Machine Guarding Guidance

Why is this guide important?

During recent facility inspections we discovered a few pieces of inadequately guarded equipment. On first appearance the equipment appears to be properly guarded. After closer inspection one finds the guarding does not adequately protect from injury.

Contact between unguarded equipment is one of the most severe and disabling of workplace injuries. These injuries are widespread and involve various activities and equipment. Examples include using stationary machines, such as saws, presses, and conveyors; bending, rolling, or shaping machines; powered and non-powered hand tools, forklifts, doors, and trash compactors; and materials handling equipment.

What types of hazards do I need to look for?

Adequate machine safeguarding is the primary way to control amputation hazards associated with stationary machinery.

Every employee that enters a mechanical room, lab or shop that has equipment with moving parts must be able to recognize the potential hazards and the proper guarding techniques utilized to protect each employee from harm's way.

To prevent worker injuries, you must be able to recognize the contributing factors, such as the mechanical components of machinery, the mechanical motion that occurs at or near these components, and the specific maintenance activities performed near the point of mechanical operation.

Anyone working around stationary equipment should be able to identify potential injury hazards.

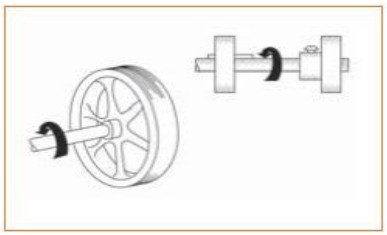
What types of mechanical components are to be guarded?

- Three types of mechanical components present injury hazards:

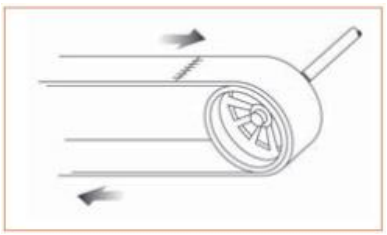
- **Point of Operation** is the area of the machine where the machine performs work. Mechanical actions that occur at the point of operation, including cutting, shaping, boring, and forming.
- **Power-Transmission Apparatuses** are all components of the mechanical system that transmit energy such as flywheels, pulleys, belts, chains, couplings, connecting rods, spindles, cams, and gears.
- **Other Moving Parts** are the parts of the machine that move while the machine is operating, such as reciprocating, rotating, and transverse moving parts as well as lead mechanisms and auxiliary parts of the machine.

What types of mechanical motions are to be guarded?

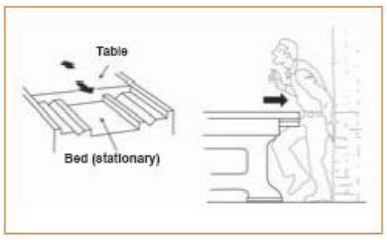
All mechanical motion is potentially hazardous. Here are the basic types of hazardous mechanical motions:



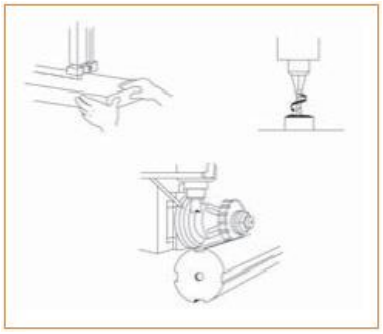
Rotating Motion is circular motion such as action generated by rotating collars, couplings, cams, clutches, flywheels, shaft ends, and spindles that may grip clothing or otherwise force a body part into a dangerous location. Projections such as screws or burrs on the rotating part increase the hazard potential.



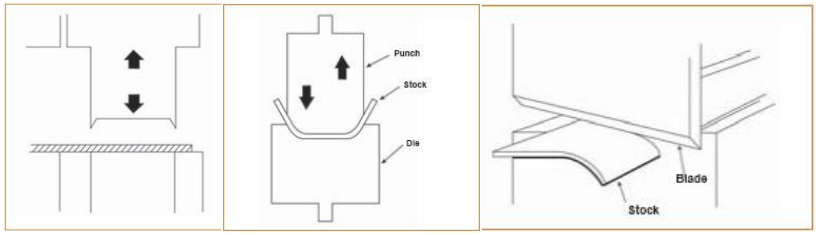
Transversing Motion is motion in a straight, continuous line that may strike or catch a worker in a pinch or shear point created by the moving part and a fixed object.



Reciprocating Motion is back-and forth or up-and-down motion that may strike or entrap a worker between a moving part and a fixed object.



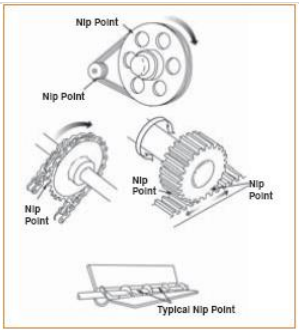
Cutting Action occurs by sawing, boring and drilling, milling, and slicing or slitting machinery.



Punching, Shearing, or Bending Actions hazard occurs at the point of operation where the worker inserts, holds, or withdraws the stock by hand.

In-Running Nip Points also known as "pinch points," develop when two parts move together and at least one moves in rotary or circular motion.

In-running nip points occur whenever machine parts move toward each other or when one part moves past a stationary object. Typical nip points include gears, rollers, belt drives, and pulleys.



Criteria for machine safeguarding:

- **Prevent Contact** - A good safeguarding system eliminates the possibility of the operator or other workers placing parts of their bodies near hazardous moving parts. Guard openings must be small enough to prevent workers from accessing danger areas.
- **Secure** - A safeguard that can easily be made ineffective is no safeguard at all. Guards and safety devices should be made of durable material that will withstand the conditions of normal use and be firmly secured to the machine. Workers must not be able to bypass, remove, or tamper with guards. To prevent tampering, guards typically require a tool to unfasten and remove them.
- **Protect from falling objects** - A small tool which is dropped into a cycling machine could easily become a projectile that could strike and injure someone.
- **Create no new hazards** - A safeguard defeats its own purpose if it creates a hazard of its own such as a shear point, a jagged edge, or an unfinished surface which can cause a laceration. The edges of guards, for instance, should be designed in such a way that they eliminate sharp edges.
- **Create no interference** - Guards that obstruct the operator's view or impede a worker from performing a job quickly and comfortably might soon be overridden or disregarded. Proper safeguarding can actually enhance efficiency since it can relieve the worker's apprehensions about injury.
- **Allow safe lubrication** - Locating oil reservoirs outside the guard, with a line leading to the lubrication point, will reduce the need for the worker to enter the hazardous area.

If machinery doesn't have a guard:

In cases where machinery has no safeguards, you can purchase safeguards from the original machine manufacturer or an after-market manufacturer.

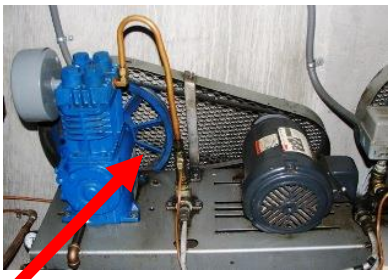
You can also build and install the safeguards. Safeguarding equipment must be designed and installed only by technically qualified professionals. When possible the original equipment manufacturer should review the safeguard design to ensure that it will protect employees without interfering with the operation of the machine or creating additional hazards.

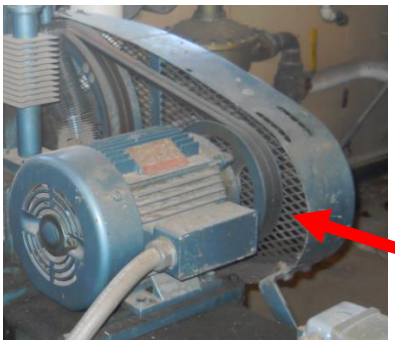
Regardless of the source, the guards and devices you use should be compatible with a machine's operation and designed to ensure safe operator use. The type of operation, size and shape of stock, method of feeding, physical layout of the work area, and production requirements affect the selection of safeguards. Also, safeguards should be designed with the machine operator in mind. See last page for examples of inadequate guarding.

OSHA standard for machine guarding:

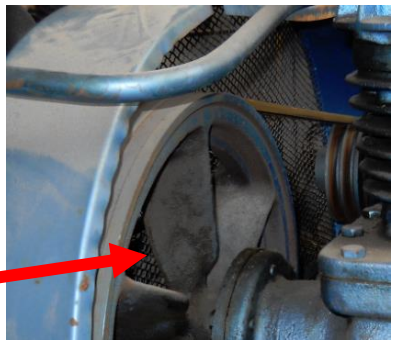
http://www.osha.gov/SLTC/machineguarding/index.html

Inadequate Guarding Examples

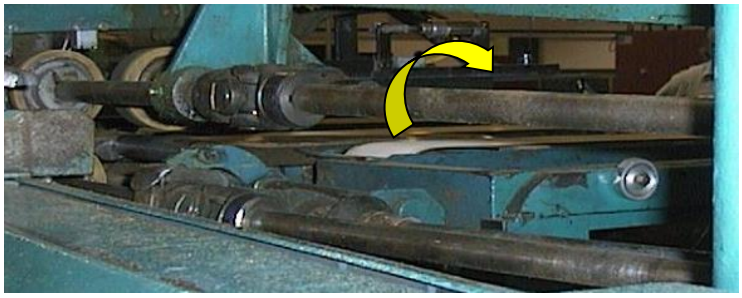




Guard does not fully enclose the hazard.

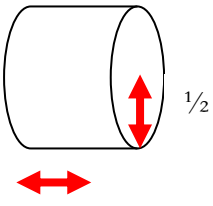


The motion of these rotating shafts can catch hair, clothing or skin and cause injury



In-running nip points.

Rotating shaft ends usually project past the bearings. They must be smooth and project less than 1/2 the diameter of the shaft – or they must be guarded.



Don't waste time building *ineffective* guards! Know the criteria and build them right the first time