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Title: Machine Guarding	Date:
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I. PURPOSE

Machine guarding is an essential element of providing a safe and healthful environment for employees and others in any facility. Serious injury can result from coming into contact with the moving parts of a machine. This policy outlines the requirements and describes methods to protect employees from machine hazards.

Thus, this policy has been established in order to:

1. Ensure the safety of employees who work on or use machines and/or tools.
2. Ensure that University employees understand and comply with safety standards applicable to this equipment.
3. Ensure that uniform practices are followed at the UR.
4. Ensure the university complies with OSHA regulations.

II. PERSONNEL AFFECTED

This policy applies to all UR properties, UR sites, and work performed by University employees regardless of job site location.

III. DEFINITIONS

The following terms are defined in order to allow a better understanding of this program:

Belts - Belts include all power transmission belts, such as flat belts, round belts, vbelts, etc.

Belt Shifter - A belt shifter is a device for mechanically shifting belts from tight to loose pulleys or vice versa or for shifting belts on cones of speed pulleys.

Employee - Includes all permanent and temporary employees and Sub-contractor employees.

Enclosures - Guarding by fixed physical barriers that are mounted on or around a machine to prevent access to moving parts.

Exposed to Contact- An object or part is exposed to contact if it is located in such a way that a person is likely to come into contact with it and be injured.

Fixed Shop Machinery - Fixed shop machinery is defined as any piece of machinery designed to perform work on material such as a drill press, bench grinder, table saw, or lathe which is mounted or fixed to the floor or a table.

Flywheel - Flywheels include flywheels, balance wheels, and flywheel pulleys mounted and revolving on crankshaft platform used for oiling, maintenance, running adjustment, or repair work, but not as a passageway.

Guard - An engineering control that uses either fixed or adjustable barriers to prevent personnel from contacting the moving parts of machinery or equipment.

Interlocking - A type of guard that, when opened or removed, causes the machine's cycling mechanism or power to automatically shut off or disengage; the machine cannot be cycled or started until the guard is back in place.

Machine - An assemblage of parts that transmit forces, motion, and energy in a predetermined manner for performing a task.

Nip-Point Belt and Pulley Guard - A nip-point belt and pulley guard is a device that encloses the pulley and is provided with rounded or rolled edge slots through which the belt or pulley passes.

Point of Operation - The area on a machine where work is actually being performed upon the material being processed. On some machines, there may be more than one point of operation.

Power transmission equipment - Horizontal or vertical belts or shafts, pulleys, gears, sprockets, couplings, chains, clutches, connecting rods, flywheels, and other such equipment.

Prime Movers - Include steam, gas, oil, and air engines, motors, steam and hydraulic turbines, and other equipment used as a source of power.

IV. RESPONSIBILITIES A. DIRECTORS and MANAGERS

1. Support this policy and ensure that the requirements are followed.

2. Provide resources and personnel as necessary to ensure compliance. Annually verify that personnel authorized to use this equipment are doing so in a safe and efficient manner.
3. Provide for resources and personnel to assure all of their employees have received necessary training and instruction regarding their assigned roles and responsibilities to comply with this policy. Maintain training documentation.

B. ENVIRONMENTAL HEALTH and SAFETY SPECIALIST

1. Evaluate work being performed to determine compliance with this policy.
2. Provide or assist in task specific training if requested.
3. Periodically review and update this written policy.
4. Provide general training for work units on the content of this program.
5. Assist university facility work units in implementing the provisions of this policy.

C. OPERATIONS and AREA MANAGERS

1. Determine the applicability of this policy to activities conducted within their respective areas of jurisdiction.
2. Designate individuals responsible for the implementation of this policy within their areas.
3. Actively support this policy as part of the University of Rochester overall safety effort.
4. Notify EH&S of any incident or related injury.

D. TRADES SUPERVISORS

1. Ensure compliance in their functional areas with the requirements set forth in this policy.
2. Ensure employees receive appropriate training and maintain documentation of such training.
3. Develop and maintain a listing of all qualified employees under their supervision.
4. Ensure employees are provided with and use appropriate protective equipment.
5. Perform or have designee perform quarterly machine guarding inspections of all machinery.
6. Ensure defective and unsafe machinery is properly tagged and taken out of service.

7. Ensure that if employees wear badges around their necks while operating machinery, that only breakaway badges are used. It is best to not have anything hanging from the neck when operating machinery.

E. EMPLOYEES

1. Follow the work practices described in this document, including the use of appropriate protective equipment.
2. Attend all training required relative to this program.
3. Immediately report any concerns related to safety to supervision.
4. Operate the equipment safely and in accordance with manufacturer's requirements.

V. REQUIREMENTS A. General

1. Serious injury can result from coming into contact with the moving parts of a machine. This procedure outlines the requirements and describes methods to protect employees from machine hazards.
2. The safeguarding of any single machine depends on how and where it is used. Variables to consider include:

    a. Manufacturers' recommendations
    b. Government regulations
    c. Production requirements
    d. Accepted industry standards
    e. Operator training and skill
    f. Company practice
    g. Environmental factors
    h. Maintenance activities
    i. Cost of safeguarding options

B. Machine Safeguarding

1. Machine safeguarding is the application of engineering, work practice, and administrative controls to prevent the injury of employees who operate machines or who are in the vicinity of machine operations. The primary steps of machine safeguarding are:

    a. Identify hazards.

b. Predict injury and the probability of occurrence.
c. Develop and implement a systematic safeguarding program.

d. Develop, implement and maintain machine guarding training and awareness.

2. There are four major elements that should be understood about machine safeguarding:

   a. Any part, function, or process that may cause injury must be safeguarded. Where possible, manufacturer-supplied means of guarding should be used.
   b. When safeguarding machines, utilize methods that provide protection and good production processes.
   c. Guards in themselves must not create a hazard.
   d. Guards should be attached to the machine, if possible.

3. Common Methods of Guarding are:

   a. Fixed barrier guards (preferred)
   b. Adjustable barrier guards
   c. Interlocking devices
   d. Remote control and placement
   e. Electronic safety devices
   f. Removal devices
   g. Pressure-sensing devices

4. Combinations of the above methods may be required for machine guarding and operational safety.

C. General machine guarding policies are as follows:

1. A guard shall be attached to each machine, if possible, and be designed so it does not offer an accident hazard. Guards must be secured with fasteners that require a tool to remove.
2. A guard device shall prevent the operator from having any part of the body from contacting the moving parts of machinery or equipment during the operating cycle.
3. Special hand tools provide supplemental protection for employees when placing and removing material. They permit easy handling of materials and

eliminate the need for operators to place a hand in the danger zone. Such tools do not replace guarding.

4. All revolving drums, barrels and containers shall be guarded by an enclosure that is interlocked with the drive mechanism.

5. All revolving shafts, wheels, pulleys and other revolving parts shall be guarded to prevent an employee from coming in contact with the moving part.
6. If the periphery of blades of a fan is less than seven feet above the floor or working level, the blades shall be guarded. The guard shall have openings that are no larger than ½ inch.
7. Machines designed for a fixed location shall be securely anchored to prevent walking, moving, and tipping.

D. Machine Operation Clearance

Machine operators and personnel performing maintenance should read and understand the applicable sections of a manufacturer's owner/operator and maintenance manuals before operating the machine. If possible and if offered, machine operators and personnel performing maintenance shall receive training from the manufacturer of the machine with approved training before working with the machines, to include at a minimum:

1. Train operators in proper operation, safety procedures, hazard recognition, and emergency shutdown procedures for each machine that they are assigned to operate.
2. Train personnel performing maintenance in hazard recognition, safe maintenance work practices, and emergency shutdown procedures for each machine that they are assigned to service.
3. Identify multiple energy sources and explain machine-specific lockout/tagout procedures to all personnel assigned to work with that machine.
4. Identify personal protective equipment required for machine operators and maintenance personnel and give the equipment to affected personnel.
5. Instruct personnel working with machines that jewelry, watches, bracelets, rings, necklaces, and neckties should not be worn and that long hair should be contained to prevent its entanglement.
6. Managers shall maintain a current list of personnel authorized to operate each machine or unique piece of equipment.

E. Installation

When installing a machine, the following guidelines should be used:

1. Allow enough space between machines to ensure safe operation and material handling.

2. Install machines according to the manufacturer's instructions. Secure machines for fixed locations to prevent them from traveling during operation or if struck by equipment or personnel.
3. Locate operator controls within easy reach of the operator. Operators should be able to get to controls without reaching over hazardous areas or points of operation.
4. Install a disconnect switch that can be locked in the off position.
5. Install exhaust systems, when applicable, and supplementary lighting, if needed, for safe operation before machines are approved for use.
6. Mount a placard on each machine that explains the safe work practices and procedures for that machine. If it is not practical to mount the placard on a machine, place the placard on the wall next to the machine in a location where the operator at the control station can easily see it.

F. Inspection

Employees who are assigned to machine operations or maintenance shall inspect machines before working with them.

G. Maintenance

A preventive maintenance program shall be implemented to maintain the reliability of the machines and their guards. The manufacturer, as appropriate, should be consulted to develop the frequency and method of preventive maintenance.

H. Guarding Methods

1. Any machine that grinds, shears, punches, presses, squeezes, draws, drills, cuts, rolls, mixes, or performs a similar action shall be guarded when possible. Safeguarding should prevent the operator and other employees from being struck, caught, burned, exposed to electric shock, or hit with chips or coolant.

2. If the manufacturer's recommendations for safeguarding do not meet government or industry standards, additional safeguarding should be implemented to comply with these standards.
3. A machine shall be operated only when all safeguards are functional and in place. No control or component of the machine's safeguarding system should be altered or bypassed, including limit switches, light curtains, interlocks, and presence-sensing devices, during normal operations.

I. Color Codes

1. Machines should be color-coded with safety orange where there is an intermediate level of hazard. For example:

    a. Hazardous parts of machines that may cut, crush, or otherwise injure. Such hazards should be colored with an orange paint that shows when enclosure doors are open.
    b. The insides of movable guards and transmission guards for gears, pulleys, chains, and the like.
    c. Exposed parts (edges only) of pulleys, gears, rollers, cutting devices, power jaws, and the like.

2. Guards and protective covers should be color-coded with safety yellow. This designates that dangerous parts of machinery or energized electrical components are contained inside the guards and caution must be exercised. Exceptions include:

    a. Portions of transparent shields designed to afford a clear view of the operation should not be painted.
    b. Metal-mesh guards should be painted black to improve the operator's visibility. The border of the guard should be painted with safety yellow.

J. General Rules for Guarding Guarding

should:

1. Protect the operator and other employees in the machine area from hazards such as those created by the point of operation, ingoing nip points, rotating parts, flying chips, and sparks.

2. Be attached to the machine or secured elsewhere if attachment is not possible.
3. Not pose an accident hazard in itself.
4. Conform to applicable government and industry standards. In the absence of such standards, it must be designed and constructed to prevent the operator and other employees from having any body part in the danger zone during the machine's operating cycle.
5. Be secured by means not easily removed. Fasteners can only be removed using a tool.
6. Facilitate machine inspection as practical
7. Permit maximum visibility of the point of operation

K. Power Transmission Apparatus

1. Hazards such as belts, gears, sprockets, chains, shafts, and pulleys that are associated with power transmissions apparatus must be guarded. Cover all moving parts of power transmission apparatus that are within 7 feet from the floor or working platform. Guard all exposed parts of horizontal, vertical, and inclined shafting that are within 7 feet from the floor or working platform. Use one of the following methods:

    a. A stationary casing constructed of expanded, perforated, or solid-sheet metal
    b. A helical-wound metal strip completely enclosing the shafting
    c. A collapsible or telescoping guarding device unless the projection is less than one-half the diameter of the shaft and the projecting end is completely smooth.

2. For machines that require frequent oiling, use openings with hinged or sliding self-closing covers provided by the manufacturer.

    a. Provide oil lubrication points at remote or ground level mechanisms.
    b. Instruct regular oilers to wear tight-fitting clothing.
    c. Whenever possible, oil machinery when equipment is not in motion.

3. Protect employees from projections in revolving parts by:

    a. Removing the projections (preferred)
    b. Making the projections flush
    c. Guarding the projections with a metal cover

This does not apply to keys and setscrews already guarded within gear or sprocket casings.

L. Switches and Remote Controls

Switches and remote controls should be safeguarded as follows:

1. Clearly mark switches and operating controls in simple language to indicate their purpose.

2. Keep switches, operating controls, and control buttons in good operating condition at all times. If a component is damaged or missing, immediately repair or replace it.
3. Guard the sides and tops of foot-operated control pedals to prevent accidental activation.
4. Never use a foot-operated control to operate a machine unless safeguarding is installed to prevent hands or other body parts from entering the point of operation.

VI. REFERENCES

A. OSHA, 29 CFR 1910 Subpart O, Machinery and Machine Guarding

B. OSHA, 29 CFR 1910.147, The Control of Hazardous Energy

C. OSHA, 29CFR 1910.132, Personal Protective Equipment

D. University of Rochester *Personal Protective Equipment Plan*

VII. REVISION HISTORY

Date	Revision No.	Description