



UMBC OFFICE OF ENVIRONMENTAL SAFETY AND HEALTH (ESH) PROCEDURE	TITLE: Shop Safety Program
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I. PURPOSE

The purpose of this procedure is to establish minimum requirements for the prevention of injury and illness during the operation of equipment, machinery, or tools in University shop environments, including teaching shops designed for use by students under the supervision of faculty or designated instructors.

This procedure seeks to ensure compliance with the following Occupational Safety and Health Administration (OSHA) standards:

- OSHA 1910 Subpart I - Personal Protective Equipment
- OSHA 1910 Subpart O - Machinery and Machine Guarding
- OSHA 1910 Subpart P - Hand and Portable Powered Tools and Other Hand-Held Equipment

II. SCOPE

This procedure applies to all UMBC employees, student employees, and students under the supervision of a faculty member or instructor.

III. DEFINITIONS

- Emergency Stop - A stop device that is designed to cut off power to the machine, tool, or equipment when activated.
- Interlock - where the operation of one part or mechanism brings about or prevents the operation of another.
- Machine Guards - physical structures or systems used to prevent inadvertent or accidental contact during machine, tool, or equipment operation.
- Nip Point - a machine or equipment part in which two in-running points rotate towards each other, or where one part rotates toward a stationary point.

- Point of Operation - point where cutting, shaping, or forming is accomplished.
- Safety Switches and Controls - devices used as alternatives or supplementations to physical machine guarding.

IV. PROCEDURE

1. General Shop Safety Requirements

- Only trained, authorized employees or students may operate equipment, tools, or machinery in the shop. Students using the shop must be supervised by a faculty member or designated instructor.
- All shop users shall have the authority to stop work if an unsafe condition or act occurs.
- Avoid working alone in the shop whenever possible.
- Machine shops shall be secured when not attended.
- Machinery, tools, or equipment shall not be left running unattended.
- Always wear the appropriate personal protective equipment (PPE) when operating machine shop equipment, tools, or machinery.
- Out of service equipment shall be tagged out of service until repairs have been made.
- Compressed air used for cleaning must be regulated to below 30 psi upon dead-ending (when pressed against an object, such as someone's skin) and have appropriate chip guarding in place to prevent flying debris from causing injury.
- Compressed air shall not be used to clean someone's body or clothing. The eyes and other body parts, such as the respiratory system, can be damaged as the result of inadequate personal protective equipment, lack of chip guards, and/or uncontrolled release of compressed air.
- Shop machinery and equipment designed for stationary use shall be secured to prevent movement or walking.
- ANSI Z87.1 certified safety glasses shall always be worn in the shops.
- Long hair shall be secured/tied back when working in the shop area.
- Loose clothing such as long sleeves or shirt-tails shall be tucked in, rolled up, or otherwise secured while in the shop area. Neckties, hood strings, and jewelry such as rings, necklaces, bracelets, and dangling earrings shall not be worn.
- Gloves are prohibited when operating machinery with rotating parts where they could potentially get snagged or caught.

- Wear footwear that is appropriate for the work environment and protects against slipping and dropped objects as needed. Open-toed shoes and sandals/flip-flops are prohibited in all shops.
- Shop areas shall be kept in a clean and orderly manner.
 - Debris such as sawdust, chips, shavings, and other debris shall be cleaned from floors, machinery, bench tops, and other common surfaces at a frequency necessary to maintain a safe and sanitary environment and to prevent hazardous/combustible accumulation of dirt, debris, and dust.
 - Wet or slippery surfaces shall be cleaned in a timely manner to prevent slips and falls.
 - Food and drinks are prohibited in the shop except in designated break areas.
- Shops shall be sufficiently illuminated to allow for safe operation of equipment, machinery and tools.
- Materials, including chemicals and other hazardous material, shall be stored in a safe manner to prevent fire, combustion, leaks, spilling, or falling.
- Know the locations of emergency exits, fire extinguishers, and first aid kits.

2. Shop Safety Plan

Each shop shall be responsible for developing and maintaining a Shop Safety Plan. Shop Safety Plans should contain the following information:

- General Shop Information
- Emergency Procedures
- General Shop Safety Rules
- Machine/Equipment/Tool-Specific Safety Guidelines
- Inventory of Shop Equipment
- Current list of Authorized Shop Users

Shop supervisors shall prepare and maintain Shop Safety Plans in collaboration with Department Management, shop employees, and students if applicable. Plans shall be reviewed on an at least an annual basis, and updated or revised when necessary, such as when new equipment is introduced into the shop. Employees and students shall review the Shop Safety Plan prior to performing work in any shop.

A template is available from ESH to assist shops with preparing a Shop Safety Plan.

3. Shop Inspections

Daily/Pre-Shift Inspections

At the beginning of each shift, prior to the start of work, shops shall be inspected to ensure safe and sanitary conditions. Any hazardous items identified shall be reported and corrected prior to work being performed.

Shop employees shall inspect their assigned work areas, to include assigned tools, equipment, and machinery, to identify any defects, damage, or other issues related to safe operation or proper function. Any identified issues shall be reported and corrected.

- Machine shop tools, equipment, or machinery that are damaged, broken, defective, or otherwise functioning improperly, shall be reported to supervision and removed from service. The equipment shall be marked or tagged as Out of Service/Do Not Use or similar language.
- Out of service tools, equipment, or machinery shall not be used until necessary repairs have been made.

Periodic Inspections

On at least an annual basis, all shops shall undergo a comprehensive inspection. Shop supervisors may perform this inspection or designate a shop employee or student to perform this inspection. Periodic inspections shall be documented utilizing the accompanying Shop Inspection Form. Any deficiencies or hazards identified during the inspection shall be documented along with steps for corrective actions to be taken.

4. Machine Guarding

Moving parts of machinery, tools, and equipment have the potential to cause severe injuries, such as lacerations, blunt force trauma, crushed fingers or hands, abrasions, even amputations.

Because of these hazards, many types of machines, tools, and equipment that are operated on job sites and in shop environments must have safeguards in place to protect the operator and others in the area from potentially devastating injuries. Examples of hazards that guards protect from include nip points, rotating or reciprocating parts, or flying sparks, chips, and debris.

There are three (3) main areas of machinery, tools, and equipment that are required to be guarded to protect against hazards:

1. **The Point of Operation** - this is the part where the work is performed on the material, such as cutting, shaping, pressing, or forming.
2. **Power Transmission Apparatus** - The components of the machine, tool, or equipment that transmit energy to the part of the machine that performs the work. Components include pulleys, belts, flywheels, rods, couplings, cams, spindles, gears, cranks, and chains.
3. **Other moving parts** - Other parts of the machine that move while it is in operation.

Types of Machine Guarding:

- **Guards** – these can be fixed, interlocking, adjustable or self-adjusting. They are a physical barrier to contact with the hazard.
- **Devices** – these can be presence sensing, pullback, restraint, operational controls or gates. They limit or prevent access to the hazardous area.
- **Location or distance** – hazards are reduced by locating the machine so that its hazardous areas are not normally accessible.
- **Automated feeding and ejection methods** – these eliminate some of the operator’s exposure to the hazards.
- **Miscellaneous aids** – shields, feeding tools (such as push sticks), holding devices or awareness barriers also protect operators and people in the area.

The following are general requirements for machine guarding:

- Physical guards shall prevent operator contact through physical prevention, either through a physical enclosure or by impeding one’s ability to reach around or through a guard.
- Points of operation on a machine, tool, or equipment are required to be guarded. The guards shall prevent contact of any body part in the “danger zone” during operation.
- Guards must be of a rigid, durable material that can withstand normal operating use.
- Guards must not introduce any new hazards or create additional interference with operation.
- Guards must not interfere with safe lubrication of shop machinery, tools, or equipment.
- Guards must protect against objects falling into the moving parts of a machine or equipment.
- Special material handling tools may be used as a supplementation to a guard to protect against point of operation hazards.
- Guards are required for any blades of a fan less than seven (7) feet above the working level.
- Foot switches shall be guarded to prevent accidental activation either from a person or a falling object.
- Guards may not be removed, tampered, or defeated during operation. Guards may only be removed during service or repair activities.
- Appropriate lockout tagout practices shall be utilized during any servicing or repair on a machine, tool, or piece of equipment where a guard must be removed (refer to UMBC Lockout Tagout Program).

- If a guard cannot be feasibly installed on a machine, tool, or piece of equipment, or if a guard is not capable of protecting the operator from a hazard, then appropriate alternative controls (such as other engineering or administrative controls) shall be implemented. Contact Environmental Safety and Health if consultation is needed for appropriate alternative measures.

Electronic Safety Devices

- If a machine or piece of equipment is equipped with an e-stop (emergency stop), the e-stop must be located in close proximity to the operator (within arm's reach).
- E-stop buttons/switches shall be red in color with a yellow background.
- All drill presses and lathes shall have spring-loaded chuck keys. Never leave keys in chucks of drill presses or lathes.
- Presses with full revolution clutches shall utilize two-hand trip devices that require two-handed continued pressure away from the point of operation in order to perform an operation.

5. Use of Hand and Power Tools

The following requirements apply to all hand and power tools and activities associated with their use:

- All tools shall be maintained in good operating condition, free of any defects that would render the tool unusable or not safe to use.
- Any tool that is not usable or safe to operate shall be reported to supervision and tagged out of service to prevent unauthorized use until repairs or replacement can be made. This includes any tools that have dull or chipped edges.
- All employees shall be familiar with the tools they are using and read the operator's manual prior to first time use.
- Electric power tools must be grounded or double insulated.
- Power tools shall be disconnected from their power source (i.e., unplugged or battery removed) prior to performing service, such as blade or wheel replacement.
- Manufacturer's operating guidelines shall be followed at all times.
- Tools shall not be used for a purpose other than which it was designed.
- If a required tool for a task is not available, report the issue to supervision. Departments shall not permit work to take place until all necessary tools are available.
- Departments shall provide the appropriate personal protective equipment (PPE) for use as needed for the tools and equipment being used. Employees shall be expected to wear the appropriate PPE when operating tools.

- Departments shall establish uniform and/or work attire requirements that are appropriate for the tools, machinery, and equipment being operated and do not create an additional hazard for employees.
- Work areas shall be free of hazards and obstructions when operating tools, such as spills, trip hazards, excessive clutter, or obstructions.
- Work areas shall be sufficiently lit to see the task being performed.
- Safely store and secure tools when not in use. Do not store tools near the edges of benches or work platforms.

Requirements for Bench, Pedestal, and Portable Grinders:

- Bench and pedestal grinders shall have a work rest adjusted no greater than 1/8 inch away from the grinding wheel.
- Tongue guards shall be no greater than 1/4 inch from the grinding wheel.
- Abrasive wheels shall be inspected prior to use. A ring test shall be performed to inspect for cracks on all bench and pedestal grinder wheels.
- Ensure that the grinder speed does not exceed the maximum speed indicated on the grinding wheel.

Shop users are encouraged to review the UMBC Machine Guarding Reference Guide for additional information on ensuring machines, tools, and equipment are appropriately safeguarded.

6. Hot Work and Fire Prevention in the Shop

Hot work is considered to be any work that has the potential to create ignition sources or produce excess heat (such as welding, cutting, soldering, brazing, and grinding).

Hot Work Permit Requirements

Hot work that is routinely performed in a shop environment shall only require the completion of an initial Hot Work Permit prior to such work taking place for the purposes of documenting the type of work to be performed, and to document the safety-related precautions and controls that are in place.

Hot work permits for shops do not need to be resubmitted after initial submission, unless conditions or processes change in the shop that render the current permit no longer accurate in relation to the type of work being performed, working conditions, or the equipment being used.

Hot Work Permits are submitted to Environmental Safety and Health through the ESH Website (the permit can be accessed [via the following link](#)). ESH will review and approve Hot Work Permits and will notify the permit requestor if corrections are required for approval.

Shop Hot Work and Fire Safety Requirements

- Know the location of fire safety equipment in the shop (fire exits, fire extinguishers, alarm pull stations). Ensure fire safety equipment is visible and unobstructed.
- Smoking is prohibited in the shops at all times.
- Wear appropriate hot work personal protective equipment and clothing when performing hot work tasks.
- Use the appropriately shaded helmet lens for the type of work being performed.
- Practice good housekeeping to minimize the accumulation of combustible dust, dirt, and debris.
- Oxygen and acetylene tanks must be appropriately secured in an upright position.
- Keep combustible and flammable materials a safe distance from hot work activity. If the materials cannot be kept at least 35 inches away from the hot work, then the items must be shielded or otherwise protected from any sparks, flame, or heat.
- Flammable or combustible-soaked rags (oily rags) shall be stored in an appropriate metal safety container with a self-closing lid.
- Do not use oily rags to clean up spills.
- Welding leads must be in good condition and properly insulated.
- Welding and cutting shall only be performed in the appropriate designated areas of the shop.
- Ensure adequate ventilation is in place to prevent the accumulation of hazardous or combustible fumes or vapors.
- Use appropriate compressed gas cylinder handling, storage, and use methods (Refer to Compressed Gas Safety procedure).
- Use an approved flint or lighter to light a welding torch. Do not use a match or unapproved lighting device.
- Keep combustible and flammable chemicals and materials appropriately stored in approved storage cabinets when not in use.
- Utilize appropriate shielding or other protective means (such as an attendant) to protect nearby materials, equipment, and persons from flying sparks when performing hot work in the shop.
- Do not use tape to repair cylinder fittings or hoses and keep them free from oil, grease, and protect hoses being flattened, pinched, or cut.

7. Training

All employees (or students under the supervision of faculty or an instructor) who are assigned to operate equipment, tools, or machinery in a shop shall be trained in their safe operation prior to initial assignment of duties.

Training shall cover the following subjects:

- A review of the equipment operator's manual(s).
- Appropriate selection and use of PPE.
- How to identify existing and foreseeable hazards in the shop and correct or report as appropriate.
- How to inspect assigned tools, machinery and equipment assigned to them.
- How to maintain tools, equipment, and machinery, as well as the shop area, in a safe, sanitary condition.

Training shall be re-administered in the following circumstances:

- Following any incident or near-miss.
- When the employee is assigned to a new type of machinery, tool, or equipment.
- Processes or conditions in the workplace change that render current training ineffective or no longer relevant to job assignment.

8. Recordkeeping

Departments shall be responsible for maintaining current records of the following:

- Records of employee training.
- Records of inspections of shops, and associated shop tools, equipment, and machinery.
- Records of repairs or service to tools, equipment, and machinery.

Records shall be retained by the department with authority over the Shop for a period of at least three (3) years.

V. ROLES AND RESPONSIBILITIES

Deans, Administrators, Department/Area Managers

- Ensure employees under their responsibility have the resources and equipment necessary to perform work safely and in accordance with this procedure.
- Ensure employees complete all required training.
- Ensure inspections of equipment, tools, and machinery are completed as required.

- Ensure services and repairs to equipment, tools, and machinery are completed in a timely manner.

Shop Supervisors

- Ensure the shop and all machines, tools, and equipment are kept in a safe and sanitary condition.
- Monitor work areas and activities for unsafe conditions. Stop and correct any unsafe conditions or activity as needed.
- Ensure employees are familiar with the safe operation of all machines, equipment, and tools and ensure all employees have completed necessary training.
- Enforce the requirements of this procedure and any applicable department procedures within their areas of responsibility.
- Ensure only authorized and trained personnel perform work on shop equipment, tools, and machinery.
- Facilitate service and repairs for shop machinery, tools, and equipment in a timely manner.

Office of Environmental Safety and Health

- Provide technical consultation and subject matter guidance to departments to facilitate safe completion of work using shop tools, machinery and equipment, in accordance with regulatory requirements, standards, and best practices.
- Periodically review this procedure to ensure continued effectiveness and revise as necessary. Communicate any revisions that are made.
- Perform periodic inspections and audits of shop conditions, activities, and records of training, inspections, and servicing as needed.
- Assist departments with identification of training and other resources to facilitate safe completion of work.

Employees

- Follow all safe work practices in accordance with this procedure.
- Utilize the appropriate PPE, tools, and resources to facilitate safe completion of assigned work, and notify supervision if items required to safely and effectively complete the task are not available.
- Ensure necessary training is completed prior to performing assigned work.
- Perform inspections as needed on tools, machinery, and equipment.
- Promptly report any unsafe or unsanitary shop conditions, or broken, damaged, or defective tools, equipment, or machinery in the shop to supervision.

VI. REFERENCES

- UMBC Policy VI-13.00.01 - Environmental Safety and Health Management and Enforcement
- UMBC Machine Guarding Reference Guide
- UMBC Shop Safety Plan
- UMBC ESH Procedure - General Safety Rules for UMBC Employees
- UMBC Lockout Tagout Program