



THE UNIVERSITY OF MAINE
Machine Shop Safety Program

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References

OSHA 1910.211-219
OSHA 1910.241-244
UMaine Policies MP10123, Hand Tools and Portable Power Tools
MF04216 Machine Shop Checklist

1. Overview

This program is intended to promote the safety of faculty, staff, and students involved with using university machine shop equipment or other power tools for work on materials including, but not limited to, wood, metal, composites, or plastics.

2. Purpose and Responsibilities

Safety & Environmental Management (SEM)

Provide guidance to supervisors on how to implement machine shop safety procedures. Offer train-the-trainer awareness training for personnel to fulfill their responsibilities under the machine shop safety program.

Deans, Directors, & Department Heads

Deans, Directors, and Department Heads are responsible for ensuring that shop specific procedures are developed and used for those pieces of equipment or machines that are operated, serviced, cleaned, or maintained by their employees or students.

Supervisors

Supervisors who have employees or students engage in the operation, servicing, cleaning, or maintenance of machines or equipment shall ensure that users follow the machine shop and Lock Out Tag Out/Zero Mechanical State (LOTO/ZMS) procedures, as outlined in the appendices. In addition, supervisors shall ensure users follow specific procedures developed by the department (and placed in appendices).

Supervisors must provide awareness training during annual departmental training for all non-authorized employees and students who are in the area during operational activities.

Supervisors shall be responsible for ensuring that affected employees and students receive Authorized Machine Shop user and LOTO/ZMS Training where required. In addition, supervisors shall ensure that all Authorized Users are trained on equipment specific procedures as required by their Department.

Supervisors shall ensure all contractors, where applicable, adhere to the University machine shop safety program.

Users

Authorized users, whether staff or student, who operate machine shop equipment, may only perform work for which they have been specifically authorized. Users of machine shop equipment are required to attend training and follow General or Equipment Specific Procedures, as appropriate.

Contractors

Contractors must obtain written authorization to utilize University equipment and they must implement all University Machine shop policies and program requirements prior to use.

3. Who Is Covered By This Program

Any University employee or student or contractors engaged in operating University machine shop equipment

3.1 Definitions

Authorized person - an individual (either trainee or competent user) who after basic safety, basic shop safety, and relevant individual tool training is authorized to operate specific equipment by the machine shop manager or supervisor.

Trainee user - is an authorized user that requires supervision in the operation of machine shop equipment.

Competent user - is an authorized user, that may depending upon the operation being carried out, work without supervision and or without monitoring.

Monitor - is a competent trained person authorized to stop hazardous operations.

4. Equipment That Is Covered By This Program

All powered machine shop equipment and portable power tools.

Powered tools and equipment are classified into three categories on a scale 1 to 3 based on their potential hazards with 3 being the highest hazard level.

Device class 1 – Hand tools and some power tools – after training operators would not require direct supervision.

Device class 2 – Machine shop tools – After training control and supervision levels will depend on the grade of user.

Device class 3 – Industrial shop tools – After training operation will be monitored even for competent users.

The classification system defines the training, supervision, personal protective equipment and access controls required for each hazard level. See appendix A for a guidance list of categorized equipment.

5. Minimum Shop Safety Policies and Practices

Individual shop managers or supervisors are authorized to apply rules/procedures that are more stringent than those indicated below. No established rules/procedure may be less stringent than those detailed below. The Shop rules must be conspicuously posted in the shop.

- 1) Before being authorized to operate equipment (whether supervised or unsupervised), a prospective user must undergo and complete Basic Safety Training, Machine Shop General Safety (general) and specific equipment safety training (initially & with annual refreshers)
- 2) Users being trained require written authorization by the shop manager/supervisor to operate under supervision specific equipment.
- 3) Competent users require written authorization by the shop manager/supervisor to operate specific equipment without direct supervision while carrying out routine tasks. (competent authorized users of industrial category equipment will be subject to monitoring by shop managers/supervisors)
- 4) Non-routine tasks must undergo a hazard analysis and be approved by the shop manager/supervisor prior to commencement of the operation.
- 5) Shop managers/supervisors have full authority of the shop and its safe use, including the responsibility, authority and obligation to prohibit shop or tool access for the health and safety of users, others in the shop, or university property and equipment.
- 6) Equipment that has been tagged out of service or equipment that is damaged or does not appear to be operating normally must not be used.
- 7) No loose clothing may be worn when operating equipment this includes ties, scarves and loose sleeves. Open toed shoes, shorts, or skirts are also prohibited.
- 8) Long hair, including beards, must be pulled back and secured and contained.
- 9) Jewelry that may cause a hazard when operating equipment may not be worn; this includes rings, necklaces, bracelets and watches.
- 10) Aisles, exits and emergency equipment must be kept clear at all times.

- 11) Safety glasses must be worn at all times in the shop when equipment is in operation. Some operations and equipment may require additional PPE.
- 12) All guards and shields must be secured and in place prior to operating the equipment.
- 13) Compressed air must not be used to clean skin or clothing.
- 14) All equipment and safety issues or concerns must be reported immediately to the shop supervisor or monitor.
- 15) Working alone:
 - a) Undergraduates and users under training must not work alone; a supervisor or monitor must be present at all times.
 - b) Users of industrial category equipment must not work alone; a monitor must be present at all times.
 - c) The normal operating procedure is that there must be at least two people present in the workshop when machine tools are being operated.
 - d) Where lone working is required a written job hazard analysis must be carried out and standard operating procedures put into effect that will eliminate or reduce the hazards associated with working alone. Copies must be provided to the Department head and the Safety & Management Department for review and authorization before work can commence. The job hazard analysis and associated SOPs must be reviewed annually.
- 16) Access to machine tools will be controlled to prevent out of hours operation of equipment.
- 17) All equipment must be maintained and used in accordance with manufacturer's recommendations and any statutory requirements.
- 18) Each department shall maintain records of the following"
 - a copy of this program;
 - specific procedures for equipment and machinery (found in their department);
 - training records;
 - periodic inspection forms and,
 - disciplinary actions/corrective actions taken when deficiencies to the LOTO/ZMS program are found.

The shop procedures shall be reviewed annually by the department and updated as new equipment or procedures are added.

- 19) Periodic Audits

Each department shall perform periodic audits of the Machine Shop procedures used by their department and note the inspectors name and last inspection date.

Audits are intended to improve the Shop safety procedures and to correct or improve any inadequacies. Inspections must be performed by an authorized competent employee. The Inspection will include a visual evaluation of those workers performing the procedures. Completed audit forms shall be kept on file for a minimum of two years and a copy should be sent to the Safety and Environmental Management Department for compliance verification.

SEM shall annually conduct an Audit of the control procedures to ensure that the procedure and the requirements of this program are being followed.

Appendix A

Classification System for Machine Tools

Device class	1	2 – Shop Tools	3 – Industrial Tools
Description	Low powered hand / small bench tools	Medium power tools to light industrial tools	Large industrial Tools (Manual and NC controlled)
Common Examples	Dremel rotary tools cordless/corded Drills palm sanders soldering irons & guns heat guns hot melt glue guns sewing machines bench sander pneumatic stapler & nailer	abrasion saw angle grinder band saw bench grinder biscuit joiner chop Saw circular Saw Ramset/powder actuated tools drill press jig saw planer router Sawzall /reciprocating saw table saw (including sawstop)	full size milling machine full size metal lathe radial arm saw large drill press large band saw surface grinder large jointer planer shaper/molder power shear MIG Welder Hydraulic Press Hydraulic testing systems
Tool use restrictions and oversight	authorized trainee users <ul style="list-style-type: none"> • May work without direct supervision as long as a safety monitor is present competent authorized users <ul style="list-style-type: none"> • may work without supervision being present • Other personnel must be present or available to provide emergency assistance 	authorized trainee users <ul style="list-style-type: none"> • Use only with competent supervision present competent authorized users <ul style="list-style-type: none"> • Use only with other personnel present or available to provide emergency assistance • For non-routine tasks a Safety monitor to be present 	authorized trainee users <ul style="list-style-type: none"> • Use only under direct competent supervision competent authorized users <ul style="list-style-type: none"> • Use only with other personnel present or available to provide emergency assistance • Work subject to monitoring by supervision • For non-routine tasks a Safety monitor to be present
User Training	Basic Safety, individual tool training	Basic Safety, Basic shop Safety, individual tool training	

Appendix B

Shop Tool Use Agreement

University of Maine Shop/Tool Use Safety Agreement

All shop users must complete and sign this form. Shop Supervisors are to keep this form on file.
See reverse for records of tool authorizations and course completions.

Name (print)	UPI #	Date
Email address		
My Faculty/Staff Supervisor (Print)	Department	
<input type="checkbox"/> Undergraduate Class	College	Major
<input type="checkbox"/> Graduate student	Year entered graduate school	<input type="checkbox"/> Postdoc
<input type="checkbox"/> Faculty or Staff Member		

I have read the shop safety rules and policies, and understand them as they apply to my work in the shop/lab areas. Specifically:

- 1 I agree to abide by the published and posted regulations and accept personal responsibility for my work in the shops and other laboratories. I will abide by any and all additional local shop rules. I understand that my failure to do so can result in my loss of privileges in the shop/lab areas.
- 2 I understand the shop access rules, monitor/supervision requirements, and shop hours and understand that shops may be subject to video monitoring.
- 3 I will wear safety glasses at all times while in the shop when operating equipment or when designated by any additional shop rules.
- 4 I understand what attire is required to work in the shop and will not enter the shop unless so attired.
- 5 After use, I will clean and maintain all equipment, floors and benches I use.
- 6 I will not attempt to use any machine, tool or equipment that I do not have written permission to use. I will ask for instruction and/or training before using any machine, tool or equipment with which I am not familiar.
- 7 I will check in with the supervisor or monitor upon entering or leaving the shop, and prior to operating any machinery.
- 8 For any equipment or tooling I find needing repair or that I damage, I will promptly notify the monitor or supervisor and I will leave a prominent cautionary note on the machine listing my name, research group or class, and a phone number or email address where I can be reached.

Certification: I understand that it is a privilege and learning opportunity to use the shop/lab areas and agree to abide by all University regulations and stipulations placed upon me as conditions for working in these areas.

Signed	Date
Shop Supervisor / Lab Manager	Date

Tool Authorizations and Course Completions

Unless explicitly stated otherwise in writing, your authorization for a particular tool is a “learner’s permit,” not a “driver’s license.” You must still check in with the monitor or supervisor and s/he may still require you to have direct supervision while using particular tools.

Tool	Restrictions
Shop Supervisor/Lab Manager Signature	Date
Tool	Restrictions
Shop Supervisor /Lab Manager Signature	Date
Tool	Restrictions
Shop Supervisor/Lab Manager Signature	Date
Tool	Restrictions
Shop Supervisor/Lab Manager Signature	Date
Tool	Restrictions
Shop Supervisor/Lab Manager Signature	Date
Tool	Restrictions
Shop Supervisor/Lab Manager Signature	Date
Tool	Restrictions
Shop Supervisor Signature	Date

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Appendix C

Student Project Review Form

University of Maine Student Project Safety Review Form

Before beginning any project work in any of the University of Maine's fabrication shops, the student and project supervisor must complete this form and provide it to the shop supervisor.

Student's Name and ID:	
Project Supervisor:	
Relevant Shops:	
Project Outline and Safety Review - Include a brief project description, any potential safety concerns, and appropriate safety measures.	

The undersigned student has received and understood all the necessary information, instruction and training to carry out the project safely. The project has been properly assessed by the project supervisor for compliance with University safety policies. Where significant risks have been identified (see attached guidelines), a written Risk Assessment Report has been completed and is attached. Any

significant changes to the work method or the project plan will be brought in advance to the attention of the project supervisor and shop supervisor.

Student's Signature..... Date.....

Project Supervisor's Signature..... Date.....

Risk Guidelines for Student Projects Involving Use of Fabrication Shops

All Student projects must be assessed with respect to potential risks to the student(s) carrying out the project, bystanders in the laboratory, shop, or other workspace(s), and other individuals who may be impacted by the construction processes or final product of the project. Projects that carry substantial risks to any of these individuals must have appropriate safety mitigations, including appropriate supervision, personal protective equipment, and inspection by qualified supervisors or other appropriate individuals before, during and after the construction process.

The following list of potential hazards should not be construed as including all possible hazards. It is essential that the student(s) and project supervisor(s) seek help on assessing potential hazards associated with any activity with which they are not sufficiently familiar.

Designed Object Hazards

Maximum voltage/current/power capable of delivering serious electrical shock
Maximum velocity or RPM (collision or entanglement risks)
Maximum temperature capable of causing burns, melting or igniting materials
Minimum temperature capable of causing freezing injury or damage to materials
Maximum pressure capable of causing injury
Maximum weight to be borne by object (potential for structural failure)
Elevated components capable of causing injury due to falls of equipment or supported persons
Other maximum stored energy capable of causing injury upon sudden release
Laser or other light sources capable of causing eye injury
Noise sources capable of causing hearing damage
Explosive, combustible, corrosive or toxic materials
Sharp edges, laceration, puncture wound hazards

Fabrication Hazards

Tools to be used
Materials to be used

Hazards Associated with Testing and Operation of Completed Object

Potential for injury to user(s)
Potential for injury to bystanders
Potential for damage to property

Risk Assessment Report Template

Background:

Hazard Assessment:

Hazard	Mitigation/Safety Measure(s)