**Student Machine Shop Safety Policy**

**Guiding Principles**

Shop and fabrication activities can play an important role in the education of many University of Louisville Physics students. Safety is a shared responsibility that involves the institution, the user, staff, and our faculty. Comprehensive safety emerges only when all aspects are considered: the tools and environment, the individuals, as well as the devices and materials being used and fabricated. Collectively and individually, our focus must be on establishing, supporting and maintaining a Department-wide culture of safety.

**Emergency Contact Information**

If life threatening injury or accident occurs, *call* ***911*** *first*, not the University's Public Safety Office. Notify Public Safety after help has been dispatched.

If there is a non-life threatening emergency, call the University's Public Safety Office at 502-852-6111.

In the event of a chemical or other hazardous material spill, also call Public Safety at 502-852-6111 and notify Environmental Health and Safety at 502-852-6670 during business hours. For more information see <http://louisville.edu/dehs>.

In all instances of an accident involving injury or material spills during business hours notify the Physics Office at 502-852-6787 as soon as it is safe to do so. Outside of normal hours, contact your immediate supervisor using the information they have provided or numbers that are posted in the shop.

**Definition, Role, and Authority of Supervisors**

A supervisor is a person who has the professional- level experience required to have full authority over all workshop operations and use. Supervisors are expected to exercise their authority to halt unsafe operations at any time and to restrict shop access to anyone who violates the rules.

Supervisors will enforce these Policies and Practices, including the rules on hours, practices, pre-training/experience requirements, proper use of personal protective equipment, and use of tool and equipment guards, and appropriate clothing. They will model best practices and educate students to promote a general culture of safety in all shop and fabrication work. Any enforcement trouble or problems with equipment needing repair, or having broken or missing guards are to be reported to the Machine Shop Committee or the Department Chairperson as appropriate.

**Machine Shop Access**

Shop access requires a signed agreement accepting the code of conduct and defining the tools which the student is authorized to use. Students are allowed in the shop only with direct supervision from a supervisor. Students will not be trained or permitted to work in the shop without permission from their scientific advisor.

**Promoting a Culture of Safety**

Promoting and maintaining a culture of safety depends on the individual behavior of everyone: students, staff, supervisors and faculty. We must look out for each other, teach each other, and when appropriate, caution each other.

**Machine Shop Rules Agreement**

*The following policy must be read, accepted, and signed by students who are being trained and who have permission to use shop facilities. Before beginning training in the shop, students must participate in the Laboratory Safety and Hazardous Waste Orientation Training offered by the University's Department of Environmental Health and Safety. See their website for information:* [*http://louisville.edu/dehs*](http://louisville.edu/dehs)

Only those trained and authorized may use tools and operate equipment located in the Physics & Astronomy Department's machine shop. Training may be formal (classroom, machinist union apprenticeship, etc.) or on-the-job, but it must be documented and it must include training on each piece of equipment to be used. Training documentation must be forwarded to the person responsible for the machine shop prior to authorization being granted.

1. State of mind. Do not operate power tools when you are tired, ill, taking strong medications, fatigued or consuming alcoholic drinks.

2. Appropriate clothing. Wear proper clothing for the type of work being done - Do not wear loose-fitting clothes or jewelry that can get caught in moving parts. Wear short sleeves, or securely roll up long ones. Do not wear highly flammable clothes. Do not wear sandals, open-toed or canvas shoes. Wearing safety-toed shoes is preferable for protection of feet and toes.

3. No jewelry. Remove jewelry before beginning work, including rings, necklaces, dangling earrings, bracelets, and watches.

4. Protect eyes. Safety glasses must be worn at all times in the shop. Most eyeglasses do not afford enough protection, and most operations and equipment require additional personal protective equipment. If in doubt, err on the side of caution. These requirements will be briefed when a person is trained on the specific machine. Protect your eyes, face, head, and scalp when required by the job, and at a minimum, wear industrial-quality safety glasses with side shields for any machine tool work. (Safety glasses must have the Z87.1 logo on them to assure they qualify as impact resistant.) Add a face shield or wear impact resistant goggles if flying particles are expected during the machining process. Safety glasses are available in the shop for your use. In the event you are welding or using ultraviolet light, appropriate UV protection for your eyes and exposed skin must be worn as well. The shop has an emergency eye wash station that you should learn how to use if needed.

6. Protect ears. Some shop operations generate noise levels over 80 db. In those cases, you must also wear ear protection, at a minimum using ear plugs. Suitable protection is available in the shop. Remember that prolonged exposure to loud noise will result in permanent hearing loss. Wear ear protection, not earbuds or earphones unless they are designed for safety with noise cancellation capability.

7. No tangled hair. Pull back long hair, use a band or suitable clip to contain it, and tuck it under a cap or clothing to keep it from getting caught in tools. Long beards must also be contained.

8. No cellphones. Personal electronic devices of any kind must not be used when working at any machine. Never answer a cellphone while a machine is running. Do not listen to music or have a conversation, even on a speaker. However, if you have a cell phone, leave it in an accessible place so that you may use it in the event of an emergency.

9. No distractions. Keep your mind on your work. Talking, texting, even listening to something distracting while running machinery can lead to accidents. Stop working and turn off the power tool you are working with if distracted by something or someone. Never look away from your work when operating a power tool.

10. Eating. Food and drinks are not permitted in the shop workspace. If you are hungry or thirsty, take a break and return refreshed.

11. Keep tools clean and in good repair. Always clean up power tools before putting them away. Avoid using tools that are or appear to be in disrepair. Use power tools only for their intended functions.

12. Repairing and cleaning power tools - Always turn off a power tool before (1) adjusting, oiling, cleaning or repairing it; (2) attaching an accessory; or (3) changing bits, blades or grinding wheels. Unplug or lockout tools when not in use. Unplug tools by pulling directly on the plug. Jerking on the cord can cause damage to the tool. Do not leave tools, hardware and other materials out when not in use. Before making adjustments or changing bits or cutters, disconnect the power cord or use a master switch or disconnect to avoid accidentally touching the switch and possible injury when the tool starts.

13. Compressed air used for cleaning - OSHA regulates the use of compressed air for cleaning in 29 CFR 1910.242(b) as follows:

* Employees shall not use compressed air for cleaning themselves or their clothing.
* The operator shall not direct compressed air at nearby employees.
* Compressed air used for cleaning work areas, such as work benches, table saws, and drill presses, shall not exceed 30 psi at the outlet, statically or dynamically, and shall be permitted only with effective chip guarding or personal protective equipment (as described in section 1910.133) to protect the operator and other employees from flying debris.

14. Keep guards in place. Safety guards cannot protect you if they are not in place and in proper working order.

15. Do not leave a manual machine running unattended. Make sure all moving parts have come to a complete stop before you leave the work area or before you make minor adjustments.

16. Cleanup. Keep the work area clean. Keep the floor free of scraps and oil. Cluttered work areas invite accidents. Keeping workshop and storage spaces clean and dry can help prevent many accidents. Sparks can ignite scraps, sawdust and solvents. Water can conduct electricity. Do not stand in water, on damp floors or in the rain when working with electrical tools. Keep hands and tools dry. After you have finished your work, leave the area clean.

17. Open access. Aisles, exits, and access to emergency equipment must be kept clear of obstructions at all times.

18. Tool choice. Use the correct tools for the job. Do not use a tool or attachment for something it was not designed to do. Select the correct bit, cutter or grinding wheel for the material with which you are working. This saves time and improves the quality of work and reduces the risk of mishap. If any doubt exists, consult the instructions or shop manual, or call an expert on tool use. The right tool makes the job easier.

19. Use safe cutting tools. Never use cracked or kinked saw blades. Keep saw blades sharp and properly set.

20. Metal work. When working with metal, secure the material with clamps or in a machinist's vise to keep it from moving. Never hold metal pieces with your hands when using power tools, and always be aware of sharp edges and burrs.

21. Work machines only at their appropriate operating speed. Do not use a power tool before it has reached operating speed or while it is coming to a stop. Never force a tool by applying too much pressure. Let each tool work at its own speed without forcing it. Once a power tool has been turned off, allow it to coast to a stop. Never force an object into moving parts to stop a machine.

22. Know the machine. Before using any tool, read the operator's manual, or comparable literature as available, to learn the applications, limitations, and potential of each power tool. Never use a tool unless trained to do so. Inspect it before each use and replace or repair if parts are worn or damaged. Repair tools only if you are trained to do so. Inspect screws, nuts, bolts and movable parts to make sure they are tightened. Make sure the cord will not become caught or tangled. The cord should be flexible, but not easy to knot. Clean the cord regularly and inspect the grounding connections. Use a ground fault circuit interrupter when working with power tools.

23. Know the power switches. Remember where the switch is located so you can turn off the machine quickly. If there is a power outage, turn the machine off or disconnect its power so that it will not restart unattended. Consider removing the work in progress if that is possible. If you leave before power is restored, tag the equipment and inform your supervisor.

24. Fire. Avoid operating power tools in locations where sparks could ignite flammable vapors. Flammable materials must be stored in accordance with OSHA regulations in appropriate containers and in fire resistant cabinets. In the event of a fire, always call 911 first. If there is any personal risk, leave the area immediately. Even small fires must be extinguished with a fire retardant that is appropriate for the material. Be aware of three fire classes and the location of the fire extinguishers: Class A, ordinary combustibles; Class B, combustible liquids; and Class C, fires in live electrical equipment. The shop area has a general purpose fire extinguisher and the building has a central alarm system with sprinklers that will automatically call the fire department if a fire is detected.

25. Air quality. Keep the shop well ventilated and volatile materials properly stored. Use of aromatic solvents or other chemicals in the open air within the shop is prohibited. The department has a fume hood suitable for working with these materials if needed. Because welding and brazing generate hazardous and lingering vapor, these operations are not permitted unless expertly supervised and with extra ventilation.

26. Rags. Used rags, especially oily and greasy ones, should be kept in a covered, marked container. Rags should be a safe distance from sources of ignition.

27. Hazardous materials. Because physicists like exotic materials, remember that even common materials can be a health hazard, and some uncommon ones are very dangerous. Be aware of the material you are using and the safety data appropriate for it. Some materials are not permitted: anything radioactive for obvious reasons, machining or grinding magnesium because of the fire hazard, asbestos, lead and beryllium because of toxicity. If in doubt, check the safety data and consult with Environmental Health and Safety before beginning. Handle fiberglass with care. Its particles can irritate the skin, eyes and respiratory system. When soldering, remember that lead solder is toxic and the work area needs good ventilation. Even better, use lead-free solders whenever possible.

28. Personal tools. Due to liability considerations and to prevent loss and damage of your property, personal power tools may not be brought from home for use in the machine shop. If you bring a special purpose tool from your laboratory, it may be used only under supervision and after consultation that it is appropriate for the task.

29. Housekeeping. Each user is expected to clean up after him/herself. Good housekeeping helps ensure long tool life and a safer work area for everyone.

30. Repairs. Do not use damaged equipment, or equipment that does not appear to be operating normally. Tell the machinist or your supervisor, and on their advice tag it as out of service so that others will know.

31. Other concerns. Immediately report all problems or concerns to the supervisor.

32. Authority. Supervisors have full authority over the shop and its safe use, including the responsibility, authority, and obligation to prohibit shop or tool access for the safety of an individual, others in the shop, or the equipment.

*For further shop and lab safety information, see the University of Louisville Department of Health and Safety and Risk Management websites, below.*

<http://louisville.edu/riskmanagement/aboutdepartment>

<http://louisville.edu/dehs/ohs/labsafe-policy>