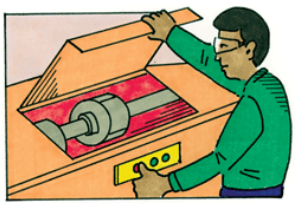
MACHINE GUARDING

While machines allow more efficient, productive work, you must use them with great caution. It's up to you to make sure all machine guards are in place, wear protective equipment, and use safety features and tools correctly.

WHERE ARE THE REGULATIONS?



The Occupational Safety and Health Administration (OSHA) has issued several regulations that apply to the use of powered machinery, under Subpart O, Machinery and Machine Guarding, and Subpart P, Hand and Portable-Powered Tools and other Hand-Held Equipment. These rules can be found in 29 CFR 1910.211-.244 and can be used as a guide.

There are also guarding requirements under resistance welding at 29 CFR 1910.255(a) (4) and (b) (4). These requirements touch on lockout/tagout procedures during welding operations and point of operation guards for press welding machines.

In general, remember that any machine part, function, or process which may cause injury must be guarded. Where the operation of a machine, or accidental contact with it, can injure you or others, the hazard must be either controlled or eliminated.

SERIOUS INJURIES ARE POSSIBLE

Crushed hands and arms, severed fingers, blindness - the list of possible machinery-related injuries is as long as it is horrifying. Guards are essential for protecting workers from needless and preventable injuries.

WHERE MECHANICAL HAZARDS OCCUR

These types of dangerous moving parts need guarding:

- The point of operation, or that point where work is performed on the material, such as cutting, shaping, boring, or forming of stock.
- Power transmission apparatus, or the components of the mechanical system which transmit energy to the part of the machine performing the work. These components include flywheels, pulleys, belts, connecting rods, couplings, cams, spindles, chains, cranks, and gears.
- Other moving parts, or parts of the machine which move while the machine is working, can include reciprocating, rotating, and transverse moving parts, as well as feed mechanisms and auxiliary parts of the machine.

Hazardous Mechanical Motions and Actions

Different types of hazardous mechanical motions and actions are basic to nearly all machines. All motions can cause serious injuries.

Rotating motion can be dangerous; even smooth, slowly rotating shafts can grip clothing, and skin contact can force an arm or hand into a dangerous position. Injuries due to contact with rotating parts can be severe.

Collars, couplings, cams, clutches, flywheels, shaft ends, spindles, and horizontal or vertical shafting are some examples of common rotating mechanisms which may be hazardous. There is added danger when bolts, nicks, abrasions, and projecting keys or set screws are exposed on rotating parts on machinery.

In-running nip points, or those locations that can capture body parts in rotating machinery parts, are common. There are three main types of nip points:

- Parts that rotate in opposite directions while their axes are parallel to each other. These parts may be in contact or in close proximity to each other. This danger is common on machinery with intermeshing gears, rolling mills, and calendar's.
- Another type of nip point is created between rotating and tangentially moving parts. Some examples would be the point of contact between a power transmission belt and its pulley, a chain and sprocket, or a rack and pinion.
- Nip points can also occur between rotating and fixed parts which create a shearing, crushing, or abrading action, for example, spoked handwheels or flywheels.

Reciprocating motions may be hazardous because, during the back-and-forth or up-and-down motion, you might get struck by or caught between a moving and stationary part.

Transverse motion (movement in a straight, continuous line) creates a hazard because a worker may be struck or caught in a pinch or shear point by a moving part.

Cutting action hazards exist at the point of operation in cutting wood, metal, or other materials. Typical machines having cutting hazards include bandsaws, circular saws, boring or drilling machines, turning machines (lathes), or milling machines. Flying chips or scrap material can also strike the eyes or face.

Punching action results when power is applied to a slide (ram) for blanking, drawing, or stamping metal or other materials. The danger of this type of action occurs at the point of operation where stock is inserted, held, and withdrawn by hand. Typical machinery used for punching operations are power presses and iron workers.

Shearing action involves applying power to a slide or knife in order to trim or shear metal or other materials. A hazard occurs at the point of operation where stock is actually inserted, held, and withdrawn.

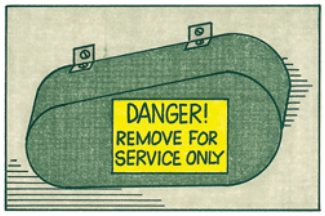
Machinery used for shearing operations includes mechanically, hydraulically, or pneumatically powered shears.

Bending action results when power is applied to a slide in order to draw or stamp metal or other materials. A hazard occurs at the point of operation where stock is inserted, held, and withdrawn. Power presses, press brakes, and tubing benders all use bending action.

GUARD REQUIREMENTS

What must a guard do to protect you from mechanical hazards? Guards must meet these minimum general requirements:

- **Prevent contact:** The guard must prevent hands, arms, or any part of your body or clothing from making contact with dangerous moving parts.
- **Secure:** Guards should not be easy to remove or alter. Guards should be made of durable material and be firmly secured to the machine.
- **Protect from falling objects:** The guard should ensure that no objects can fall into moving parts.
- **Create no new hazards:** A guard defeats its own purpose if it creates a hazard of its own such as shear point or a jagged edge.
- **Create no interference:** The guard should not keep you from doing your job. If possible, maintenance workers should be able to lubricate the machine without removing the guards.



MACHINE GUARDING METHODS

Safeguards can be grouped under five general categories:

1. **Guards** are physical barriers which prevent access to danger areas.

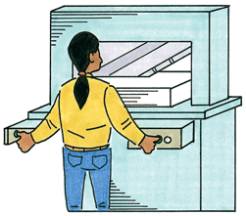
2. **A safety device** may perform one of several functions. It may:

    a. Stop the machine if a hand or any part of the body is inadvertently placed in the danger area.

    b. Restrain or withdraw the operator's hands from the danger area during operation.

    c. Require the operator to use both hands on machine controls, thus keeping both hands and body out of danger.

    d. Provide a barrier which is synchronized with the operating cycle of the machine in order to prevent entry to the danger area during the hazardous part of the cycle.



3. **Guarding by location** or distance has many applications. To guard a machine by location, the machine or its dangerous moving parts must be positioned so that hazardous areas are not accessible or do not present a hazard during the normal machine operation. For example, locating a machine so that a wall protects the worker is guarding by location.

4. **Feeding and ejection methods** of guarding limit hazards associated with feeding stock into a machine.

5. **Miscellaneous aids** provide an extra margin of safety. One example is an awareness barrier that serves to remind you that you are approaching a danger area.

PERSONAL PROTECTIVE EQUIPMENT

Engineering controls that eliminate the hazard at the source and do not rely on behavior for their effectiveness, tend to offer the best and most reliable means of safeguarding. Therefore, engineering controls must be the employer's first choice for eliminating machine hazards. But whenever engineering controls are not available or are not fully capable of protecting you, you must wear protective clothing or personal protective equipment (PPE).

For example, caps and hair nets can help keep your hair from being caught in machinery.

It is important to note that protective clothing and equipment can create hazards. A protective glove can become caught between rotating parts, or a respirator face piece can hinder the wearer's vision, for example.

Other clothing may present additional safety hazards. For example, loose-fitting shirts might possibly become entangled in rotating spindles or other kinds of moving machinery. Jewelry, such as chains, watches, and rings, can catch on machine parts or stock and lead to serious injury by pulling a hand, or head, into the danger area.

GROUNDING IS AN IMPORTANT PRECAUTION

Most machines and power tools are powered by electricity. Electricity will give you a shock if you accidentally become part of the electrical path to ground.

Grounding electrical current is one of the most important safety measures to take when working with electric equipment. Grounding provides a safe path for electricity, preventing leakage of current in circuits and equipment. Grounding should be provided for the entire system and individual pieces of equipment. Check all ground connections regularly for tightness.

WORK AT WORKING SAFELY

You should be aware of the following:

1. The hazards associated with particular machines.
2. How guards provide protection.
3. How and why to use the guards.
4. How and under what circumstances guards can be removed, and by whom (in most cases, repair or maintenance personnel only).
5. What to do (e.g. contact your supervisor) if a guard is damaged, missing, or unable to provide adequate protection.