

**School of Engineering and School of Architecture  
General Safety Rules and Operational Policies for  
Manufacturing & Prototyping and Materials Testing Labs  
(August 10, 2016 r4)**

**NOTES**

- Persons violating safety rules or operational policies are subject to appropriate disciplinary action and/or immediate dismissal from the area by student lab supervisors, faculty, or staff.
- For additional training in any of the outlined topic areas please contact the Office of Environmental Health and Safety at extension 6114.

**Emergencies**

1. Report all emergencies to your instructor, RPI staff, or student lab supervisor. If an injury needs prompt medical attention, call Public Safety at campus phone extension 6611 or by cell phone at 518-276-6611. For non-emergencies dial 518-276-6656.
2. Do not attempt to move an injured person unless there is an imminent danger to life.
3. First-aid kits are available throughout the shop areas for minor injuries.
4. Do not attempt to clean up any bodily fluids under any circumstances. Report it to your instructor, staff member, or student lab supervisor immediately.
5. In case of fire or hazardous chemical spill evacuate the premises immediately.

**General Operational Policies**

1. Faculty, staff, and student lab supervisor are responsible for interpreting and administering safety rules and operational policies for their particular shop area.
2. Faculty, staff, and student lab supervisor have the right to dismiss a student from a shop area if safety rules are violated.
3. Students are not permitted to work alone in the shop areas without the supervision of an instructor, staff member, or student lab supervisor.
4. Only current RPI faculty, staff, and students who have been properly trained and authorized are allowed to directly operate equipment (machine tools, welding equipment, robots, assembly systems, and electronic equipment) or any other type of power equipment in the manufacturing and prototyping areas within the Schools of Engineering and Architecture.
5. Use the buddy system and watch out for other people. If you are aware of an unsafe situation, please report it to your instructor or staff member immediately.
6. Do not tamper with projects, experiments, machine set-ups, or prototypes that are not under your jurisdiction.
7. Use of tobacco products, alcohol, and illegal substances is prohibited in the shop area.
8. Do not operate any machines if your abilities are impaired for any reason (examples: personal illness, lack of sleep, drugs, or alcohol).
9. Everyone is responsible for housekeeping and cleaning up after themselves. Project work is to be done in the designated workbench areas only and properly stored for safe keeping after use. Aisles, doorways, and stairways are to be kept clear for purposes of safe passage.
10. Do not run in the shop area or distract the work of others with unnecessary yelling, loud music, etc.
11. Report any cases of vandalism or theft to your instructor, staff member, or student lab supervisor immediately.
12. Students should not perform any type of maintenance on equipment in the shop areas.
13. Food and drinks are only allowed in designated areas.
14. Rensselaer is not responsible for personal property (e.g. computers, multi-media devices, tools) in the fabrication shops.

**General Safety**

1. Safety glasses with side shields are mandatory in all areas at all times. Persons not wearing safety glasses will be asked to leave.
2. Students should purchase their own safety glasses with side shields. You can purchase glasses at the campus bookstore, Pfeils Hardware (63 3<sup>rd</sup> St. in downtown Troy), or Home Depot.

3. Wear appropriate clothing for the task you are working on (example: long pants or proper personal protective gear, such as gloves, etc). Ask an instructor or staff member if you are not sure if you are dressed correctly for the task at hand.
4. Loose clothing, neckties, long hair, personal stereo wires, and jewelry can become entangled in rotating equipment leading to serious injury or death! Make certain that such articles are removed or securely fastened to avoid entanglement.
5. Machine and fabrication shops are noted for the hazard of dropped objects; because of this, puncture resistant work boots are the preferred footgear. Persons wearing open toe shoes, thin fabric, open-back shoes, ripped sneakers, sandals, crocs, formal “strappy shoes”, high-heeled shoes, etc. will not be permitted to use the shop areas.
6. Use appropriate safety equipment (i.e., welding gloves, ear protection, aprons, welding helmets, face-shields) while working in the area. See your instructor or a staff member for guidance.
7. Report all spilled fluids immediately (since they are an extreme slip hazard).
8. Personal communication and music systems (MP3 players, cell phone, text messaging, etc.) are not allowed when operating manufacturing equipment and power hand tools.
9. Open flames (e.g. Soldering or brazing torches, candles, cigarette lighters) are only permitted in the welding area of the student shop (JEC 1012).
10. Systems using a projectile must be approved by a faculty member or staff member.
11. Powered/operating projects may not be left unattended. Should long-term testing be required, it must be arranged on a case-by-case basis with permission of an instructor and lab manager (i.e. Sam Chiappone).

### **Mechanical Systems, Machinery, and Power Tools**

1. Do not use machinery or power hand tools without the proper training. If you do not know how to operate a power tool or machine, or do not fully understand the instructions you have been given, ask an instructor or staff member for help.
2. Do not use gloves while operating machinery; they can become entangled in rotating tools.
3. Do not touch any rotating component of a machine until it has completely stopped.
4. Use care when handling tools. Cutting tools are very sharp! Wrap tools in a rag when removing or installing cutting tools.
5. Do not distract people operating machines; which includes speaking to them. Do not allow yourself to be distracted. If you must talk, bring machinery to a complete stop first. If you are asked to stop the operation of a machine, then do so immediately! Do not leave machines running while unattended.
6. Personal power and hand tools may be used only with the permission and supervision of your instructor or staff member.
7. Many hazards exist in a machine shop. Before you move a heavy object, swing a hammer, or engage any machine power, think about the consequences of your actions. How and where are you going to put the heavy object down? Are your fingers going to get caught? Are somebody else’s fingers going to get hurt? When the power comes on, will tools fly? Will cutting tools run into things they aren’t supposed to hit? PLEASE THINK BEFORE YOU ACT!
8. Fabrication or modification of pressure vessels by student, staff, or faculty is not allowed. Use of commercially available pressure vessels within their manufacturer-rated operational range is allowed with faculty or staff supervision.
9. Fabrication or modification of rotating components (e.g. flywheels, tires used as launchers) with stored energy over 100J is not allowed without special permission from a faculty or staff member.

### **Electrical**

1. Working with line voltage or voltages greater than 24V must be done under the direct supervision of an instructor or staff member.
2. Do not work on electronic circuits when the power is on, unless it is absolutely necessary and under the supervision of a faculty member or staff. Student lab supervisors are not allowed to supervise this activity. Low power analog and digital circuitry (e.g.  $\leq 5V$ ) are the ONLY exceptions to this rule, provided the power supply or battery is fused at 1 amp or less.
3. Use the one handed rule (only one hand touching circuit at any given time) when working on active circuits. Electric currents of less than 50-100mA can cause death.

4. Capacitors (electrolytic and other) can hold voltages for several hours. Be sure they are discharged with an insulated clip lead before working on the circuit.
5. Certain components such as power resistors and semi-conductors get very hot. Give them a chance to cool before touching them.
6. When soldering, wear safety glasses and do not flick the soldering iron to remove excess solder. You may burn your colleague.
7. All batteries must be manufacturer labeled and their battery chemistry (type) listed. Lead-Acid batteries must be of the sealed, non-spill, "gel cell" or "AGM" type – Liquid electrolyte lead acid batteries (e.g. Motorcycle and CAR BATTERIES) are PROHIBITED.
8. Any batteries not of the standard consumer type (e.g. AA, AAA, C, D, 9V, 6V lantern battery, etc.) must be approved by a staff member or instructor.
9. Lithium-based batteries (labeled "Lithium," "Li-po," "Li-Ion," "Lithium-Polymer," "MnO<sub>2</sub>-Li," or ANY other type of lithium based chemistry), etc.) may not be used without approval of both your instructor and the lab manager (i.e. Sam Chiappone). Note that this is **never** given for IED.
10. Batteries and power supplies must be fused appropriately.
11. Batteries must not be left unattended while charging.  
DO NOT ATTEMPT TO CHARGE NON-RECHARGABLE BATTERIES!
12. All extension cords should be visually inspected for damages prior to use. Any cords suspected of having a defect should be turned in to a faculty or staff member. Unplug all extension cords after use.
13. Do not plug a 3 prong electrical cord into a two prong extension cord.
14. Do not block electrical panels. All panels must have a clearance of 36" around them.

## Chemical

1. All projects with a chemical component need preliminary approval from faculty and or laboratory staff prior to acquiring chemicals for a project or beginning construction of a project.
2. Do not drain dispose any chemical without first consulting an instructor or staff person.
3. All painting is to be done in the paint booth (with the ventilation system turned on) regardless of application method. The paint booth is located in the Design Lab Fabrication and Prototyping Area, JEC 2332.
4. Any paint or chemical compounds requiring mixing and or the use of a respirator requires approval by the Office of Environmental Health and Safety and direct supervision of a shop staff member. Please contact Sam Chiappone at 276-8295 (JEC 3100) or Scott Yerbury at 276-8290 (JEC 2332) for assistance.
5. All chemical containers must be labeled as to their contents. Do not use abbreviations or formulas as labels. Chemical contents must be spelled out legibly in English.
6. Safety Data Sheets (SDS) are available on line at <http://hr.rpi.edu/update.do?artcenterkey=396> or at SDS online [www.msdsonline.com](http://www.msdsonline.com) (still valid as of 7/20/15)
7. Oil soaked rags or rags with any type of solvent are to be disposed of in proper containers. Do not dispose of these items in regular trash containers.
8. Hazardous or regulated materials such as batteries, computer components, and chemical reagents must be disposed of in accordance with Rensselaer's Hazardous Materials Disposal Program. An online version of the Hazardous Materials Disposal Program is located at <http://hr.rpi.edu/update.do?artcenterkey=383>
9. Bio-reactors, live cultures, decomposing organics, or other potential gas sources must be properly vented or stored temporarily in a fume hood. Gas exposure, pressure buildup, flammability, and explosion risk must always be carefully considered and addressed with such projects.

## Optical Safety

1. Intense visible and invisible (UV, IR) light can be produced by lasers, arc lamps, high output LEDs and concentrated sunlight. This light may cause physical burns or severe eye damage.
2. Wear appropriate eye and skin protection when concentrating direct sunlight, operating intense light sources such as lasers, arc lamps, high output LEDs, and when using laser cutter/engravers for engraving mirrors and coated metals such as enameled brass and anodized aluminum.
3. Lasers used in projects must be properly labeled (i.e. manufacturer's labels, listing output wavelength, power, and class).
4. Lasers for project use may not exceed Class 3R (post-2002 classification), or Class IIIa (pre-2002 classification). For visible CW lasers, this sets an absolute maximum output of 5mW. UV and IR lasers are more dangerous, as they produce radiation that is invisible to the human eye. Wear eye protection appropriate to laser wavelength.

5. Do not attempt to modify or disassemble laser systems (e.g. laser cutter/engraver) at any time.
6. Always read the manual and caution labels carefully before operation of any laser or laser-based device.
7. Do not laser-cut or heat materials that may produce toxic substances such as PVC and Teflon. If material is questionable DO NOT expose to laser (i.e. laser cutter/engraver) or sunlight (i.e. solar concentrator, solar oven).
8. All questions relative to laser safety should be directed to a faculty or staff member for possible referral to the Office of Environmental Health & Safety (phone 518-276-6114) for final resolution.

### **Woodworking Safety**

1. Be aware of the direction of moving blades. (Rotation of the blade toward, away or parallel to you have differing consequences).
2. Point chisels and other sharp hand tools AWAY from your body and other people.
3. Secure your work before operating woodworking power tools.
4. Wood and wood dust are flammable, take proper precautions.
5. Use the proper equipment for ripping and crosscutting operations. Cross cuts are across the shortest length and ripping cuts are parallel to the longest length of the wood grain.
6. Treated Lumber is not to be cut in the Architecture Fabrication Shop (GR 1st Fl) or School of Engineering shops.
7. Medium Density Fiber (MDF) board should only be cut on equipment in the Architecture Fabrication Shop or JEC Machine Shop with appropriate ventilation.

In reviewing this sheet and signing the class safety sheet list, I acknowledge that I have carefully read and fully understand the general safety rules and operational policies of the School of Architecture and School of Engineering's Manufacturing & Prototyping Areas, and I will comply with them. I also realize that other, undefined hazards will exist in the fabrication & prototyping areas and therefore, my safety, and that of others, is ultimately my own responsibility.

Persons violating safety rules or operational policies are subject to appropriate disciplinary action and/or immediate dismissal from the area by student lab supervisors, faculty, or staff. For additional training in any of the outlined topic areas please contact the Office of Environmental Health and Safety at extension 6114

Please contact Sam Chiappone, Manager of Fabrication & Prototyping ([chiaps@rpi.edu](mailto:chiaps@rpi.edu)), if you have questions relative to the policies, testing process, or projects outside of the scope of these policies for School of Engineering projects. Bill Bergman, Manager Wood Shop ([bergmw@rpi.edu](mailto:bergmw@rpi.edu)), is the contact for projects in the Architecture Fabrication Shop, School of Architecture.