



# MACHINERY AND MACHINE GUARD SAFETY PLAN

October 2020

## MACHINERY AND MACHINE GUARD SAFETY PLAN

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 injure the operator or others in the vicinity, the hazards must be eliminated or controlled. This page contains general information on the various hazards of mechanical motion and techniques for protecting workers..

**Crushed hands and arms, severed fingers and limbs, lacerations and abrasions** - the list of possible machinery-related injuries is long and horrifying. Many hazards are created by moving machine parts. Safeguards are essential for protecting workers from preventable injuries.

The following standards have been established to ensure the safety of machine operators and other employees in the area:

- [Machine Guarding](#)
- [Point of Operation Guarding](#)
- [Additional Guarding](#)
- [Barrels, Containers, and Drums](#)
- [Exposure of Blades](#)
- [Anchoring Fixed Machinery](#)
- [Eye and Face Protection](#)
- [Lockout/Tagout](#)

### Machine Guarding

The purpose of machine guarding is to protect the machine operator and other employees in the work area from hazards created by ingoing nip points, rotating parts, flying chips and sparks. Some examples of this are barrier guards, light curtains, two-hand operating devices etc. [[29 CFR 1910.212\(a\)\(1\)](#)]



General Requirements: [[29 CFR 1910.212\(a\)\(2\)](#)]

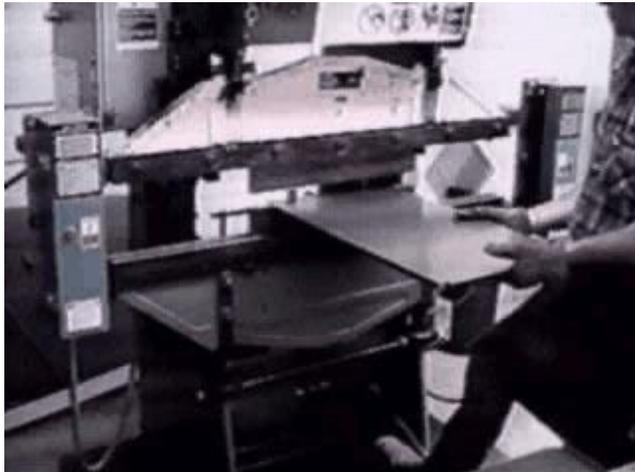
- Guards must not create potential hazards and must be attached to the machine where possible.
- If guards cannot be attached to the machine, attach elsewhere.

## Point of Operation Guarding

The point of operation is the area on a machine where work is performed. [[29 CFR 1910.212\(a\)\(3\)\(i\)](#)]

Machines that expose an employee to injury must be guarded. The guarding device must:

- Be in conformity with any appropriate standards. [[29 CFR 1910.212\(a\)\(3\)\(ii\)](#)]
- If specific standards are not available, the machine construction should prevent the operator from having any part of his/her body in the danger zone during the operating cycle. [[29 CFR 1910.212\(a\)\(3\)\(ii\)](#)]
- Special handtools used for placing and removing material from point of operation areas must allow easy handling of the material without the operator placing a hand in the danger zone. Such tools must not replace guards required by this section. [[29 CFR 1910.212\(a\)\(3\)\(iii\)](#)]



**Press Brake Operation**

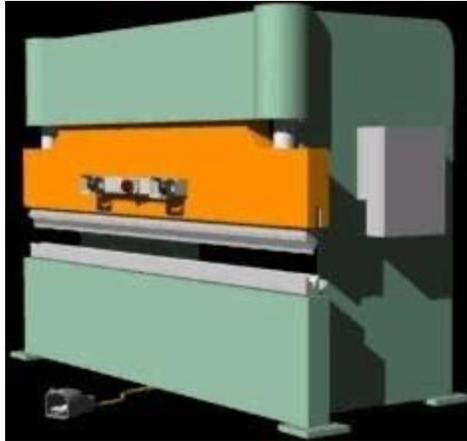


## Additional Guarding

The following is a list of machines that usually require point of operation guarding:

[\[29 CFR 1910.212\(a\)\(3\)\(iv\)\]](#)

- Guillotine cutters ([a](#))
- Shears ([b](#))
- Alligator shears ([c](#))
- Power presses ([d](#))
- Milling machines ([e](#))
- Power saws ([f](#))
- Jointers ([g](#))
- Portable power tools ([h](#))
- Forming rolls and calenders ([i](#))



**Press brake cycle**

## Barrels, Containers, and Drums

Revolving barrels, containers, and drums must be guarded by an enclosure interlocked with the drive mechanism, so the barrel, gun, or container cannot revolve unless the guard enclosure is in place. [\[29 CFR 1910.212\(a\)\(4\)\]](#)

## Exposure of Blades

When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades must be guarded. The guard must not have openings larger than one-half ( $\frac{1}{2}$ ) inch. [[29 CFR 1910.212\(a\)\(5\)](#)]



**Running Fan**



## Anchoring Fixed Machinery

A machine designed for a fixed location must be securely anchored to prevent walking or moving. [[29 CFR 1910.212\(b\)](#)]



**Anchored Machine**

## Eye and Face Protection

Eye and face protection must be provided to each employee when exposed to eye or face hazards from flying particles. [[29 CFR 1910.133\(a\)](#)]

For more information, please refer to:

- [Eye and Face Protection](#). OSHA eTool.
- [Eye and Face Protection](#). OSHA Safety and Health Topics Page.



**Safety Goggles**

## Lockout/Tagout

The employer must establish an energy control program consisting of energy control procedures, employee training, and periodic inspections to ensure that before any employee performs any servicing or maintenance on a machine or equipment, the machine or equipment is isolated from the energy source and rendered inoperative. [[29 CFR 1910.147\(c\)\(1\)](#)]

For more information, refer to:

- [Lockout/Tagout](#) Plan.

## Basic Shop Safety Rules

- Users must receive instruction on each piece of equipment prior to using it for the first time.
- Make sure emergency contact numbers are posted.
- No loose clothing or jewelry. Long hair must be secured up. No open-toed shoes or sandals.
- Safety glasses are to be worn at all times while machines & tools are in use.
- No food or drink is permitted in the workshop.
- Cell phones, mp3 players, and other personal electronic devices must not be used when working at any machine. Loud music is prohibited.
- Users must not undertake any actions that may injure or distract other users or result in damage to equipment or the work of others. No horseplay allowed in the shop.

**A combination of guards (rigid barriers) and devices (interlocks, stop buttons) must be used to protect against the hazards of:**

- Power transmission devices – belts, gears, chains, etc
- Points of operation - cutting edges
- Moving parts – rotary movement, in-running nip points
- Flying chips/materials

## **General Machine Safety Rules**

- 🔊 A machine designed for a fixed location must be securely anchored to prevent walking or moving.
- 🔊 No equipment is to be left running while unattended.
- 🔊 Any damage to the machines, tools, fixtures, etc. must be reported to a supervisor immediately.
- 🔊 Machines shall be completely stopped and de-energized before attempting to clear jammed work or debris.

Machine guarding hazards are addressed in specific standards for the general industry, marine terminals, long shoring, and the construction and agriculture industries.

## **MACHINE SAFETY**

Machine shops are an integral part of the MetroEd's Facilities Department. Machine shops can pose a myriad of hazards that must be taken seriously. Many of the most frequently cited OSHA safety standards pertain to machine safeguarding. Nearly 45,000 machinery accidents occur each year in industry, causing over one thousand fatalities

### **Basic Shop Safety Rules:**

- Users must receive department-approved instruction on each piece of equipment prior to using it for the first time.
- Make sure emergency contact numbers are posted and emergency response procedures are in place.
- Never permit operators to wear loose clothing or jewelry. Long hair must be secured up. • No open-toed shoes or sandals.
- Safety glasses are to be worn at all times while machines & tools are in use.
- No food or drink is permitted in the workshop.
- Cell phones, mp3 players, and other personal electronic devices must not be used when working at any machine.
- Loud music is prohibited.
- Ensure aisles and exit paths remain unobstructed at all times. Users are required to clean up all chips, dirt, oil, etc. produced by the use of any piece of equipment.
- All tools must be cleaned and returned to the proper location when finished. No tools are to be removed from shop without authorization.
- Users must not undertake any actions that may injure or distract other users or result in damage to equipment or the work of others. No horseplay allowed in the shop.
- All injuries shall be immediately reported to the supervisor. Injury reports shall be submitted via the District's injury reporting system. Contact Human Resources for additional information on Injury and Illness Prevention Plan. The plan also can be found on the MSD website. A combination of guards (rigid barriers) and devices (interlocks, stop buttons) must be used to protect against the hazards of:
  - Power transmission devices – belts, gears, chains, etc.
  - Points of operation - cutting edges
  - Moving parts – rotary movement, in-running nip points
  - Flying chips/materials

### **General Machine Safety Rules:**

A machine designed for a fixed location must be securely anchored to prevent walking or moving.

No equipment is to be left running while unattended.

Any damage to the machines, tools, fixtures, etc. must be reported to a supervisor immediately.

Machines shall be completely stopped and de-energized before attempting to clear jammed work or debris

### **HAND AND POWER TOOLS**

Hand and power tools are a common part of our everyday lives and are present in nearly every industry. However, these simple tools can be hazardous and have the potential for causing severe injuries when used or maintained improperly. The District is responsible for the safe condition of tools and equipment used by employees, but the employees have the responsibility for properly using and maintaining tools.

### **GENERAL REQUIREMENTS**

- Use the right tool for the job.
- Match the tool to the task.
- Examine all tools for damage before each use.
- Inspect power cords. If damage is found, take the tool out of service and report the condition to your supervisor.
- Read the tool's instruction manual, and follow use and maintenance guidelines.
- All power tools shall have a 3-prong grounded plug or be double-insulated.
- All power tools shall be UL listed.
- Make sure all safety guards and devices are in place.
- Always wear the appropriate personal protective equipment (PPE).
- Safety glasses and gloves should be worn while operating most power tools.
- Other PPE may also be necessary.
- Avoid using power tools in wet or damp environments.
- Utilize a GFCI when necessary.
- Do not wear loose clothing, dangling objects or jewelry.
- Long hair must be restrained.
- Unplug tools before installing, adjusting and changing any accessory or attachment.
- Maintain solid footing and good balance when using tools.
- Hold or brace the tool securely. Be aware of your surrounding environment.
- Ensure power tool accessories are specific for the tool it's to be used with.

### **SPECIFIC REQUIREMENTS**

- Keep fingers away from saw blades
- Clamp materials down and keep all guards in place
- Do not use compressed air to clean people
- When performing electrical work, ensure the use of insulated, rated tools
- When using pneumatic tools, a safety clip or retainer must be installed to prevent the equipment or hoses from coming apart

- Never point pneumatic tools at anyone
- All hand grinders must be used with the guards and handles in place
- Impact tools, such as drift pins, wedges, and chisels, shall be kept free of mushroomed heads. The wooden handles of tools shall be kept free of splinters or cracks
- Before an abrasive wheel is mounted, it should be inspected closely to be sure that it is free from cracks or defects
- Where flammable atmospheres exist, spark-resistant tools made from brass, plastic, aluminum, or wood will prevent ignition sources

## **TRAINING**

All users of hand and power tools must receive initial training on how to safely operate the tool.

## **MATERIAL HANDLING**

### **Housekeeping & Storage**

Housekeeping is everyone's responsibility, and maintaining a clean and safe work area is key to preventing employee injuries, building fires, and chemical spills. Maintain clear exit paths at all times. Do not block emergency equipment, such as eyewash stations, fire alarms & extinguishers, and electrical panels. Limit quantities of stored materials, especially chemicals and combustible materials. Do not store materials within 18" of a sprinkler head, as this impedes their performance. Do not store combustible materials within 24" of a non-sprinklered ceiling.

How to Lift Safely - Safe lifting and material handling means keeping your back aligned and balanced when lifting. With a little practice, precautionary methods outlined below can become good daily habits that could help prevent back injuries both on and off the job.

Before lifting, take a moment to think about what you're about to do. Examine the object for sharp corners, slippery spots or other potential hazards. Know your limit and don't try to exceed it. Ask for help if needed, or divide the load to make it lighter. Know where you are going to set the item down and make sure your path is free from obstruction. Then follow these steps:

1. Stand close to the load with your feet spread apart about shoulder width, with one foot slightly in front of the other for balance.
2. Squat down bending at the knees (not your waist). Tuck your chin while keeping your back as vertical as possible.
3. Get a firm grasp of the object before beginning the lift.
4. Begin slowly lifting with your LEGS by straightening them.
5. Once the lift is complete, keep the object as close to the body as possible. As the load's center of gravity moves away from the body, there is a dramatic increase in stress to the lower back. To place the object below the level of your waist, follow the same procedures in reverse order.

Remember, keep your back as vertical as possible and bend at the knees. Be extra cautious of lifts that require twisting, reaching, awkward handholds, or unstable footing. If you must turn while carrying the load, turn using your feet - not your torso. When manually moving materials, you should seek help

when a load is: so bulky it cannot be properly grasped or lifted when you cannot see around or over it  
when a secure grip cannot be attained too heavy for your comfort

### **Material Handling Aids**

Carts, bins, hand trucks, dollies, and forklifts are all mechanical aids that can help transport a load without putting undue strain on your back. Pushcarts and bins can be useful for light, awkward loads, while hand trucks and fork-lifts can help move heavier, stackable material. Secure the load for transport, then push the load, don't pull it.

Personal Protective Equipment - Workers should use appropriate protective equipment as necessary to help reduce accident potential. For loads with sharp or rough edges, wear gloves or other hand and forearm protection. To avoid injuries to the eyes, wear safety glasses. When the loads are heavy or bulky, the mover should also wear steel-toed safety boots to prevent foot injuries if the worker accidentally drops a load.

### **Training**

Employee training is available through the Facilities Department.

## **WELDING AND METAL WORK SAFETY**

Metalworking is the process of working with metals to create individual parts, assemblies, or large scale structures, and requires a correspondingly wide range of skills, processes, and tools. Modern metalworking processes, though diverse and specialized, can be categorized as forming, cutting or joining processes. Today's machine shop includes a number of machine tools capable of creating a precise, useful metal workpiece. Although metal work provides an important service to the campus, it also provides unique hazards as well.

### **General Metal Work Safety**

- All equipment operators and shop personnel shall be trained on safe operation.
- Operators shall inspect machinery before and after use for any defects.
- Point of Operations Guarding MUST be in place and used at all times.
- Eye protection shall be worn at all times.
- Always wear correct personal protective equipment (PPE) pertaining to the job task.
- Remove or secure jewelry, long hair, and loose clothing.
- Avoid skin contact with metalworking fluids.
- When possible, always use a well mounted vice to grip work.
- Remove all scraps of metal with a brush, NEVER by hand or with an air compressor gun.
- Always receive authorization before working with reactive or harmful emission giving metals.

### **Welding Safety**

When welding outside of a designated welding booth, ensure that a District hot work permit is completed and adequate safeguards are in place to prevent fire and personal injury. Avoid welding on materials such as galvanized or stainless steel in order to minimize toxic fume exposure. Always utilize mechanical exhaust ventilation while welding.

### **Arc Welding Safety**

- Make sure the work and /or work table is properly grounded.
- Inspect your work area thoroughly before beginning. DO NOT arc weld if it is damp or substances have a potential to ignite.
- Turn the arc welder off before removing any grounds from the table or material.
- DO NOT arc weld with skin unprotected. The arc light acts as Ultraviolet light and will cause something comparable to sunburn.
- Avoid clothing that has pockets, or spaces where hot embers may fall into.

### **Oxygen Fuel Gas Welding/ Cutting**

- All compressed gas cylinders should be clearly marked, and appropriately stored.
- Check all connections and hoses for leaks. Remove defective equipment from service.
- If using acetylene, keep the pressure below 15 pounds.
- Purge your hoses before lighting the torch.
- Never light your torch with a mixture of fuel and oxygen. After purging the lines, light the torch with only the fuel gas valve open.
- Check valves should be installed on both torch inlets and operating properly. Check valves can stop the reverse flow of gases, but will not prevent flashbacks.
- To prevent flashbacks, flashback arrestors must be installed on the outlets of both regulators, and/or torch inlets.

For more information on metal working, welding, or machine shop safety, contact the Maintenance and Operations Department. Training will be provided by an outside agency.

## **WOOD WORKING SAFETY**

Woodworking machines can pose a myriad of hazards that must be taken seriously.

### **General Woodworking Machine Safety**

- Always keep hands, fingers, loose clothing, long hair, and jewelry away from moving or rotating parts.
- All equipment operators shall receive training on safe equipment operation.
- Safety glasses shall be worn while operating all woodworking machines. Always de-energize the machine when providing maintenance, dust/chip removal, and blade adjustments.
- Inspect all equipment and blades/bits for damage before use.

- When powering down equipment, never attempt to stop the blade with material. Allow the saw to completely stop on its own before leaving the work station.
- Appropriate point-of-operation guarding must be functional and in place at all times. Never remove the guard. If a guard is not in place or is causing interference, ask a shop supervisor to assist you.

### **Wood Cutting Machines**

- Appropriate chip guards, splitters, and anti-kickback devices shall be in place.
- Always use the proper saw or blade for the materials and type of cut that needs to be done.
- Use correct technique when cutting. Large wood pieces being cut should be supported on the sawn end by a coworker or support stand.

### **Wood Sanding Machines**

- Sanding belts shall be guarded from contact on all areas except the area performing the work.
- Do not operate sanding machines with torn, cracked, or broken belts or disks.
- Do not sand or grind materials that have a potential to produce harmful dust or debris (beryllium/copper beryllium alloy).
- Work in well ventilated areas. Use vacuums to collect dust while sanding. Wear a dust mask as needed.

### **Drill Presses**

- For materials that are brittle, plastic, or otherwise weak, ask the shop supervisor for guidance on proper techniques and tools.
- Run drill at the correct RPM for the diameter of the drill bit and material. Use a correctly ground drill bit for the material being drilled.
- Always hold work in a vise or clamp to the drill table. Use backing board to support the drill when drilling through material.
- If the drill binds in a hole, stop the machine and turn the bit backwards by hand to release it.

### **Wood Turning Lathes**

- When removing or installing components, never use machine power to do so.
- Remove all chips or turnings with a tool or brush. Never remove them with a bare hand or with an air gun.
- Use speeds that are appropriate for the material and job you are cutting.
- Make sure that the chuck, drive plate, or faceplate is securely tightened onto the lathe spindle.
- Always clamp the tool bit as short as possible in the tool holder to prevent it from breaking or chattering.

For more information, as well as safety training, contact the Facilities Department.

If you have any questions or concerns about your safety and the safety of others please contact the Facilities Manager.

How do I find out about employer responsibilities and workers' rights?

[Workers](#) have a right to a safe workplace. The law requires employers to provide their employees with safe and healthful workplaces. The OSHA law also prohibits employers from retaliating against employees for exercising their rights under the law (including the right to raise a health and safety concern or report an injury).

For more information see [www.whistleblowers.gov](http://www.whistleblowers.gov) or [Workers' rights](#) under the OSH Act.

OSHA can help answer questions or concerns from employers and workers. To reach your regional or area OSHA office, go to OSHA's [Regional & Area Offices](#) webpage or call 650-573-3812. Workers may file a complaint to have OSHA inspect their workplace if they believe that their employer is not following OSHA standards or that there are serious hazards. Workers can [file a complaint](#) with OSHA by calling 650-573-3812, online via [eCompliant Form](#), or by printing the complaint form and mailing or faxing it to the local OSHA area office. Complaints that are signed by a worker are more likely to result in an inspection.

If you think your job is unsafe or if you have questions, contact OSHA at 650-573-3812. Your contact will be kept confidential. We can help. For other valuable worker protection information, such as Workers' Rights, Employer Responsibilities, and other services OSHA offers, visit [OSHA's Workers'](#) page.

## OSHA STANDARDS

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- **Part Number:** 1910
  - **Part Title:** Occupational Safety and Health Standards
  - **Subpart:** O
  - **Subpart Title:** Machinery and Machine Guarding
  - **Standard Number:** [1910.212](#)
  - **Title:** General requirements for all machines.
  - **GPO Source:** [e-CFR](#)
- 

### [1910.212\(a\)](#)

Machine guarding.

#### [1910.212\(a\)\(1\)](#)

Types of guarding. One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are-barrier guards, two-hand tripping devices,electronic safety devices, etc.

#### [1910.212\(a\)\(2\)](#)

General requirements for machine guards. Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard in itself.

#### [1910.212\(a\)\(3\)](#)

Point of operation guarding.

##### [1910.212\(a\)\(3\)\(i\)](#)

Point of operation is the area on a machine where work is actually performed upon the material being processed.

**..1910.212(a)(3)(ii)**

**1910.212(a)(3)(ii)**

The point of operation of machines whose operation exposes an employee to injury, shall be guarded. The guarding device shall be in conformity with any appropriate standards therefor, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.

**1910.212(a)(3)(iii)**

Special handtools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall not be in lieu of other guarding required by this section, but can only be used to supplement protection provided.

**1910.212(a)(3)(iv)**

The following are some of the machines which usually require point of operation guarding:

**1910.212(a)(3)(iv)(a)**

Guillotine cutters.

**1910.212(a)(3)(iv)(b)**

Shears.

**1910.212(a)(3)(iv)(c)**

Alligator shears.

**1910.212(a)(3)(iv)(d)**

Power presses.

**1910.212(a)(3)(iv)(e)**

Milling machines.

**1910.212(a)(3)(iv)(f)**

Power saws.

**1910.212(a)(3)(iv)(g)**

Jointers.

**..1910.212(a)(3)(iv)(h)**

**1910.212(a)(3)(iv)(h)**

Portable power tools.

**1910.212(a)(3)(iv)(i)**

Forming rolls and calenders.

**1910.212(a)(4)**

Barrels, containers, and drums. Revolving drums, barrels, and containers shall be guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place.

**1910.212(a)(5)**

Exposure of blades. When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one-half (1/2) inch.

**1910.212(b)**

Anchoring fixed machinery. Machines designed for a fixed location shall be securely anchored to prevent walking or moving.