Machine Guarding

What will this training cover?

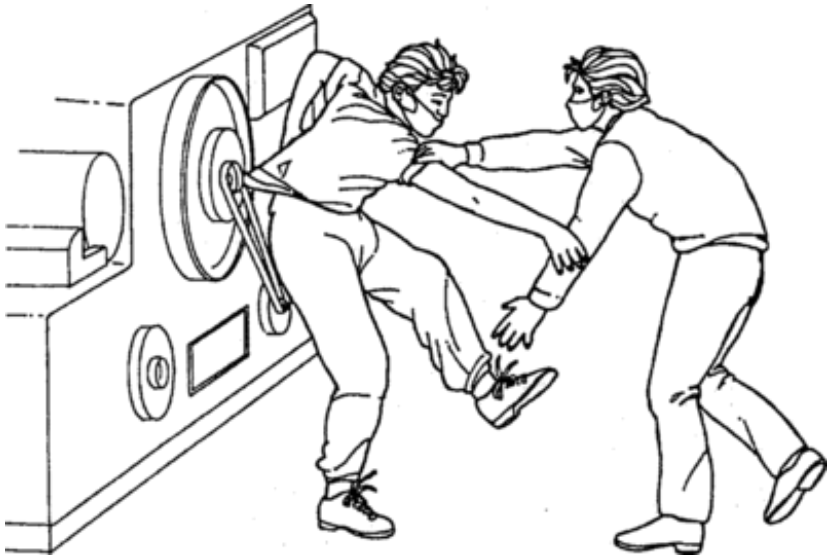
- How machines cause injuries
- How machine guarding helps reduce injuries
- Best practices when working with machine guarding

- Chances are, you've never been seriously injured by a machine, but machine accidents happen ALL the time
- In the United States, it is estimated there are around 15,000 machine accidents each year
  - These accidents result in horrible injuries such as crushing of a body part, amputation, electric shock, and blindness
- There are hundreds of work place fatalities every year caused by machines
- If you work around machinery, you shouldn't take your safety for granted!

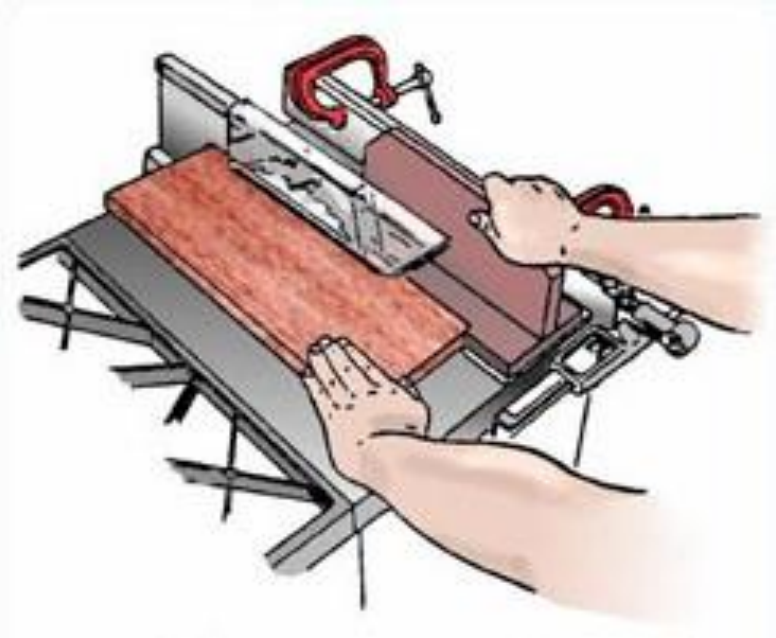
- Many machine accidents are due to faulty or missing machine guarding, OR to workers taking shortcuts to get around machine guarding
  - Machine guarding is there for your safety!

- OSHA has certain rules for machine guarding, essentially boiled down to one sentence… “ Any machine part, function, or process that might cause injury must be safeguarded”
- Any moving part of a machine has the potential to hurt you

- Common dangers to watch out for:
  - Nip Point (pinch point): occurs between two moving parts or between a moving part and a fixed part.
  - Nip points can be extremely dangerous because they have the potential to pull body parts and whole bodies into a machine
  - Rotating parts: contact with quickly moving parts can cause burns and abrasions
  - Back and forth machine movement: can cause crushing or stabbing injuries
  - Presses, dye cuts, and product pushing devices are examples of machines with back and forth motion



- Blades can cause cutting injuries: circular blades, band-type blades, and manufacturing line blades
- All blades, if they have the potential to come in contact with a worker should be guarded



- The point of operation is where the machine acts upon a material or product. It is where the main function of the machine takes place and the material is either cut, shaped, drilled, or formed
- The point of operation is frequently the most dangerous part of the machine because it is where the worker is most likely to come into contact with the machines moving parts

- There are some common mistakes that cause most machine accidents
    1) Reaching into a machine to clear a blockage
    2) Failing to use proper lock out/tag out procedures
    3) Working on a machine without authorization
    4) Using a machine with missing or loose machine guarding

- The primary role of a machine guard is to prevent people from coming into contact with the machines hazardous moving parts
- A machine guard must also have these characteristics:
  - It must be secure – a safeguard that can easily be removed is not a good safeguard
  - It must protect the machine from dropped objects – a foreign object that falls into a machine can become a hazardous projectile and damage the machine
  - It must create no new hazards – no shear points or jagged edges
  - It must create no interference with operation of machine
  - It must allow safe lubrication – a worker should be able to lubricate the machine without removing the safe guards

- There are 3 main categories of machine guarding that have different ways of accomplishing a machine guards purpose

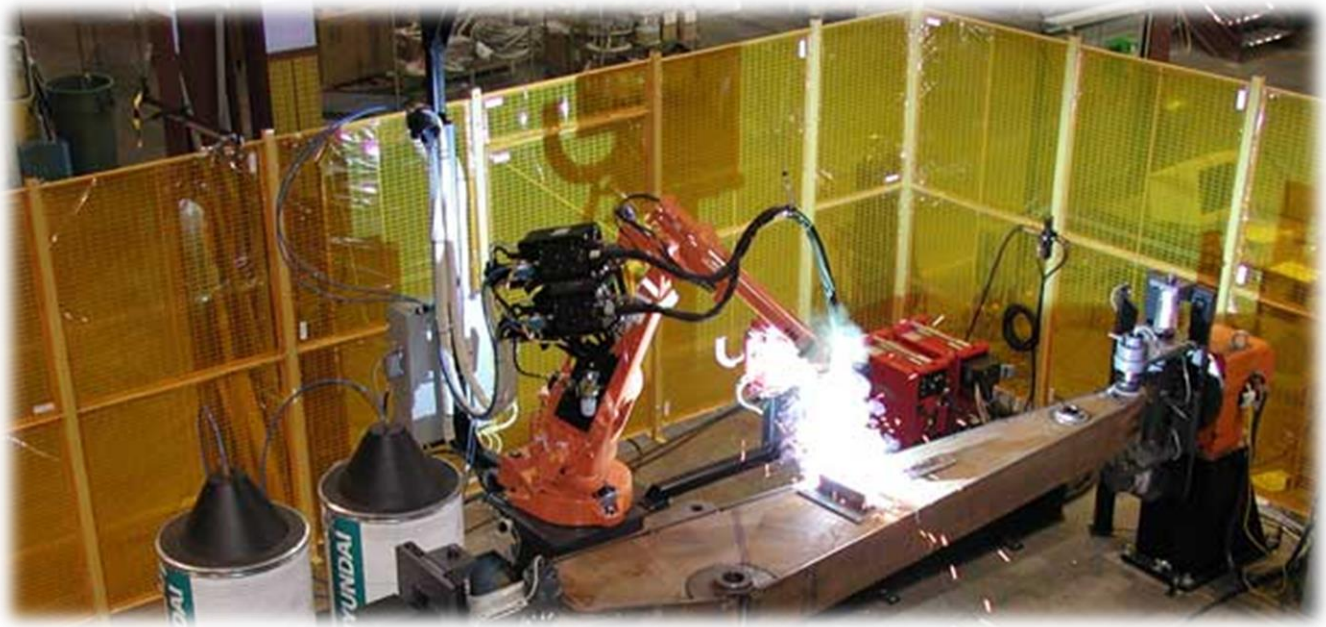
1) Barrier guards
   - Structures like shields or fences that physically prevent an operator from reaching a dangerous area

2) Devices
   - This includes mechanisms that control a workers access to a dangerous area (ex. presence-sensing mat, or a light curtain that shuts off a machine if a worker is detected nearby

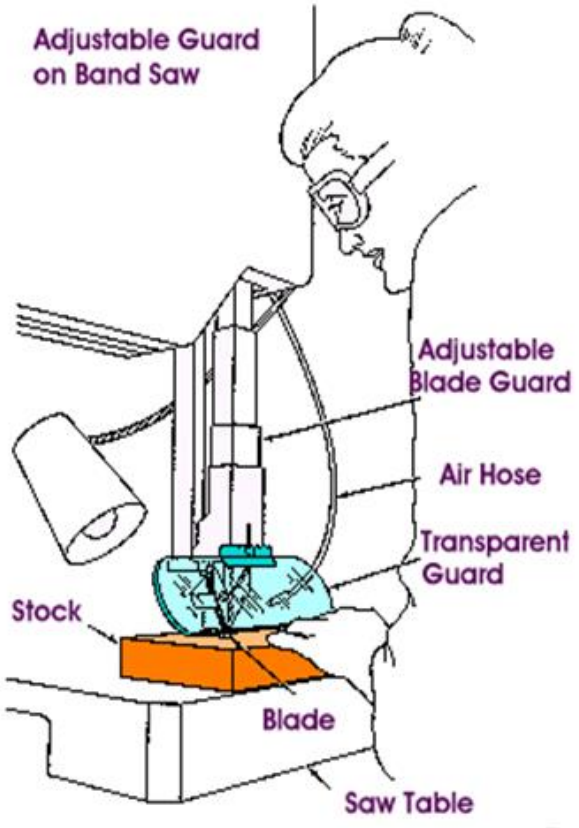
3) Location/Distance
   - Locating the machine controls far enough away from the point of operation that the operator cannot be injured while operating the machine

- Fixed Barrier Guard
  - Permanent part of the machine and should not be easy to remove
  - Fences, see-through plastic barriers, and blade shields
  - Fixed guards are most commonly used for machine parts that rarely need to be accessed or serviced
  - They are not practical for the use at the point of operation because the worker will need to access this area frequently

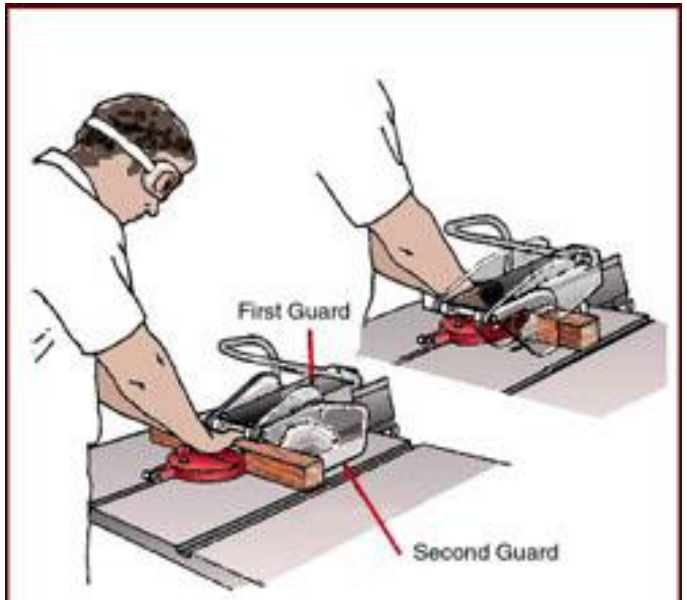
- Interlocked Barrier Guard
  - This type of guard is tied to the operation of the machine
  - When an interlocked guard is opened or removed, the machine is shut down – the machine cannot be turned back on until the guard is put back in place or reset
  - Ex. Safety gate around a piece of equipment – when this gate is opened for any reason, the equipment shuts down



- Adjustable guards
  - Used when a permanent fixed guard would hinder the machine operation
  - Adjustable guards allow the guard to be moved out of the way for adjustment to the machinery
    - This can be to run different sizes of material or product or to switch out different machine attachments
  - They allow useful flexibility BUT the safety of the barrier guard is subject to human error

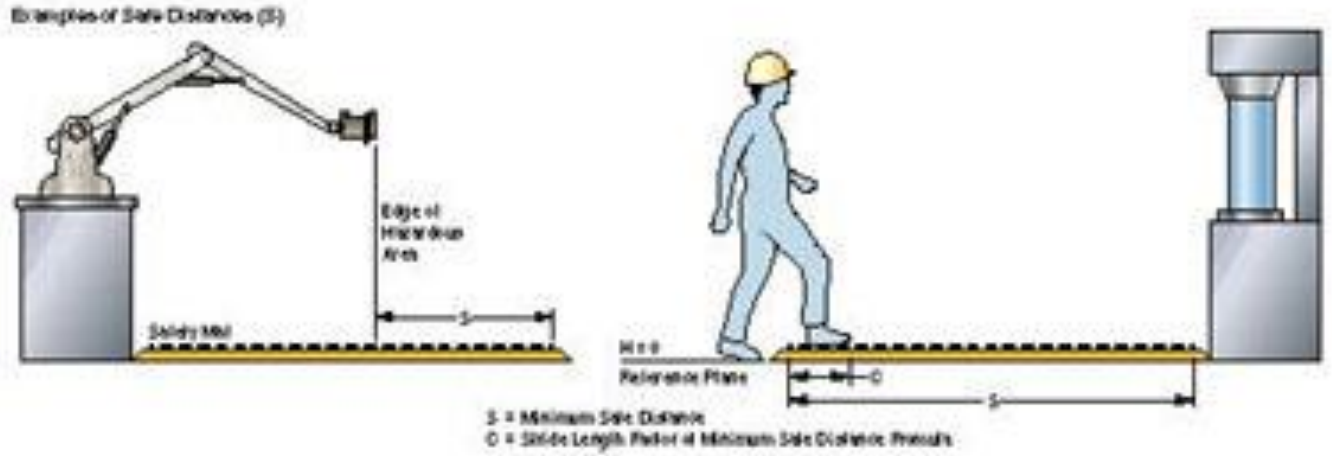


- Self-Adjusting Guards
  - provide a barrier that moves according to the size of material being run
  - Avoid potential for human error
  - (Ex. Pivoting guard found on table saws that move up and down to allow different sizes of wood to be cut)
  - Must allow materials to enter the machine without binding up or kicking back



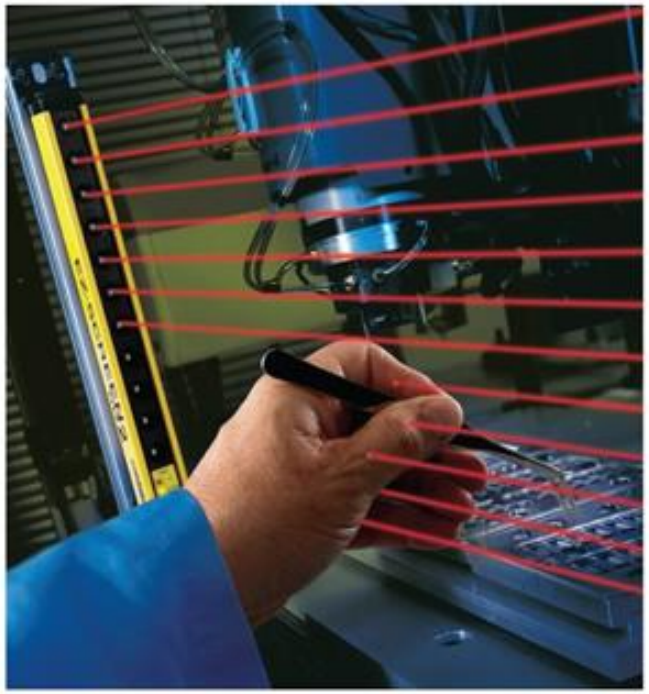
Source: *Concepts and Techniques of Machine Safeguarding*, OSHA

- Presence Sensing Devices
  - Sense the presence of a person, either by weight with pressure sensitive mats, or with the breaking of a light wall as with light curtains and laser scanners
  - Unlike other devices that prevent physical contact with the hazardous area, presence sensing devices detect a hazardous situation
  - Most are set up to stop machine operation immediately when someone is sensed in a dangerous area
  - All presence-sensing devices must be inspected and calibrated regularly to ensure they are working correctly and that they stop quickly enough to prevent injury



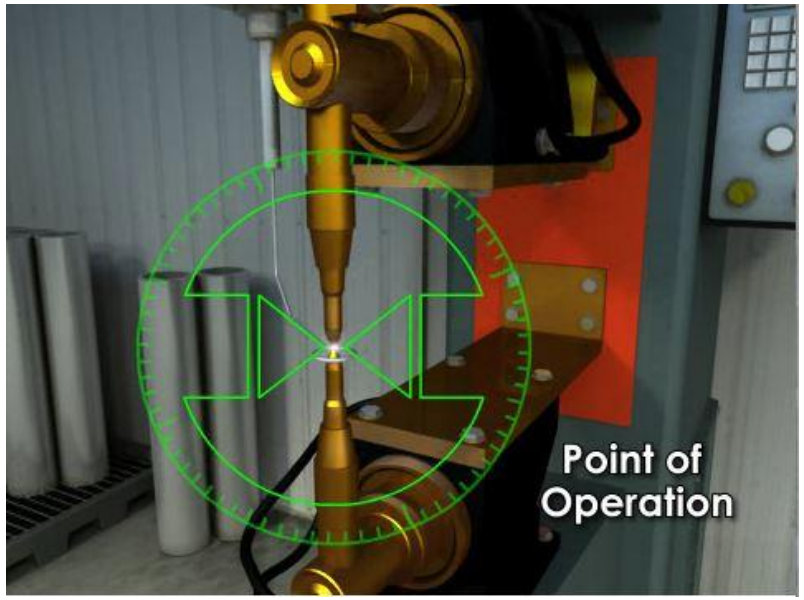
- There are two types of mat devices – disabling and enabling
- Disabling Mats stop the machine when weight is detected on their surface
- Enabling Mats work in an opposite manner as disabling mats – they only allow the machine to operate when a workers weight is detected on the mat
  - These must be located at a safe distance away from the machine

- Light Curtain
  - Presence sensing device that use light to form an invisible barrier
  - If the stream of light is broken, the machine shuts down immediately
  - They can protect a wide area or a small point of operation



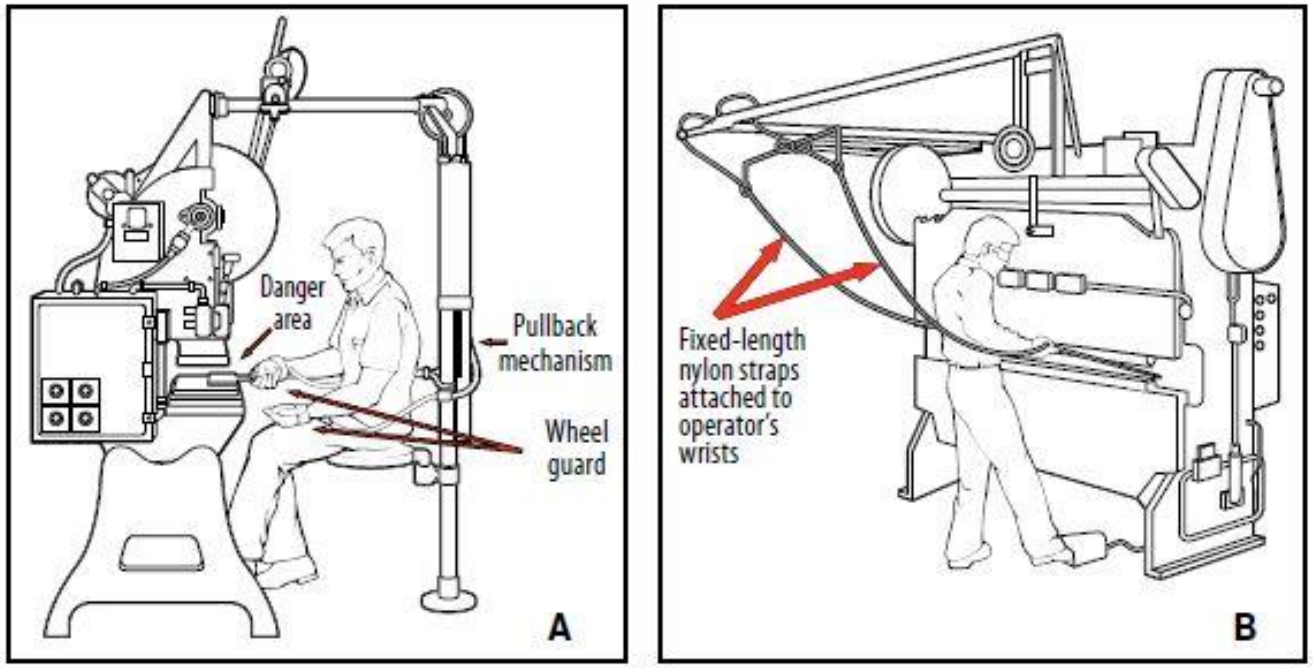
Safety light screens allow safe, unhampered production for a variety of machine-related applications ranging from automated processes to hand-fed machines.

- Drop Probe
  - Device that is also presence sensing
  - It is used when the operators hands must be near the point of operation
  - Riveting machines and spot-welding machines often use drop-probe safety devices
  - Consist of a shaped piece of metal situated directly above the point of operation
  - When the machine is activated, the drop probe quickly moves down to check if there is an obstruction in the way
  - If the drop probe drops freely and doesn't contact an obstruction, the machine performs its cycle
  - If the drop probe does detect an obstruction, like the operators hand, the machine will not operate



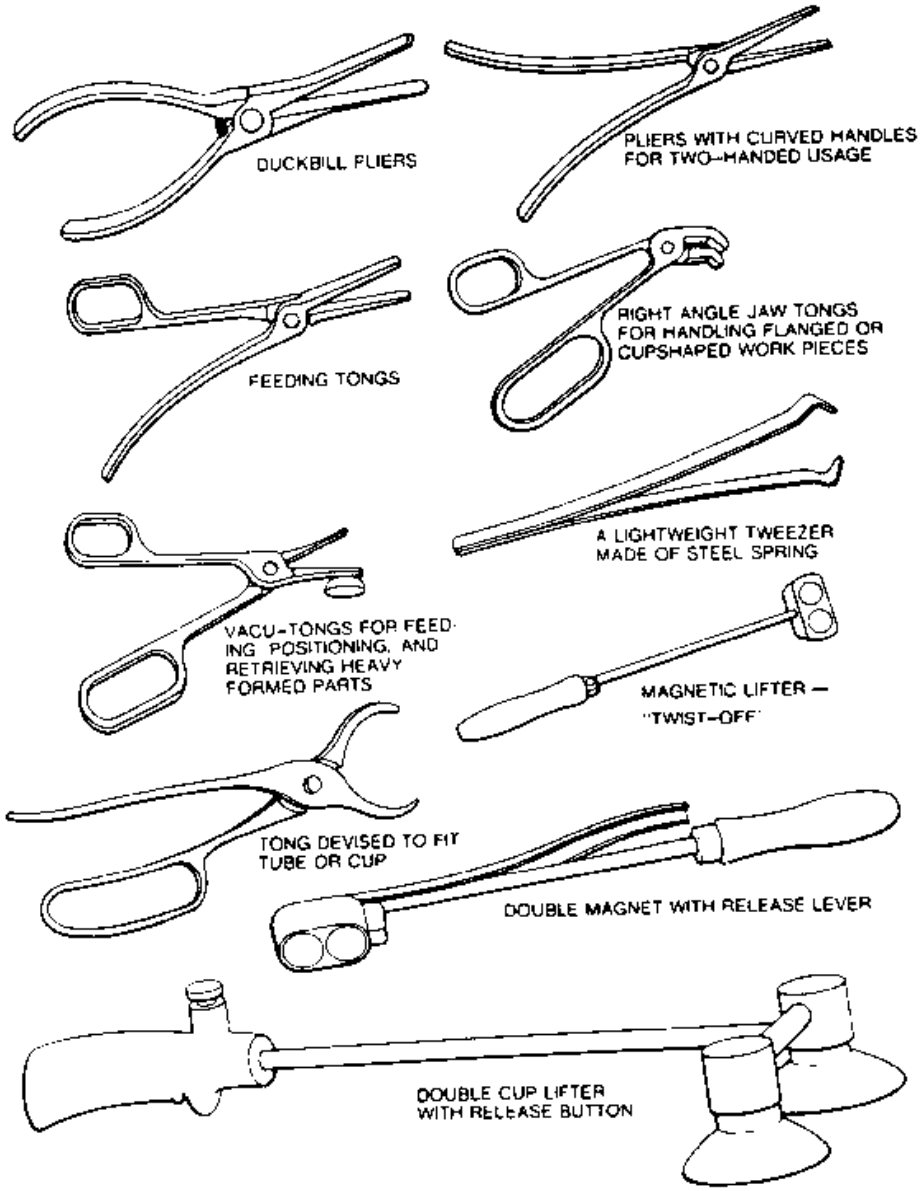
- Two Hand Controls
  - Require the worker to use both hands while operating the machine
  - The buttons must be pressed at the same time and must be held down in order to keep the machine running
  - Two hand controls keep the operators hands away from moving parts and reduce the likelihood of a machine being started accidentally
  - Some two hand controls are far apart from each other and require two workers to initiate a machine
  - Should be situated a safe distance away from moving parts and the machine should immediately stop once the controls are released

- Restraints
  - Cables or straps attached to the operators hands or wrists that prevent an operators hands from entering the point of operation
  - Must be long enough to allow the worker to work easily, but short enough to prevent the workers hands from entering the hazardous area
  - It is important that restraint devices fit all body types conformably and safely
  - Some restraint devices require a hand held tool for the operator to use



- Robots
  - Robots are used in factories and warehouses to load and unload materials, to assemble parts, and to perform other repetitive tasks
  - Robots are consistent, reliable, and able to do work that would be dangerous for people
  - The moving parts of robots create their own safety hazards and must have safeguards in place just like any other machinery
  - The most common safeguarding technique is to use light curtains or interlock barriers to prevent anyone from getting near the robot when it is moving

- Feeding and Ejecting Devices
  - Aid in bringing material in and out of the machine, reducing the workers exposure to the machines hazards
  - Many feeding and ejection methods do not require the workers hands to be near the point of operation
  - However, the use of these devices does not eliminate the need for safe guarding
  - Guards and other devices must still be used wherever there is a chance for worker injury



- Emergency Stops – E-Stops
  - Buttons that immediately shut down a machine
  - Only press an E-stop when a piece of equipment is endangering a worker or if there is a problem with the machine that might damage it
  - E-stops are usually bright red and fairly large and should be located within reach of all dangerous areas of a machine – especially where workers perform their duties

- It may be necessary to enter a machine to:
  - Perform maintenance
  - Clean the machine
  - Dislodge a jam
- Many machines include a motion disconnect switch
  - In many cases, employees can place their lock on the motion disconnect switch
  - Follow proper Lock Out/Tag Out procedures

- Good Housekeeping
  - An important aspect when staying safe around machines
  - Slipping or tripping on trash or other items that haven't been stored can cause a worker to fall into the machine moving parts
  - It is important to keep work areas clean of loose objects that don't belong there

- Clothing Guidelines
  - Don’t wear loose clothing – has the potential to get caught in moving machine parts
  - Tuck in your shirt and button your shirt sleeves to further reduce dangling clothing
  - Tie back or restrain long hair which can also get caught in moving parts
  - Don’t wear loose jewelry that has the potential to get caught in moving parts

- Employee Training
  - Machine operators should receive specific training on the machines they operate
  - If you work on a machine, can you answer the following questions?
    - What dangers does the machine have?
    - What dangers does the machine guarding protect against?
    - How is the machine guarding set up and used?

- Employee Responsibilities
  - Inspect machine guarding before using equipment
  - Do not operate a machine unless the machine guards are in place and are functional
  - Do not remove or adjust machine guards unless you have permission to do so

Questions?

- Contact Radiological & Environmental Management (REM) if you have questions

  - Stephanie Phillips steels@ipfw.edu 260-481-4193
  - Jenna Biggins justja01@ipfw.edu 260-481-5744