Machinery – Supervisors/Users

Standard Operating Procedure

Revision Date: 02/20/23

Each shop must develop a policy regarding training requirements and oversight necessary for specific pieces of equipment, room and equipment access requirements, general rules and responsibilities of shop users and a process for student project review. This policy should be posted within the shop (for review or reference) or its location noted. A template is provided for an Academic Machine Shop Safety Policy ([Appendix A](http://oseh.umich.edu/wp-content/uploads/sites/37/2016/06/MachineShopGuideline.pdf)) that can be modified to the specific shop’s requirements. *All laboratory workers must read and understand the*[*Laboratory Emergencies SOP*](https://ehs.umich.edu/wp-content/uploads/2022/05/LaboratoryEmergencyProceduresSOP.docx)*prior to commencing any work in a laboratory.*

Also refer to the [EHS Machine Shop Safety for Academics Guideline](http://ehs.umich.edu/wp-content/uploads/2016/06/MachineShopGuideline.pdf) for more information.

# Equipment Setup [Provide additional information as it pertains to your research protocol]

* Locate equipment in areas with adequate clearances, power, lighting & ventilation for safe operation.
* Equipment operating in wet areas must only be plugged into GFCI-protected outlets.
* Stationary machines are to be leveled and securely anchored to the floor.
* All attachments used with machining tools must be consistent with manufacturer’s recommendations.
* Equipment controls must be protected from unexpected or accidental activation.

## Process [Write the steps for using the chemical in your research protocol]

# Potential Hazards [Provide additional information as it pertains to your research protocol]

Shop users may encounter numerous potential hazards when working with (or in proximity to) hand tools and stationary machines, e.g., lathes, saws, drills, and grinders including:

* Mechanical hazards: points of operation, pinch points, shear points, power transmission points, etc.
* Operational hazards: heat, metal chips, noise, etc.
* Chemical hazards: coolants, cleaning solvents, lubricants, etc.
* Electrical hazards: exposed wiring, malfunctioning equipment, etc.

# Engineering Controls [Provide additional information as it pertains to your research protocol]

Engineering controls that eliminate the hazard at the source and do not rely on the worker's behavior for their effectiveness offer the best and most reliable means of safeguarding. Therefore, engineering controls must be the first choice for eliminating machine hazards. However, whenever engineering controls are not available or are not fully capable of protecting the employee (or an extra measure of protection is desired), Administrative (Work Practice) Controls and/or Personal Protective Equipment (PPE) must be employed.

Engineering controls include guards, barriers, restraints, gates, trip-wires, emergency stops, interlocks, optical sensors, two-handed controls, pressure sensors, proximity sensors/controls, radiofrequency & electromechanical devices, as applicable, for each device, tool or equipment.

# Work Practice Controls [Provide additional information as it pertains to your research protocol]

* Incorporate all applicable elements of the [EHS Machine Shop Safety Guideline](http://ehs.umich.edu/wp-content/uploads/2016/06/MachineShopGuideline.pdf).
* Enforce the use of a “Buddy System” and develop shop/equipment access rules.
* Conduct periodic & regular shop/equipment inspections using the Environment, Health & Safety (EHS) Shop Self-Inspections & Surveys Checklist (or equivalent).
* Remove, lock-out (preferably) or tag-out, out-of-service, and promptly repair any malfunctioning or damaged equipment.
* Ensure all users are properly trained in the use of specific equipment as well as the shop’s rules.
* Enforce good housekeeping.

# Personal Protective Equipment [Provide additional information as it pertains to your research protocol]

In order to select the appropriate PPE for the workplace a hazard assessment is conducted. The hazard assessment determines the hazards and potential hazards associated with a task, machinery or process. The hazard assessment form may be found [here](https://ehs.umichsites.org/wp-content/uploads/sites/37/2016/09/ppeappa.pdf)**.** It should be completed by the workplace supervisor, Machine Shop Responsible Person (MSRP) or another qualified person that is knowledgeable with the shop’s machine hazards.

The appropriate PPE for the situation may be subsequently determined. Enforce the proper use of appropriate street clothing and use of Personal Protective Equipment (PPE) with all shop users.

## Street Clothing

* Wear long pants and closed toe shoes.
* Wear closely fitting clothing, i.e., no loose shirt sleeves, loose apron ties/straps, etc.
* Confine long hair/beards to prevent entanglement in machinery (hair long enough to be put up via bun, pinning-up ponytail, or hairnet).
* Do not wear jewelry (rings, necklaces, etc.).

In general, the following PPE is typically required or recommended for most machine shops:

## Personal Protective Equipment (PPE)

* **Eye protection:** ANSI/ISEA Z87.1 safety glasses or goggles when working around machines or with hand tools.
* **Face protection:** Face shields are required if flying fragments/particles are likely to be generated.
* **Hand/body protection:** Properly selected gloves are required when using hazardous chemicals and handling scrap metal or wood, sharp-edged stock, and unfinished lumber, as well as protective sleeves, aprons, etc.

***IMPORTANT:*** *Do not wear gloves while machining, as they can get caught in moving equipment.*
* **Foot protection:** ASTM F2412-05 approved steel-toed boots (ANSI Z41 approved if boots purchased on or before 1/26/07) may be required where potential dropping of heavy objects exists.
* **Hearing/respiratory protection:** For loud work or operations with respiratory hazards, contact EHS at (734) 647-1143 for an assessment and recommendations.

# Non-Routine Equipment Servicing [Provide additional information as it pertains to your research protocol]

* Equipment repair or special adjustment shall only be conducted by qualified service technicians. Consult equipment manufacturer for recommendation.
* To ensure personnel safety during non-routine cleaning or maintenance performed in-house, lock out and tag out procedures shall be followed as specified in the [EHS Lock Out/Tag Out Safety Program](http://ehs.umich.edu/wp-content/uploads/2016/08/loto_guideline.pdf). Contact EHS at (734) 647-1143 for assistance.

# Waste Disposal [Provide additional information as it pertains to your research protocol]

Because most spent, unused, and expired chemicals/materials are considered hazardous wastes, they must be properly disposed of. **Do not dispose of chemical wastes by dumping them down a sink, flushing in a toilet or discarding in regular trash containers, unless authorized by EHS Hazardous Materials Management (HMM)**. Contact EHS-HMM at (734) 763-4568 for waste containers, labels, manifests, waste collection and for any questions regarding proper waste disposal. Also, refer to the EHS [Hazardous Waste](http://ehs.umich.edu/haz-waste/) Web page for more information.

# Training of Personnel

* Each shop’s Responsible Person/Monitor must complete the online EHS Machine Shop Responsible Person Training. Go to the [EHS My LINC](http://ehs.umich.edu/education/) Web page and log-in, in order to access this training module (IHS070w).
* Only authorized machine tool users as defined by the Machine Shop Safety for Academic Department Guideline are permitted to operate machining tools in U-M facilities.
* Training of authorized machine tool users shall be performed by the Responsible Person or Monitor who has thorough knowledge and experience of how individual machining tools and equipment are operated, the “**safety**” hazards associated with those machining tools and equipment, and specific actions to take in case of an emergency.
* All users of a machine shop should attend **"Basic machine shop safety training"** developed and provided by the Responsible Person/Monitor for a specific shop. The training should include the following topics at a minimum: Unit-specific Machine Shop Policy, use of personal protective equipment (PPE), applicable prohibitions, e.g., loose clothing, hair, gloves and jewelry, etc., guard use/positioning, machining tool and bit maintenance, as well as hand tool and facility safety. Machine shop general safety rules and equipment specific guidelines ([Appendix C](http://ehs.umich.edu/wp-content/uploads/sites/37/2016/06/MachineShopGuideline.pdf)) should also be included in the basic training program.

The length and type of training for specific machines shall be determined by the designated Responsible Person or Monitor as delineated in the site shop policy per the [Classification System Matrix](http://oseh.umich.edu/wp-content/uploads/2016/06/MachineShopGuideline.pdf). Shop equipment will require Tool Specific Training which should include instruction and hands-on demonstration of the following:

* Description and identification of the hazards associated with a particular machine;
* Proper safety precautions when working with a particular machine;
* Limitations of the tools/equipment/materials and when and what not to use;
* Safeguards, protection they provide, and ensuring their presence before using a machine;
* What to do if a damaged guard, missing part, unusual noise, etc., is noticed;
* How to use the emergency buttons and other measures, when necessary;
* Maintenance (as applicable) and cleaning procedures.

Based on the unit-specific Machine Shop Policy, certain tools or machines may also require proficiency testing prior to being deemed an "authorized machine tool user." Proficiency determinations may be evaluated through completion of a shop project or through extensive hands-on training/oversight as determined by the Responsible Person.

# Certification

I have read and understand the above SOP. I agree to contact my Lab Director if I plan to modify this procedure.

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### Major Revisions (Tracking purposes only -- Do not print as part of SOP)

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| Date | Revision |
| 09-14-18 | EHS name and logo were added, updated the formatting, and revised the content under Exposure/Unintended Content (AKJ). |
| 02-25-19 | Updates links (DML) |
| 02-20-23 | Removed emergency information sections, duplicate of new Laboratory Emergencies SOP. (DML) |