

MARICOPA COUNTY COMMUNITY COLLEGE DISTRICT

Machine Guarding Program

March 1, 2013

I. PURPOSE

Machine guarding is an essential element of providing a safe and healthy environment for employees and others at Maricopa County Community College District (MCCCD). Serious injury can result from coming into contact with the moving parts of a machine. This program outlines the requirements and describes methods to protect employees from machine hazards. Therefore, this program has been written to:

- Ensure the safety of employees who work on or use machines and/or tool (both powered and non-powered).
- Ensure MCCCD employees understand and comply with safety standards applicable to this equipment.
- Ensure all MCCCD employees, regardless of job classification, adhere to the practices and procedures outlined in this written program.
- Ensure MCCCD complies with Federal, state and local laws regarding occupational health and safety.

II. DEFINITIONS

Belts: Belts include all power transmission belts such as flat belts, round belts, v-belts, 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.

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: A heavy revolving wheel in a machine that is used to increase the machine's momentum and thereby provide greater stability or a reserve of available power during interruptions in the delivery of power to the machine. Flywheels include balance wheels and flywheel pulleys mounted and revolving

on a crankshaft platform used for oiling, maintenance, running adjustment or repair work but not as a passageway.

Guard: An engineering control that uses either a fixed or adjustable barrier to prevent persons from coming into contact with 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 properly re-installed.

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 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 similar equipment.

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

III. RESPONSIBILITIES

- A. The College President will support this written program, provide resources and personnel necessary to ensure compliance with this written program and annually verify that authorized personnel are using machines and equipment in a safe and efficient manner. Additionally, the College President will ensure all employees receive the necessary training and instruction regarding their assigned roles and responsibilities to comply with this written program.
- B. Department Directors, Managers and Supervisors will review the activities conducted within their areas and ensure implementation of this written program within those areas of responsibility to prevent death and/or injury to employees under their supervision when working on or near machines and equipment. They will ensure all injury, loss and incident reports are completed and submitted in a timely manner.
- C. Trades Supervisors will ensure compliance with this written program by the employees they supervise in their functional areas. They will assist in ensuring employees have received the necessary training and instruction, receive the necessary and correct personal protective equipment (PPE) and understand all provisions outlined in this written program. Additionally, trades supervisors will perform inspections of all machines in their area to ensure proper

guarding, at least quarterly, ensure defective or unsafe machinery and tools are properly tagged as such and taken out of service.

- D. Employees will follow the work practices described in this written program including the use of all appropriate PPE, to attend all training required by their supervisor, immediately report any concerns related to safety to their supervisor and operate all machines and equipment in a safe, efficient manner in accordance with the manufacturer's requirements/recommendations.

IV. 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. Variable to consider include:
 - a. Manufacturer's recommendations.
 - b. Government regulations.
 - c. Individual college requirements, if any.
 - d. Accepted industry standards.
 - e. Operator training and skill.
 - f. Classroom environment factors.
 - g. Maintenance activities.

B. Machine Safeguarding.

- 1. Machine safeguarding is the application of engineering, work practice and administrative controls to prevent injury to employees who both operate and 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 (4) major elements that should be understood about machine safeguarding:
 - a. Any part, function or process that may cause injury must be safeguarded.
 - b. When safeguarding machines, use methods providing protection and processes.
 - c. Guards must not create a hazard of themselves.

d. Guards should be attached to the machine or equipment whenever possible.

3. Common Methods of Guarding:

- 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

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

C. Procedures.

1. A guard shall be attached to each machine, if possible, and be designed so it does not present an accident hazard.
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" of a machine or equipment operation. Such tools do not replace guarding as the more effective safety method.
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 longer 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 they are assigned to operate.
2. Train personnel performing maintenance in hazard recognition, safe maintenance work practices and emergency shutdown procedures for each machine they are assigned to service.
3. Identify multiple energy sources and explain machine-specific lock-out/tag-out procedures to all personnel assigned to work on that machine in accordance with the MCCCCD Lock-Out/Tag-Out (LOTO) Program.
4. Identify personal protective equipment (PPE) required for machine operators and maintenance personnel and provide the necessary PPE to affected employees.
5. Instruct personnel working with machines that jewelry including watches, bracelets, rings and accessories such as neckties should not be worn. 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 and ensure machines are secure to a fixed location to prevent them from moving during operation or if struck by personnel/equipment.
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 machine are approved for use.
6. Mount a placard on each machine that explains the safe work practices and procedures for that machine. If 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 preventative maintenance program shall be implemented to maintain the reliability of the machine and their guards. The manufacturer, as appropriate, should be consulted to develop the frequency and method of preventative 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 or exposed to electricity.
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 motion detecting 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 other similar devices.
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, in-going 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 a standard directly addressing the machine or equipment, 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.
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 which are within seven (7) feet from the floor or working platform. Guard all exposed parts of horizontal, vertical and inclined shafting which are within seven (7) feet from the floor or working platform. Use one of the following methods:
 - a. A stationary casing construction 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 which require frequent oiling, use openings with hinged or sliding self-closing covers provided by the manufacturer and:
 - a. Provide oil lubrication at remote or ground level mechanism.
 - b. Instruct regular oilers to wear clothing that properly fits and is not baggy.
 - 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 method).
 - b. Making the projections flush.
 - c. Guarding the projections with a metal cover.

NOTE: 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.