility.

The Facility Manager is Rodney Katz, Office: ELW 111a, tel 8667. Email: rkatz@me.uvic.ca
A separate "**Shop Policy**" deals in details with specific access, responsibility, and safety issues in this facility.

DESIGN PROJECT STUDIO - ELW A127

This room is for general use by undergraduate students taking the Mech 350, 400, and some 499 courses. It contains workbenches, hand tools, and a drill press for basic project design and construction. Safety glasses are supplied and appropriate safety signs are posted.
The Studio support person is Ken Begley, ELW B103, tel 4218.

APPENDIX A

EMERGENCY COORDINATORS AND EVACUATION SITES

Floor Emergency Coordinator for 5th floor **EOW** :
Dorothy Burrows, or a designated alternative
Office: EOW 548
Local: 8900

Floor Emergency Coordinator for **ELW 1st floor** :
Minh Ly
Office: ELW A214, local: 8893

Floor Emergency Coordinator for **ELW 1st floor** :
Rodney Katz
Office: ELW B111, local: 8667

Floor Emergency Coordinator for **ELW 2nd floor** :
Patrick Chang
Office: ELW 232, local: 6032, or 8919

WHIMIS Coordinator: Patrick Chang, Office: ELW A216, local: 6032

ME Department's designated Emergency Evacuation site (Designated Refuge area): The **parking area** South of ELW, between ELW and the Ring Road.

December 18, 2015