MACHINE GUARDING

Moving machine parts have the potential to cause severe workplace injuries, such as crushed fingers or hands, amputations, burns, or blindness. Safeguards are essential for protecting workers from these preventable injuries. Any machine part, function, or process that may cause injury must be safeguarded. When the operation of a machine or accidental contact injures the operator or others in the vicinity, the hazards must be eliminated or controlled. Machine guarding is a safety feature on or around manufacturing or other engineering equipment consisting of a shield or device covering hazardous areas of a machine to prevent contact with body parts or to control hazards like chips or sparks from exiting the machine. Each piece of machinery has its own unique mechanical and non-mechanical hazards. Machine guarding provides a means to protect humans from injury while working nearby or while operating equipment. It is often the first line of defense to protect operators from injury while working on or around industrial machinery during normal operation.

Machine Guarding provide knowledge to manage the safe selection, procurement, use of and safe work practices, inspection and record keeping for all machine guarding equipment and devices. Included are guidelines for identification and correction of locations with machine guarding hazards that may endanger faculty, staff, students, and the public.

This Machine Guarding Safety Standard applies to any department on campus, at field stations, or on leased property where any type of activities could result in injuries from

machine operation. The campus Machine Guarding Safety written program outlines roles and responsibilities for users of machinery (including fulltime employees, contract employees and graduate students performing research related activities in field stations and remote research facilities) as well as those of EH&S/General Safety staff in managing this program, and "Owner Departments" that purchase, maintain and/or manage an inventory of shop, scientific, maintenance or repair machinery.

All machine guards must meet these minimum general requirements:-

1. Prevent Contact – The safeguard must prevent hands, arms or any other part of a workman's body from making contact with dangerous moving parts, hot/ cold surface, harmful fluids and any other hazardous material from all directions.

2. Be Firm & Secured – Guards and safety devices should be made of durable material that will withstand the conditions of normal use and must be secured firmly. Material used in the construction of guards shall be of such design and strength as to protect workman from identified hazards

3. Protect from Falling Objects - The safeguard should ensure that no objects can fall into moving parts and cause injury to workman working in vicinity

4. Not Create New Hazards – The Safeguards should ensure that new Hazards are not created such as sharp edges, pinch points etc.

5. Not Interfere With Job Performance – Any safeguard should not impede a workman from performing the job effectively.

6. Interlocked with machine control system - When a fixed guard must be moved aside to enable a workman to access a point of operation or feed point during routine/non routine activity, the guard must be interlocked to disable the control system until the guard is put back in place and the control system is reset manually.

7. Allow safe Lubrication- If possible one should be able to lubricate the machine without removing the safeguards. Locating Oil reservoirs outside the guards, with a line leading to the lubrication point, will reduce the need for the operator or maintenance workman to enter the hazardous area.

METHODS OF SAFEGUARDING

There are five (5) general methods of machine safeguards that can be used to protect workers and personnel in the immediate vicinity of machinery. They are:

- **Guards –** these are physical barriers that prevent contact. They can be fixed, interlocked, adjustable, or self-adjusting.
- **Devices –** these limit or prevent access to the hazardous area. These can be presence-sensing devices, pullback or restraint straps, safety trip controls, two-hand controls, or gates.
- **Automated Feeding and Ejection Mechanisms** – These eliminate the operator's exposure to the point of operation while handling stock (materials).
- **Machine Location or Distance** – this method removes the hazard from the operator's work area.
- **Miscellaneous Aids –** these methods can be used to protect both operators and people in the immediate vicinity of operating machinery. Examples include shields to contain chips, sparks, sprays or other forms of flying debris; holding tools that an operator can use to handle materials going into the point of operation; and awareness barriers to warn people about hazards in the area.

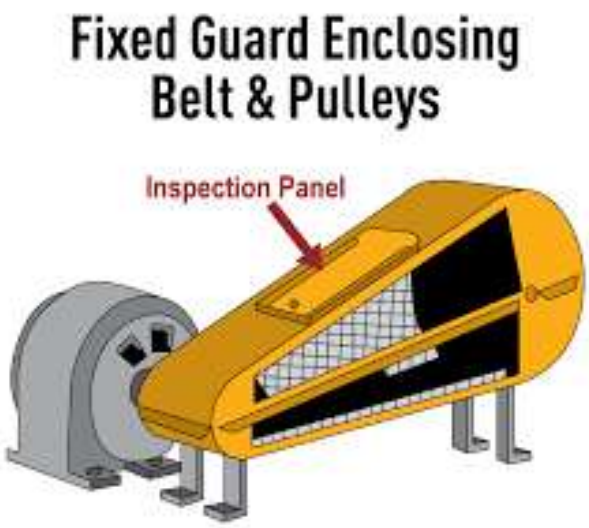
TYPES OF MACHINE GUARDS

There are several different types of machine guards. Guards are materials that keep workers from having direct contact with moving parts and other dangerous areas of a machine. Some guards also protect workers from shavings, flying shards or metal sparks created by working machines. Guard design and material will vary from machine to machine and from tool to tool. The most common types of machine guards are:

- Fixed guards
- Interlocking guards
- Adjustable guards
- Self-adjusting guards

Fixed Guards:

Fixed guards are permanently attached to the machine or tool, don't have any moving parts, and can't be moved while the machine is in use. They're most often used to enclose the point of operation, or other hazards that the operator doesn't need to interact with, like fan blades or flywheels. Because fixed guards are permanent features of the machine, they must be disassembled and removed to perform any kind of adjustment or maintenance.

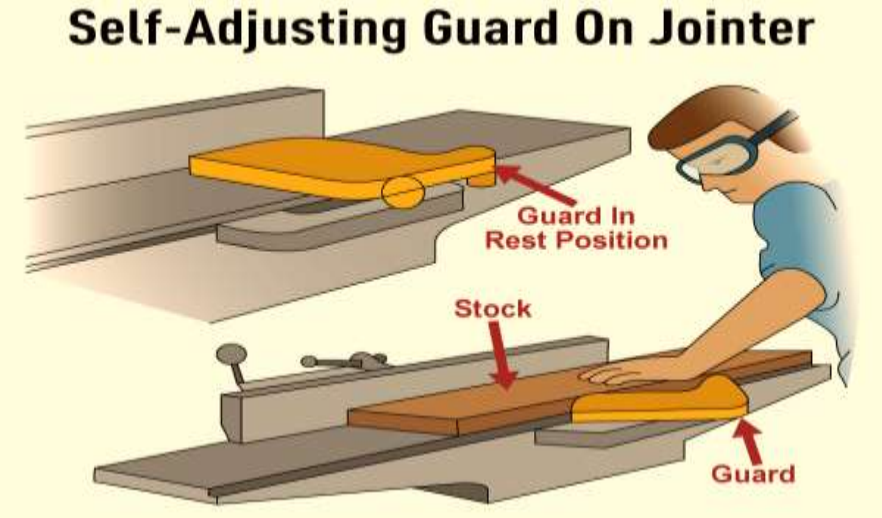


Adjustable Guards:

Adjustable guards, like fixed guards, are permanent, but they can be adjusted to allow the machine to handle different sizes of material. They must be manually adjusted and locked into place, so all employees who will operate adjustable guards must be trained on their use. If improperly adjusted or locked, adjustable guards can fail to prevent contact with moving parts, causing serious or even fatal injury.

Self-Adjusting Guards:

Self-adjusting guards serve the same purpose as adjustable guards, but automatically adapt to the size of the material. When the machine is at rest, these guards sit all the way down. When the machine is in use, the operator feeds material into the machine, which opens the guard just enough to let the material in. These guards are commonly found on table saws and woodworking tools.



Interlocking Guards:

Interlocking guards, also known as barrier guards, automatically shut off or disengage the power source when the guard is open or removed. These are particularly useful in situations where operators need to be able to open the guard or access the guarded parts of the machine, such as when clearing jams. These guards allow safe access to interior parts of the machine without requiring a total disassembly. However, they can be easy to open on accident and require careful adjustment and maintenance.

GENERAL SAFETY PRECAUTIONS

To avoid potentially life-threatening injury, employees should receive proper training before operating any machines or power tools. Employees must never operate machinery without prior training.

Employees must:

- Inspect all tools and guards before each use
- Follow all proper lockout/tag out procedures when necessary
- Use proper procedures when setting up a machine, adjusting a machine, clearing jams, and cleaning or lubricating parts
- Never remove guards while operating a machine
- Tag all damaged guards and machinery "Do Not Use" and report them immediately

ROLES AND RESPONSIBILITIES

"Owner" Departments –The department owning the machinery must:

- Inspect machines annually and repair as necessary
- Render unusable when in disrepair
- Provide training to all personnel as required by the "training" section of this program
- Keep and maintain attendance records of all training for a minimum of 3 years
- Provide alternative methods or administrative controls for protection when if/when safeguards restrict access to the 'point of operation'.
- Consult EH&S/General Safety staff if there are any questions about safeguards or administrative controls prior to using or allowing the use of a machine.

Machine Operator Responsibility – Every employee/staff who operates machinery must:

- Be trained on and applies the use of machine safeguards.
- Inspect the machines and safeguards prior to each use.
- Always use safeguards as required.
- Alert Owner Department Management when machines and/or safeguards need repair/replacement.
- Assess work to determine if machine safeguards cannot be used and work with the supervisor to provide Administrative controls for safety.