

## **MACHINE SAFETY PROGRAM**

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### **I. Purpose**

Worcester Polytechnic Institute is committed to providing a safe work and learning environment for faculty, students, and staff. This commitment extends itself to safe machine operation and use by developing a Machine Safety Program. This program includes procedures that ensure compliance with the Occupational Safety and Health Administration (OSHA) requirements as well as best management practices that reduce risk and ensure a safe working/learning environment.

A wide variety of motions (rotating, reciprocating and transverse) and operations (cutting, punching, shearing and bending) by machinery can create a hazard to a machine operator. Recognition of the hazards presented by the machinery is critical. The most common machine hazards include mechanical, operational, chemical and electrical. Once the hazard is identified, it can then be addressed and safeguarded against. There is no single way to protect against all hazards, so it is important that a combination of approaches be implemented. The following sections of this program will discuss those requirements to ensure safe operation.

### **II. Scope**

The scope of this program extends to all faculty, students, and staff or visitors of Worcester Polytechnic Institute, who operate, maintain, or work in areas adjacent to hazardous equipment and/or machinery. This program discusses engineering controls, administrative controls, personal protective equipment and training requirements for safe machine operation.

### **III. Application**

This program applies to all aspects of hazardous machinery operation. Of particular concern within this program are machine operators, department supervisors and the machines themselves.

### **IV. Procedures**

#### General Procedures for Operating Machinery

The following general procedures are to be followed by all departments, groups, individuals, etc. that own and operate hazardous machinery. Failure to adhere to this program may result in loss of access to the workshop.

Do Not Operate Equipment unless Authorized.

- No one shall operate a machine unless they have received training and authorization to use the specific equipment.
- Machine operator authorization may vary by department and will not be entirely interchangeable. Check with department supervisor for shop specific authorization requirements for each shop.

Machinery can cause serious injury or death.

- Always use care when working with or around machinery
- Become familiar with equipment operation by reviewing an owner's manual or other documentation.
- Inspect machinery before using.
  - Do not use broken machinery and report problems to the department/shop supervisor immediately.

- Ensure all guards, shields and interlocks are in place before operating machinery.
- Do not operate machinery if you are tired or under the influence of alcohol or drugs.

#### Do NOT Work Alone

- When using shop machinery or tools, at least one other authorized person is to be present in the shop.
  - Students may never work alone under any circumstance.
  - Staff/faculty requests to work alone must be approved by the shop supervisor or laboratory supervisor and EHS. Additional work practice controls shall be discussed and implemented in advance with EHS if this is to be allowed.
- Everyone must understand the shop emergency procedures before operating equipment.

#### Appropriate Attire & Personal Protective Equipment (PPE)

- Use of eye protection (safety glasses or goggles) is mandatory in all shops when machinery or hazardous materials are being used.
- Closed toe/heel shoes, shirt & long pants shirt are considered appropriate shop attire.
- Loose clothing and neck ties must be removed or tied back.
- Long hair must be tied back such that it could not be caught in moving parts.
- Jewelry (rings, bracelets, necklaces, large earrings) must be removed.
- Do not use PPE that may get caught in moving parts and create additional hazards.
- When PPE is used, it must be used in accordance with the Worcester Polytechnic Institute Personal Protective Equipment Assessment Program.

#### Do Not Repair Equipment unless Authorized

- Know your limitations. Improper repairs can endanger someone else.
- Do not remove machine guards, shields or interlocks.
- Staff authorized to repair equipment receive training beyond that of a machine operator.

#### Housekeeping is essential

- A clean shop is a safe shop and housekeeping will help avoid accidents.
- Ensure that all floors, work surfaces, and other horizontal surfaces are kept clean and free of debris and dust.
  - Whenever feasible (e.g. after each project) vacuum debris and dust in shops to minimize airborne hazards. Sweeping is another acceptable alternative, but using compressed air is not allowed for cleaning. Minimize dust generation when sweeping.
- Properly manage hazardous waste. Contact EHS for training or with questions.
- After use, promptly return tools, stock and chemicals to their designated storage location.

#### Generic Equipment Operational Guidelines

Appendix A of this program contains these safe operation guidelines that are generic in nature and can be used as general safe operational principles for the following common equipment.

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|-------------------|-----------------------------|
| • Drill Press     | • Abrasive Wheel Grinder    |
| • Lathe           | • Disc and Belt Sanders     |
| • Milling Machine | • Table Saw                 |
| • Band Saw        | • Powered Hand Circular Saw |

This program applies to all hazardous machinery including powered hand tools. It is important that all machine operators review machine owner's manuals or other documentation on equipment before use. Information contained within an owner's manual will provide equipment specific operational guidance.

### Machine Operator Authorization

Each department/shop will be responsible for implementing a machine operator authorization process. The authorization process will require the following:

- All machine operators must complete safety training. At a minimum, training will include the following courses:
  - Machine Safety Training
  - Hazard Communication/Right-To-Know Training (HazCom)
    - Laboratory Safety Training may be substituted for HazCom as an equivalent course at the discretion of EHS.
- Additionally, EHS in conjunction with the department supervisor will assign other safety training requirements to individuals based on their specific needs. These trainings include:
  - Control of Hazardous Energy–Lockout/Tagout Training
  - Emergency Action Plan Training
  - CPR, AED, and First Aid Certification
- All machine operators must also complete additional machine specific training and/or shop safety orientation as required by individual departments.
  - The machine specific training and/or shop safety orientation will be conducted by authorized individuals who have extensive machine specific operational expertise.
    - Training/orientation shall include:
      - Shop specific emergency procedures
      - Equipment specific operation information
      - Shop manager contact information
      - Shop requirements for housekeeping
      - Shop hours of operation
      - Other pertinent information
  - Some machine shops and/or workshops require students to take academic non-credit courses in machining or shop operation with close supervision prior to authorization.
- Authorization may not transfer between different shops on campus due to the equipment specific training and shop specific authorization requirements. The EHS training credit will be transferable.
- Access to the shop and its machinery should be restricted to authorized users only. The department/shop shall develop access policies and only provide access as appropriate. The shop and/or machinery shall be secured under lock and key and/or swipe card access to prevent unauthorized use.

### Machine Servicing and Maintenance Requirements

Faculty and staff who are responsible for performing service or maintenance on a machine will need to follow the machine operator authorization process in addition to the training requirements necessary for maintenance.

In the event that machine guarding is temporarily removed to service a machine, the proper lockout/tagout procedures are to be followed. For specific Worcester Polytechnic Institute Lockout/Tagout procedures please refer to the Control of Hazardous Energy - Lockout/Tagout Program.

### Machine Guarding Requirements

The most effective safeguard for machinery is referred to as machine guarding which provides a physical barrier to protect the operator. Machine guarding requirements are outlined in OSHA 29 CFR 1910 Subpart O and should be installed and maintained to ensure that they:

- Prevent Contact – Safeguards must minimize the possibility of the operator or another worker placing their hands or other body parts into hazardous moving parts.
- Remain Secure – Workers should not be able to easily remove or tamper with the safeguard.
- Protect From Falling Objects – Safeguards must ensure that no object is allowed to fall into moving parts.
- Create No New Hazards – A safeguard defeats its purpose if it creates a hazard of its own.
- Create No Interference – A safeguard should not create an unacceptable impediment for the worker.
- Allow Safe Maintenance and Lubrication – It should be possible to lubricate the machine without removing the safeguard.

OSHA requires that machine guarding be provided and maintained in a manner sufficient to protect machine operators and other persons present in machine areas from hazards associated with the operation of machines. The purpose of machine guarding is to protect the machine operator and other employees in the work area from hazards created by ingoing nip points, rotating parts, flying chips and sparks.

### General Machine Safety Design Requirements

All power-transmission apparatus shall meet or exceed the requirements for such equipment as listed in the OSHA standard 29 CFR 1910.219 – Mechanical Power-Transmission Apparatus. All power-transmission apparatus including shafts, flywheels, pulleys, belts, chain drives, etc. less than seven feet (7') from the floor or working platform must be guarded.

All woodworking machinery shall meet or exceed the requirements for such equipment as listed in the OSHA standard 29 CFR 1910.213 – Woodworking Machinery Requirements. If a guard is used as part of a dust collection system the guard must be designed and constructed of such material that it will protect the operator from flying splinters, broken saw teeth, etc., and will deflect sawdust away from the operator. The sides of the lower exposed portion of the blade shall be guarded to the full diameter of the blade by a device that will adjust itself to the thickness of the stock and remain in contact with stock being cut to give maximum protection possible for the operation being performed.

## **V. Responsibilities**

### Departmental and Laboratory Supervisors shall:

- Ensure machines are equipped with appropriate safeguards.
- Ensure machine guards, shields & interlocks are in proper condition at all times.
- Provide personal protective equipment to operators if necessary.
- Develop and implement a machine operator authorization process.
- Provide machine/equipment specific training to all operators of the specific equipment and maintain a record of any training that is performed.
- Perform periodic audits of all machines/equipment within their scope of responsibility. Consult EHS on how to properly audit machinery/equipment and ensure worker safety.

- Utilize the Machine Safety Self-Audit Checklist located in Appendix B as a tool to ensure machine safety.

Machine Operators shall:

- Complete all authorization requirements to become a machine operator prior to operating a machine at Worcester Polytechnic Institute.
  - Including training and re-training requirements at designated intervals as covered in the training requirement section.
- Understand shop specific rules and emergency procedures.
- Only operate machinery and tools that you have been specifically trained and authorized to use. This requires each operator to be familiar with the manufacturer's instruction manual or shop specific safety procedures for each machine or tool.
- Operate machinery in a safe manner so as to not introduce an unsafe condition.
- Never allow unauthorized personnel into the work area.
- Report any machine operational or guarding deficiencies to supervisors immediately. Do not continue to operate equipment if deficiencies are found.
  - Do not perform maintenance activities on equipment unless trained and authorized.
  - Equipment with deficiencies must be locked and taken out-of-service to prevent unauthorized use.

Machine Maintenance Personnel shall:

- Ensure that only authorized employees perform lockout/tagout activities in accordance with the Worcester Polytechnic Institute Control of Hazardous Energy - Lockout/Tagout Program.
- Attend Control of Hazardous Energy – Lockout/Tagout training.
- Inform affected individuals that maintenance activities are being performed.
- Ensure machine guards remain in place until the machine is locked and tagged out.
- Ensure that they do not operate machinery to confirm successful maintenance on equipment that is not properly guarded.
- Report any guard, shield or interlock deficiency to supervisors immediately.

Individuals in areas adjacent to operating machinery shall:

- Do not enter workshops without authorized supervision.
- Work in a safe manner so as to not introduce an unsafe condition.
- Report any unsafe conditions or activities to supervisors immediately.

Environmental Health & Safety shall:

- Provide Machine Safety Training templates to departments or arrange to provide Machine Safety Training.
- Provide assistance in machine guard evaluation.
- Assist in the selection of personal protective equipment.
- Provide periodic inspections of workshops with machinery.
- Review this program annually and revise as needed.

## VI. Training Requirements

OSHA's requires employers to inform employees of hazards in the workplace. The inherent nature of machinery presents a hazard and thus requires a level of competence to be displayed by machine operators and maintenance staff. Worcester Polytechnic Institute therefore requires that employees working with machinery attend multiple layer of training hosted to ensure a level of competence for machine operators and maintenance staff. Refresher training would be required at any point where the level of competence does not meet OSHA's requirements and at the discretion of department supervisors or EHS staff. Specifically, Worcester Polytechnic Institute requires that any employee involved in a machine accident or near-miss be retrained prior to returning to work on machinery.

Training is a key component of the machine operator authorization process. As discussed in the Machine Operator Authorization section of this program there are specific training expectations for anyone operating machinery. Please refer to this section for specific training requirements.

## VII. Definitions

The following definition section includes a few selected OSHA defined terms from the OSHA standard 29 CFR 1910.211 – definitions which will help clarify sections of this Program. Please refer to the OSHA standard for a complete listing of definitions.

*Abrasive wheel* – means a cutting tool consisting of abrasive grains held together by organic or inorganic bonds. Diamond and reinforced wheels are included.

*Brake* – means the mechanism used on a mechanical power press to stop and/or hold the crankshaft, either directly or through a gear train, when the clutch is disengaged.

*EHS* – means the Office of Environmental Health & Safety at Worcester Polytechnic Institute.

*Feeding* – means the process of placing or removing material within or from the point of operation.

*Flanges* – means collars, discs or plates between which wheels are mounted and are referred to as adaptor, sleeve, or back up type.

*Inorganic wheels* – means wheels which are bonded by means of inorganic material such as clay, glass, porcelain, sodium silicate, magnesium oxychloride, or metal. Wheels bonded with clay, glass, porcelain or related ceramic materials are characterized as "vitrified bonded wheels."

*Guard* – means a barrier that prevents entry of the operator's hands or fingers into the point of operation.

*Motions* – are hazards which include rotating, reciprocating, and transversing.

*Operations* – are hazards which include cutting, punching, shearing and bending.

*Organic wheels* – means wheels which are bonded by means of an organic material such as resin, rubber, shellac, or other similar bonding agent.

*Point of Operation* – is the area on a machine where work is performed during any process such as shearing, punching, forming and assembling.

*Push stick* – means a narrow strip of wood or other soft material with a notch cut into one end and which is used to push short pieces of material through saws.

*Two hand control device* – means a two hand trip that further requires concurrent pressure from both hands of the operator during a substantial part of the die-closing portion of the stroke of the press.

## VIII. References

Worcester Polytechnic Institute EHS, Control of Hazardous Energy / Lockout-Tagout Program.

Worcester Polytechnic Institute EHS, Hazard Communication / Right-To-Know Program.

Worcester Polytechnic Institute EHS, Hazardous Waste Guidelines.

Worcester Polytechnic Institute EHS, Personal Protective Equipment Assessment Program.

U.S. Department of Labor, OSHA 29 CFR 1910 Subpart O – Machinery and Machine Guarding. Occupational Safety and Health Administration

U.S. Department of Labor, OSHA 29 CFR 1917.151 – Machine Guarding. Occupational Safety and Health Administration