



Machine Shop Safety Procedure

1. Purpose

The purpose of this procedure is to help address the potential hazards and risks associated with shops and maker spaces and to prevent injuries and incidents from occurring.

This procedure is in compliance with 29 CFR 1910 Subpart O, "Machinery and Machine Guarding" and Subpart P, "Hand and Portable Powered Tools and Other Hand-Held Equipment".

2. Scope

This procedure applies to all University owned and operated shops and maker spaces for employees, students, and contractors. This includes the main campus, other University-owned property, University-leased spaces, and temporary field locations that are under the control and supervision of Notre Dame personnel.

Locations that do not meet the definition of a shop or maker space may refer to this plan for general safety.

3. Responsibilities

3.1. Department Chair / Unit Director / Area Manager:

- Accountable for the safe and compliant operation of shops and maker spaces in their units/departments.
- Ensure appropriate resources are provided to support the safe operation of shops and maker spaces.
- Notify Risk Management & Safety (RMS) of new shops and the assigned shop manager.

3.2. Risk Management & Safety (RMS) shall:

- Maintain this written procedure to meet regulatory requirements and periodically review the program to assure it remains current.
- Provide technical assistance to ensure this program is successfully implemented.
- Conduct a shop safety inspection of each shop at least every two (2) years and work with shops and departments to address findings.
- Inform shop managers and unit/department leadership of program requirements and updates.
- Advise and assist shops with shop safety issues and



procedures, as requested.

- Help investigate shop incidents or accidents.

3.3. Shop Manager (Professor / Instructor / Supervisor) shall:

- Ensure that only trained and authorized personnel are authorized access and permitted to work in the shop.
- Ensure this procedure is reviewed, implemented, and enforced by all shop users.
- Ensure the shop participates in RMS machine shop inspections.
- Ensure a Training Needs Assessment is completed and that personnel complete required training per the Training Needs Assessment. Training must be documented.
- Determine and implement mitigations to address shop safety inspection findings in a timely manner.
- Address or escalate reported or observed safety concerns to a department leader or to RMS.
- Be familiar with the safe operation of all shop machines, equipment and tools.
- Ensure that all machine safeguards are in place and operational.
- Ensure shop users follow machine safety operating procedures, including, but not limited to, not bypassing, removing or defeating machine safeguards.
- Maintain the owner's manuals or instructions for each piece of equipment.
- Complete a personal protective equipment (PPE) hazard assessment for the shop.
- Ensure that equipment needing repair or service is taken out of service and that repairs and service are made only by authorized personnel.
- Maintain all records including but not limited to training, shop safety inspections, and maintenance and repair records.
- Enter and maintain a list of chemicals used and stored in the shop in the RMS chemical safety platform.

3.4. Authorized Personnel shall:

- Include employees and students trained to use shop equipment and permitted to work in the shop area.
- Know and comply with this procedure's safety guidelines and requirements.
- Complete all required and assigned safety training prior to using shop equipment.
- Operate machines and equipment with all safeguards in

place.

- Never bypass, remove, or attempt to defeat safeguards.
- Report all missing or damaged safeguards to the shop manager immediately.
- Report unsafe conditions to your shop manager, immediate supervisor, or RMS.
- Use PPE appropriately, consistent with training and shop rules.
- Report accidents and incidents (including near misses) to your supervisor, and to the University using [the online incident reporting system \(OnBase\)](#).
- Conduct and document visual pre-use inspections of machines and equipment to ensure the machine and guards are in proper operating condition.
- Maintain proper housekeeping of the work area.

4. Definitions

- 4.1. Emergency Stop – A hardwired stop that is generally accessible to equipment users in their work area and is designed to cut off power to the machine or process when activated.
- 4.2. Ground Fault Circuit Interrupter (GFCI) – A fast-acting circuit breaker designed to shut off electric power in the event of a ground-fault within as little as 1/40 of a second.
- 4.3. Hazards – Mechanical, electrical and/or physical conditions that could cause harm to employees or other personnel in the vicinity of machinery or equipment. Mechanical Hazards include rotational motion, nip points, and cutting, shearing, punching and forming mechanisms.
- 4.4. Hot Work Activity – Any use of open flames such as welding, torch use or soldering. This also includes any activity which creates sparks such as grinding. Refer to the University's [Hot Work Procedure](#).
- 4.5. Interlock – An arrangement in which the operation of one part or mechanism automatically brings about or prevents the operation of another. Interlocks shall be durable, not easily bypassed, and shall stop all hazardous motion before employee interaction.
- 4.6. Machine Guards (Guards) – A barrier that does at least one of the following:
 - Prevents the hands or other body parts from reaching



through, over, under, or around the guard into the hazard area.

- Prevents objects or debris from falling onto or being ejected towards an employee.
 - Types of guards include: fixed, interlocked, adjustable and self-adjusting.
- 4.7. Machine Shop (Shop) - A shop is a designated room or area (single room, a group of rooms, or a part of a room) where fabrication and/or repair activities occur, using tools and machinery that present physical hazards to occupants. Shops at the University include a broad range of uses that support teaching, research and facility maintenance and repair where physical hazards from tools and machinery are more prominent and considered hazardous to an untrained person.
- 4.8. Maker Space – a communal public workshop in which makers can work on small personal projects.
- 4.9. Nip Point – An in-running machine or equipment part, in which two in-running parts rotate towards each other, or where one part rotates toward a stationary object.
- 4.10. Point of Operation – The point at which cutting, shaping or forming is accomplished upon the stock, including the hazards associated with inserting and manipulating the stock.
- 4.11. Safeguard – Term for a number of measures that provide workers with effective protection from harmful contact with moving parts or other harmful conditions. Safeguards include barrier guards, safety devices, shields, awareness barriers, warning signs, or other appropriate means, used singly or in combination.
- 4.12. Safeguarding Device – Devices used as alternatives to barrier guards, such as interlocked movable barrier guards, two-hand controls, and electronic presence-sensing devices such as light curtains and pressure-sensitive mats. These solutions are more complex and technical but are designed to provide protection during normal operation.

5. General Machine Shop Requirements

- 5.1. Only authorized personnel are permitted to utilize machine shop equipment and tools. See Section 13 – Training.

- 5.2. Machine shops shall be secured when the shop supervisor or designee is not in the shop.
- 5.3. It is recommended that there are a minimum of 2 (two) personnel present in machine shops when equipment is in use.
- 5.4. Appropriate personal protective equipment (PPE) shall be worn while working in machine shops or when using hand/portable power tools that may be hazardous to the operator. See Section 11 – PPE.
- 5.5. Damaged or broken equipment/tools shall be removed from service and tagged “**DO NOT USE**” or similar verbiage. Repairs shall be made prior to placing equipment back into service.
- 5.6. Shop layout and machinery placement shall not interfere with clear access to emergency exits or emergency equipment such as fire extinguishers or electrical disconnects. Machinery shall be positioned so that a clear and safe operating area is maintained for each machine.
- 5.7. Housekeeping.
 - Areas shall be maintained in a clean and orderly manner.
 - Sawdust, metal chips, and other debris shall be routinely cleaned (e.g., at end of work shift or class) from surfaces such as machinery, bench tops, and floors.
 - Wet surfaces or slippery floors shall be cleaned or addressed immediately.
- 5.8. Food and drink are prohibited inside shop areas and any other area where food and beverages may be contaminated by dust, debris, paint, or chemicals.
- 5.9. Materials shall be stored in a manner that prevents objects from falling. Shelves or cabinets shall be used as appropriate to store materials and storage of items shall not exceed the capacity of the shelves or cabinets.

6. General Equipment and Machine Guarding Requirements

- 6.1. One or more methods of guarding shall be provided to protect operators and other personnel in the area from machine hazards.
 - Hazard examples include those created by point of operation, nip points, rotating parts, flying chips and sparks.

- Examples of guarding methods include fixed guards, barrier guards, two-hand tripping devices, electronic safety devices, etc.
- 6.2. Routine Machine Guarding Checks
- Machinery and equipment shall be visually checked before each operation to verify that the guards are in place and that sensing devices and interlocks, if available, are functioning properly and have not been bypassed, removed or otherwise not functional.
 - Missing guards or defective safeguards shall be replaced immediately or the machines taken out of service until corrections are completed.
- 6.3. Machine guards shall meet the following requirements:
- Prevent operator contact with the hazard by enclosing it or otherwise preventing access to the hazard by reaching over, under, around or through a guard.
 - Be firmly attached to equipment or secured elsewhere by use of fasteners that requires a tool to remove. If the guards cannot be affixed to the machine, consult RMS.
 - Constructed of durable material that will withstand normal conditions of use.
 - Protect objects from falling into the machine's moving parts.
 - Not introduce any new hazards or create unintended machine operations.
 - Allow for safe lubrication and maintenance of equipment.
- 6.4. Point of operation guarding
- The machine's point of operation shall be guarded. The guard shall be designed and constructed to prevent the operator from having any body part in the danger zone during the operating cycle.
 - Special hand tools for placing and removing material should be used. If used, the tools shall permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall only be used to supplement a guard.
- 6.5. Machines must be equipped to prevent machinery from automatically or unintentionally restarting when an unscheduled power interruption occurs.
- 6.6. All foot operated switches shall be guarded to prevent accidental activation by personnel or falling objects.



- 6.7. When the periphery blades of a fan are less than seven (7) feet above the floor or working level, the blades shall be guarded.
- 6.8. When guarding or other engineering controls are not feasible or are not fully capable of protecting the operator, consult with RMS for potential administrative or personal protective equipment controls.
- 6.9. Machines designed for a fixed location shall be securely anchored to prevent walking or moving.
- 6.10. Spring loaded chuck keys shall be used with all drill presses and lathes.
- 6.11. Safeguards removed during repair or preventative maintenance shall be replaced before equipment is returned to service. Equipment with removed safeguards shall be locked and tagged in accordance with the University's [Lock, Tag, Try Program](#).
- 6.12. All machines equipped with emergency stop (e-stop) buttons shall have the e-stops located in close proximity (within the operator's reach) to the machine operator and be red in color with a yellow background. Emergency stops not located on equipment shall be clearly labeled with the name of the equipment it stops.
- 6.13. Compressed Air.
 - The use of compressed air to clean equipment shall utilize air nozzles that upon dead-ending the exit orifice, reduce the static pressure to less than 30 psi.
 - Use of compressed air for cleaning is only permitted when there are chip guards and when PPE is used by the operator and other personnel in the area.
 - Compressed air shall never be used for cleaning personnel or their clothing.

7. Welding / Cutting / Brazing – Hot Work Activities

- 7.1. Areas where hot work activities are performed shall follow the University's [Hot Work Procedure](#). Contact NDFD or RMS for support.

8. Hand and Power Tools

- 8.1. Exposed moving parts of power tools shall be safeguarded. This includes belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains or other moving parts.
- 8.2. Safeguards shall never be removed when a tool is being used.
- 8.3. Bench, pedestal and portable grinders:
 - Bench and pedestal grinders shall have a work rest adjusted no greater than $\frac{1}{8}$ inch away from the grinding wheel. Tongue guards shall be no greater than $\frac{1}{4}$ inch from the grinding wheel.
 - Wheels mounted on abrasive wheel tools shall be inspected prior to mounting. This includes conducting a ring test on bench and pedestal grinder wheels. Instructions can be found at the following link: [ring test](#).
 - When mounting a wheel, always ensure that the grinder speed does not exceed the maximum operating speed marked on the wheel.
- 8.4. Electric power tools are to be effectively grounded or be double insulated.
- 8.5. Hand and power tools shall be in good operating condition free from defects or broken parts.
- 8.6. Power tools shall be unplugged before performing service such as blade replacement, grinding wheel replacement, etc.
- 8.7. A Ground Fault Circuit Interrupter (GFCI) shall be used for electric power tools that could potentially be used in a wet environment.
- 8.8. Extension cords are not allowed to be used as permanent fixtures.
 - There is a 90-day limit for the use of an extension cord.
 - Extension cords shall be inspected prior to use.
 - Ground Fault Circuit Interrupter (GFCI) shall be used with all extension cords servicing hand tools.

9. Hazard Communication and Chemical Waste Handling / Storage

- 9.1. The purpose of the Hazard Communication Program is to ensure employees are aware of hazardous chemicals in the workplace and are provided information regarding the potential hazards associated



with exposure to these chemicals. For additional requirements, shops shall adhere to the [Hazard Communication Program](#). Some elements of the program include:

- Chemicals shall be properly stored for example, in cabinets approved for that use such as flammable or corrosive cabinets.
- Work areas and shops shall maintain a chemical inventory and have a method of providing Safety Data Sheets (SDSs) for each chemical.
- Personnel shall be informed of the hazards of the chemicals they will be working with prior to their work assignment.

9.2. Hazardous waste shall be handled per the requirements of the [Hazardous Waste Procedure](#).

10. Emergency Response

10.1. The Shop Manager or designee is responsible for training shop users on the shop's emergency plan. This training must be documented and includes:

- Building evacuation assembly point and the building severe weather shelter area.
- Location of the campus phone in order to report an emergency and the numbers to the Notre Dame Police Department dispatch.
- First aid kit location.
- Fire extinguisher location.
- Emergency eye wash location and function.
- Emergency stop button for each piece of equipment being used and other means of disabling power to machinery.

10.2. All accidents and injuries shall be reported immediately to the Shop Manager. The Shop Manager shall adhere to the University's [Incident Reporting and Investigation Procedure](#).

11. Personal Protective Equipment (PPE) and Work Area Attire

11.1. All shops shall complete a [PPE Hazard Assessment](#).

11.2. The minimum PPE required for shop areas includes long pants, closed toe shoes, and t-shirt equivalent shirt. PPE beyond this shall comply with the shop's PPE assessment.

11.3. To minimize the risk of entanglement in machinery:



- Loose-fitting clothing such as long sleeves or shirttails shall be tucked in, rolled up, or otherwise secured to prevent contact with moving parts.
- Neckties, scarves, hood strings shall not be worn when in machine/shop areas or around moving and rotating machine parts.
- Long hair must be tied back. Hair below the collar shall be tied back or covered by a hat.
- Long beards shall also be secured or covered when working around machinery.
- Jewelry that can get caught in moving parts shall be removed. This may include rings, bracelets, necklaces, etc.
- Gloves shall not be worn near rotating equipment. Gloves may be necessary for material handling tasks that could cause splinters or when conducting welding or grinding operations or when working with hot materials such as when forming glass.

11.4 Shops where noise exposures exceed the action level of 85 dBA shall wear hearing protection and follow the requirements outlined in the University's [Hearing Conservation Program](#) . Contact RMS for additional guidance or for a noise survey.

12. Visitors and Contractors

- 12.1. Contractors are not permitted to use University-owned equipment with the exception of the contracted maintenance trades who maintain trade shops.
- 12.2. Contractors who are performing repairs or servicing University owned equipment may have to operate the equipment for troubleshooting or verifying repairs.
- 12.3. Visitors, including visiting faculty, are not permitted to utilize machine shop tools or equipment unless special provisions have been made. Contact RMS for support.

13. Training

- 13.1. The shop manager or designee shall complete a [Training Needs Assessment](#). This shall include the personnel operating equipment in the shop.
- 13.2. All employees shall complete the General Shop and Machine Guarding training course in eNDeavor. Training recurs every three (3) years.
- 13.3. Shop managers will ensure all students are trained prior to using



shop machines, equipment, and tools. At a minimum, training shall include:

- Orientation to the shop's rules and procedures.
- Machine specific training including:
 - Description and identification of the hazards associated with the particular machinery or equipment.
 - Purpose and function of the safeguards, how they provide protection, and the hazards for which they are intended.
 - How to use the safeguards and under what circumstances they can be removed and by whom.
 - What to do if safeguard is damaged, missing or unable to provide protection.

13.2 All training shall be documented and include the date the training occurred and the person conducting the instruction.

14. Pre-Use Inspections

14.1. Prior to using a machine or tool, the User, Shop Manager, or Designee shall visually ensure each machine, guard, e-stop (if so equipped) and other safety devices are present and functioning properly. If safety devices are missing or not working, the tool or machine shall be immediately taken out of service and not used until repairs have been made.

15. Record Retention

15.1. Shop or machine specific training records and safety assessments shall be maintained per the [University Record Management and Archive Policy](#).

15.2. These records may be retained electronically or in hard copy format.

16. References

16.1. 29 CFR 1910 Subpart O, "Machinery and Machine Guarding"

16.2. 29 CFR 1910 Subpart P, "Hand and Portable Powered Tools and Other Hand-Held Equipment"

16.3. University of Notre Dame Lock, Tag and Try – Zero Energy Procedure



- 16.4. University of Notre Dame Hot Work
- 16.5. University of Notre Dame Hazard Communication Program
- 16.6. University of Notre Dame Hearing Conservation Program
- 16.7. American National Standards Institute applicable standards

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REVISION TABLE

History	Effective Date
Obsoleted “Metal or Woodworking Shop Policy” dated January 2013 with this newly created procedure.	October 2018
Updated 15.3 to reflect biennial shop inspections rather than annual inspections.	January 2021
Revised definitions. Delegated responsibility for shop oversight to departments.	August 2024
Revised training requirements to better define employee and student training. Modified PPE requirements wording.	July 2025
Added anti-restart device requirements. Re-organized the requirements found in paragraphs 5 and 6 to better align with the paragraph titles.	November 2025