

MACHINE SAFEGUARDING GUIDE

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Introduction

The intent of the Machine Safeguarding Guide is to provide UW shop managers, personnel, and students responsible for the operation, maintenance, and repair of shop machinery/equipment with information on the common hazards and safeguarding controls required to mitigate the associated risks. The hazards and safeguarding information provided is not all inclusive of all types of machines but is provided to aid in the hazard and safety assessment process required to ensure the protection of personnel. Refer to [WAC 296-806](#) for safeguarding requirements for specific machines.

Machine hazards

1. Mechanical hazards

- Power transmission parts – these are moving parts of the power train that consist of belts, pulleys, chains, sprockets, gears, shafts, and couplings. Rotating motions can result in entanglement, crushing, amputations, and fractures.
- Point of Operation – this is the hazardous area in a machine where a part is being formed or work is being done (cutting, shaping, shearing, punching, boring). Often it is called the feed point and is where the human interacts with the machine. Cutting, shearing, bending activities can result in entanglement, lacerations, fractures, and amputations. These actions can also result in flying debris, kickback of feed materials, and exposure to particulates.
- Other moving parts – include all parts of the machine that move while the machine is working (reciprocating, rotating, transverse moving parts) and can include auxiliary parts of the machine.
- Ejected material – this is any material ejected by the work process that could be hazardous.

2. Non-mechanical hazards

- Inhalation, ingestion, injection, or absorption through skin of hazardous agents: toxic or corrosive chemicals, harmful airborne particulates, gases, vapors, or fumes
- Heat, noise, and vibration
- Ionizing radiation (gamma, beta, alpha) ([UW Radiation Safety Manual](#) to the Radiation Safety manual for definitions)
- Non-ionizing radiation (UV, lasers, Radiofrequency (RF), magnets,)
- Biological contamination
- Ergonomic related musculoskeletal injuries

3. Other hazards

- Slips, trips, and falls around machinery.
- Tipping or falling equipment due to lack of seismic restraint.
- Fire or explosion
- Struck by injuries related to flying debris, uncontrolled pressure release.
- Electrical shock
- Static Electricity

General principles in machine safeguarding

Elimination of the hazard (e.g., inherently safe design, purchasing the part instead of making the part) or substitution of hazards introduced by machinery (e.g., less hazardous materials, reduced force, or speed, etc.) is always the best option to reduce the risk if possible. When this is not possible, safeguarding will require several controls to reduce the risk of injury during the operation and maintenance of machinery.

Guards

Guards are the first choice of engineering controls when preventing the worker from contact with moving parts or flying debris, particulates, or hazardous liquids, gases, and fumes.

Guards can be:

1. **Fixed** – Provides a barrier and is a permanent part of the machine. The guard is permanently in place and only removed or opened for tool changes and maintenance.
2. **Interlocked** - A barrier, or section of a barrier, interfaced with the machine control system in such a manner to prevent inadvertent access to the hazard. When an interlocked guard is opened or removed the tripping mechanism and/or power automatically shuts off (electrical, mechanical, hydraulic, or pneumatic) and the machine cannot cycle until the guard is back in place. Replacing the guard should not automatically restart the machine.
3. **Adjustable** – A guard or barrier that can be adjusted to meet a variety of work piece operations. This type of guard must be removed and adjusted by the operator which may increase the potential for the guard to not be put back into place and/or allow the operator's hand to enter the danger zone.
4. **Self-adjustable** – A guard or barrier that adjusts automatically to the size of the work piece and therefore the guard is always in place. The guard is in place when the machine is at rest.

Guards must be designed to meet the following performance criteria:

- Prevent access to the hazardous area from all directions

- Not create additional pinch points or other hazards
- Safely contain broken parts
- Allow for safe lubrication and minor adjustments without guard removal; if not, the machine must be locked and tagged out in accordance with the [UW Hazardous Energy Control Program \(LOTO\)](#).
- Offer good visibility to feed points (points of operation)
- Durable to operational and environmental conditions
- Are secured and cannot be easily defeated or modified

Barriers or perimeter fences

Where exposure to hazardous machinery can be protected by a fixed barrier or perimeter fences, it is **recommended** to design the barrier to be six feet tall. For specific regulatory requirements refer to [WAC296-806-20056 Fixed Barrier Safe Distances](#).

Shields

Shields can be used as an additional safeguard to protect personnel from exposure to ejected parts, flying debris, particulates, coolant, hydraulic fluids, oil, and other hazards (noise, radiation, etc.). The use of shields does not replace the requirement for guards. Pieces of personal protective equipment, such as face shields, are not included in this definition.

Shields or equivalent guards are required when working with metal lathes to protect personnel from flying chips and coolant. Shields or hoods are required to cover all cutting heads on all woodworking turning lathes whether or not the heads rotate.

Safeguarding devices

An engineering device that prevents or detects exposure to the hazard(s) prior to entering the hazard zone. These controls can be used in lieu of guards or can be supplemental controls when machine guards do not fully enclose or protect the worker from the hazard. To ensure effective safeguarding, these controls must be installed at a safe distance from the machine hazard zone.

1. **Pressure sensing devices:** Interlock with the machine's control system to stop the operation when the sensing field is disturbed. A pressure sensing mat relies on a predetermined weight to trigger the interlock. The reliability and redundancy of these devices must be based on a risk assessment.
2. **Pullback/Restraint Devices:** Wrists are connected by cords and secured to a fixed anchor point which restricts the operator's hands from entering the point of operation by pulling back the operator's hands from the point of operation during cycling or as restraints preventing the operator from entering the hazard zone at any time. These devices are typically used for power presses.

3. **Two-handed controls:** The operator is required to use both hands on the controls located a safe distance away from the machine.
4. **Foot controls:** Foot-operated pedals that are not securely fixed to a location at a safe distance are not to be considered a safeguarding measure because it does not prevent an operator from moving their hands close to the point of operation. Foot controls must be guarded to prevent accidental activation. Foot controls shall remove all power from the machine when the pedal is released.

Emergency stops

Emergency stops (E-stops) are not considered safeguarding devices because they do not prevent or detect the hazard. Emergency stop devices are required in accordance with [WAC 296-806](#) (e.g., compactors, conveyors, power roll benders, etc.) or when a risk assessment identifies the need for this additional safeguard.

Types of emergency stop devices:

1. **E-stop:** Should be palm or mushroom type buttons that can be depressed by the palm or hand in one action. The push buttons should be unobstructed and easily accessible.
2. **Trip wire:** Shall consist of rope or cable that has tension and is located around the machine and when pulled/pushed it stops the machine. The trip wire must be reset before restarting the machine.
3. **Foot operated pedals** (not used at a safe distance): Once the pedal is released, all power to the machine is removed.

Emergency stop devices must meet the following general conditions:

- Are red in color; emergency stop buttons must be red or yellow background to meet NFPA 79.
- Are easily reached from the operator's normal work position
- Are kept in a good working condition
- Must be manually reset before a machine can be restarted

Awareness warnings, signals, and safety markings

1. **Awareness barrier** does not provide physical separation but provides a warning to the person that they are approaching a hazard zone. The awareness barrier can be adjusted to allow for entry of personnel or work materials but prevents personnel from entering an area without awareness. The awareness barrier offers a visual boundary indicating the hazard zone.
2. **Warning lights and audibles alarms** can be visual and/or audible and provide a warning when approaching a potential hazard or hazard zone. Contact EH&S for determining specifics on designing and installing warning lights/audible alarms to ensure compliance with local regulations, codes, and standards.

3. **Floor markings** may be used to delineate the areas for walking and can also provide awareness for the areas approaching machine hazard zones. Guidance for floor marking can be found in ANSI B11.19 American National Standard for Machinery Safety and UW EH&S [Access to Shops Focus Sheet](#).

Miscellaneous

Safeguarding by distancing

Employees are kept far enough from a hazard that they will not contact or be injured by the hazard. Personnel must be protected from:

1. Falling objects overhead
2. Vertical clearance – seven feet from stairways, fixed ladders, platforms, walking and working surfaces.
3. Horizontal distance – the safe distance between the machine hazard and the height of a barricade can be calculated using the [table](#) below, as long as the height of the hazard is known.

Table 1: Safe Distances for Fixed Barricades (B)

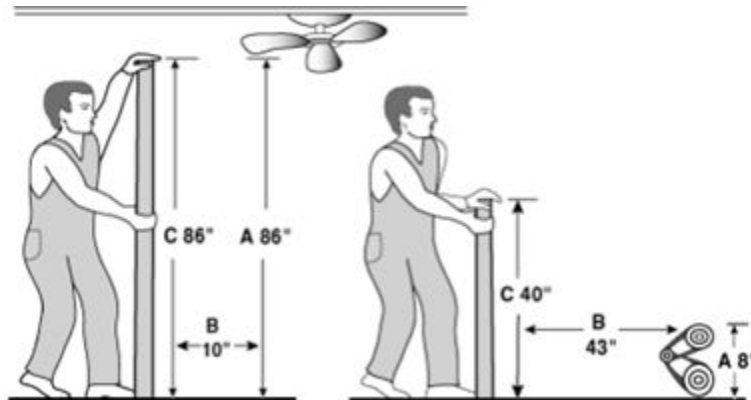
Height of the Hazard (A)	Height of the Barricade (C)							
	96	86	78	71	63	55	48	40
96	0	4	4	4	4	4	4	4
86	10	14	16	20	20	24	24
78	14	20	24	28	36	43
71	24	36	36	40	43
63	20	36	36	40	51
55	4	32	36	40	51
48	20	36	40	55
40	12	36	40	55
32	24	36	51
24	20	48
16	12	48
8	8	43

Note: The height and distance requirements of Table 1 are designed to safeguard workers from a fixed hazard. If a hazard involves flying chips, fluids, parts or materials, the barrier height, distance, and construction may need to be adjusted to provide adequate protection.

How to measure variables A, B, and C

Examples (refer to the diagram below):

- If the height of the hazard (A) is 86 inches, and the horizontal distance from the hazard to the barricade (B) is 10 inches, the required height of the barricade (C) is 86 inches.
- If the height of the hazard (A) is 8 inches, and the height of the barricade (C) is 40 inches, then the required horizontal distance from the hazard to the barricade (B) is 43 inches.



Source: [WAC 296-806-20056](http://wac.wa.gov/wac/296-806-20056)

Hand tools

Hand tools used as a risk reduction measure must be long enough to keep the operator's hands from the hazard zone. The tools must be of sufficient strength so as to not shatter or collapse if in contact with the machine or components.

Feeding tongs or pliers – use ergonomically designed hand tools to limit stress to hands, wrist, and arms during use.

Push block - A nonmetallic device with one or more handles. A push block also has a flat bottom surface with either a heel or friction material on it, used as a hold-down and feed device. The purpose of this is to provide a safe distance between the hands and the cutting tool.

Push stick - A nonmetallic stick shaped device designed to provide a safe distance between the hands and the cutting tool. It has, as part of its design, a notched end with a heel and toe to hold down and feed the work piece past the cutting tool.

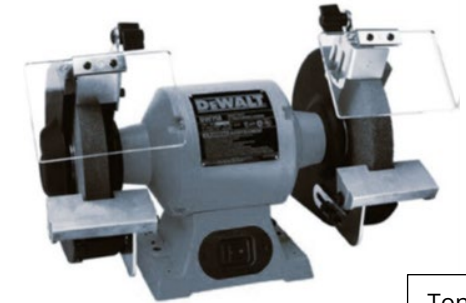
Hazards and safeguards for commonly used equipment and machines

For all tool use, safety glasses or goggles must be worn. No loose clothing, jewelry, or hair.

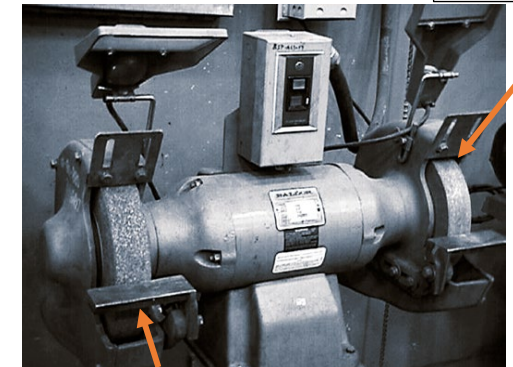
In addition to the safeguards listed below, use a seismic restraint for bench and floor models; local lighting recommended; low voltage (< 24 volts), electrically grounded, and anti-start mechanism to prevent automatic restart operation following power outage.

Abrasive wheel grinder/sander

Hazards	Safeguards
<p>The grinder can rotate at several thousand revolutions per minute and can cause serious injury (entanglement, fractures, crushing) from an unguarded wheel, flange, and spindle.</p> <p>A naturally occurring nip point created by tool rest can result in lacerations, fractures, amputations.</p> <p>Abrasive wheel shattering</p> <p>Additional concerns of flying fragments, sparks, air contaminants, etc. Cutting, polishing and wire buffing wheels can result in the same hazards.</p> <p>High noise</p>	<p>UW Grinder/Buffer SOP Template</p> <ul style="list-style-type: none"> • Adjustable tongue guard 1/4" max. from wheel. • Adjustable work rest 1/8" max. from wheel or per Manufacturer's recommendation (e.g., 1/16"). • Spindle guards • Bench grinder needs to be secured to the work surface. • The required guarding for a wire brush attachment is a tongue guard. (A tool rest is not recommended in this situation). • Optional shields can be attached to prevent exposure to flying debris, particulates, and sparks. • Dust collection systems can be installed to reduce dust accumulation. • Do not wear gloves when operating. • Ear protection • E-stop



Tongue guard 1/4 inch gap



Work rest - 1/8 inch from wheel or closer

Belt and disc sanders

Hazards	Safeguards
<p>Belt and disc sanders utilize an abrasive material to remove material from the work piece at high speeds and can be used on different materials. Cuts and lacerations can result from contact with the rotating belt or disc materials. Crushing, fractures, amputations can occur if contact with nip points and unguarded pulleys, wheels, rotating parts. Exposure to hot objects from excessive heat build-up during sanding operations. Exposure to flying objects, dust, and particulates. High noise</p>	<p>UW Grinding/Sanding Buffing SOP</p> <ul style="list-style-type: none"> • All guards must be in place to prevent access to belts and pulleys. • Worktable or work rest must be secured and within 1/16 inch from disc or belt. • Only use materials designated for the particular machine. • Do not wear gloves to avoid entanglement. • Hearing protection • Provide dust collection when sanding materials that generate larges amount of dust and particulate. • E-stop



Figure 1: [Disc and Belt Sander](#)



Circular saws (various types)

Hazards	Safeguards
<p>Severe cuts to or amputations of the fingers or hands can occur if they come in contact with the saw blade. If the rotating blade is not properly guarded, exposure can occur during operation or when the saw is idling.</p> <p>Overhead swing saws can pose additional hazards if the return device fails, if the saw bounces forward from a retracted position, or if the saw blade is able to go past the edge of the table, possibly contacting the operator's body.</p> <p>High noise</p>	<p>Over table cut-off saws (miter, chop, and overhead swing saws) must be provided with fixed hood guards that enclose the arbor and top half of the saw.</p> <p>These saws also must be equipped with a self-adjusting lower blade guard that automatically adjusts itself to the thickness of the material being cut and provides continuous protection from the blade.</p> <p>Most guards supplied by manufacturers are designed to move out of the way as the blade nears the cut.</p> <p>If a guard seems slow to return to its normal position, adjust or repair it immediately.</p> <p>Although not as common as with ripsaws, hazardous kickbacks might also occur. Kickbacks can be minimized by setting the proper blade depth so that the lowest tooth extends no more than 1/8 inch beyond the bottom of the material.</p> <p>Do not wear gloves</p> <p>Hearing protection</p>



Figure 2: Radial saw CSE2 G15



Drill press

An electrically powered belt-driven machine that consists of multiple cutting edge drill bits held in a rotating chuck to drill or bore holes in wood, metal or plastic; drill presses can sit on the benchtop or the floor.

Hazards	Safeguards
<p>Hazards include contact with rotating parts (chuck, drill bit, belts, and pulleys) that can cause entanglement injuries and lacerations.</p> <p>Inadequately secured stock material and chuck key, if left in the chuck can strike operators and other personnel.</p>	<p>UW Drill Press SOP Template</p> <p>Install guards around rotating chuck and drill. Belts and pulleys must be guarded at all times.</p> <p>Ensure stock material is fastened to the table during operation.</p> <p>Remove chuck key from chuck and keep in a secure location.</p> <p>E-stop</p> <p>Ensure bench and floor mounted drill press is seismically restrained. The floor models require a seismic restraint design that meets the building code requirements.</p>



Figure 3: Drill Press Gould Hall



Figure 4: Sieg Hall Benchtop Drill Press

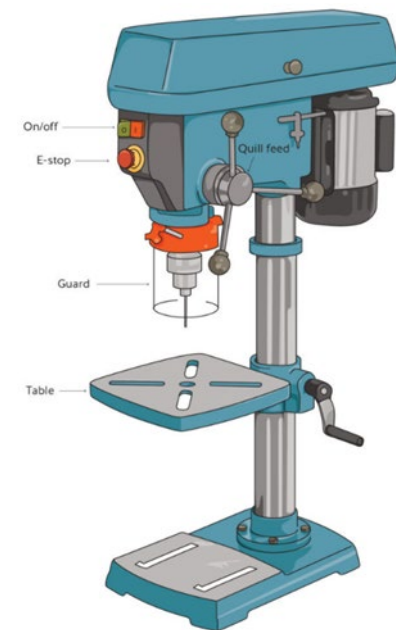
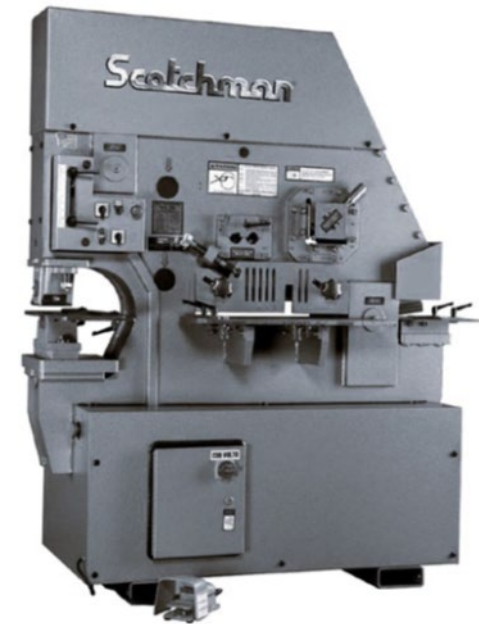


Figure 5: Drill Press Photo credit: © WorkSafeBC

Ironworkers

Versatile metal fabricating machines that can perform punching, shearing, notch-cropping, and bending operations

Hazards	Safeguards
<p>Hydraulically powered machine that operates at high pressure (max. pressures 2350 psi).</p> <p>Hazards</p> <p>Point of operations - crushing and shearing points</p> <p>Improper alignment of punch can result in injury from flying or moving parts.</p> <p>Heavy pieces of metal with sharp edges.</p> <p>Faling tools</p> <p>Noise from motors/pumps</p>	<p>UW Ironworker SOP Template</p> <p>Guards at all points of operation with fixed or adjustable guard. Guards are to be adjusted to 1/4 inch from the tip of the material to the bottom of the guard.</p> <p>Hold down devices adjusted and secured.</p> <p>Properly align the punch and dies.</p> <p>Cover foot pedals to prevent accidental cycling.</p> <p>E-stop</p> <p>Electrical disconnect that can accept OSHA approved lockout device/tag.</p> <p>Hearing protection</p>



Laser cutter

Hazards	Safeguards
<p>Laser beam can result in eye injuries or burns to skin.</p> <p>Fire and contact with hot materials during cutting and engraving operations.</p> <p>Exposure to laser generated airborne contaminants (LGAC)</p> <p>Moving cutting head</p> <p>Contact with sharp objects</p>	<p>UW Laser Cutter SOP Template</p> <p>Class I laser and enclosure cover interlocked with operation of the laser. This will prevent operators from exposure to laser, cutting head and LGACs during laser operation.</p> <p>E-stop, accessible single action hand switch, or foot-operated switch</p> <p>Connect to manufacturer’s recommended filtration system of local exhaust connection.</p> <p>Fire extinguisher in the event materials catch fire.</p> <p>Gloves to protect from contact with hot surfaces and sharp edges.</p>



Figure 6: [Filtration system](#)

Lathe - metal

Hazards	Safeguards
<p>Fast rotating parts: spindle, tail piece, and turning work piece, can cause contact and entanglement hazards.</p> <p>Pinch points can be created by moving parts and tool rest and result in bruising, crushing or amputations.</p> <p>Cutting tools, drill bits, metal edges can result in cuts, lacerations, and amputations.</p> <p>Fly objects, wood chips, wood pieces or tools can be released during operation or thrown if not secured.</p> <p>Burns can result from contact with hot work piece or cutting tools</p>	<p>UW Lathe SOP</p> <p>Guard Chuck and Workpiece /point of operation</p> <p>Tool rest</p> <p>Secure the work piece in the lathe.</p> <p>Ensure all E-stops are accessible with single action hand switch, foot operated pedal.</p> <p>Face shield</p> <p>Do not wear gloves</p> <p>Wait until materials cool or use tools to pick up hot items</p>



Figure 7: [Lathe Safety Guard](#)



Figure 8: [chuck guard](#)

Lathe - wood

Hazards	Safeguards
<p>Fast rotating parts: spindle, tail piece, and turning work piece, can cause contact and entanglement hazards.</p> <p>Pinch points can be created by moving parts and tool rest and result in bruising, crushing or amputations.</p> <p>Cutting tools, drill bits, metal edges can result in cuts, lacerations, and amputations.</p> <p>Fly objects, wood chips, wood pieces or tools can be released during operation or thrown if not secured.</p> <p>Burns can result from contact with hot work piece or cutting tools</p>	<p>Chuck and work piece point of operation guard/shield</p> <p>Tool rest should be close to work piece.</p> <p>Secure the work piece in the lathe.</p> <p>Ensure all E-stop, accessible single action hand switch, or foot switch.</p> <p>Anti-restart</p> <p>Chuck key is in secure storage location when not in use.</p> <p>Face shield if point of operation if guard/shield not possible</p> <p>Dust collection system</p> <p>Do not wear gloves</p> <p>Hearing protection</p>



Figure 9: [Lathe Safety Guard](#)



Figure 10: [chuck guard](#)

Metal shears

Hazards	Safeguards
<p>Metal shears can be manual or powered by electrical, hydraulic, or pneumatic energy sources. Metal shears are used to make straight cuts in flat sheet metal stock.</p> <p>Hazards include:</p> <p>Amputation – caused by shear blade.</p> <p>Flying objects - caused by metal cutting action or work pieces being flung across the room.</p> <p>Cuts and lacerations – caused by contact with sharp edges and potential burrs on the metal.</p> <p>Pinch points that result in bruising or crushing – caused by hold down clamps between the work piece and the machine.</p>	<p>UW metal Shear SOP Template</p> <p>A fixed or adjustable point of operation guard at the in-feed of the shearing machine to prevent operator contact with the shear’s point of operation as well as the pinch point of the hold-down.</p> <p>Hold-down devices that prevent the work piece from kicking up and striking the operator.</p> <p>Foot-operated pedal with emergency stop function.</p> <p>If two-handed controls are installed, arrange two-hand trips and controls so that the operator must use both hands to initiate the shear cycle. Two-hand trips and controls should be designed so they cannot be defeated easily. The ANSI B11.4 Safety Requirements for Construction, Care, and Use of Shears standard recommends the installation of additional safeguarding when two-hand controls are used on part-revolution shears, based on the nature of the shearing operation.</p> <p>Mount guarded foot pedal controls at a safe distance away from the point of operation to prevent accidental activation.</p> <p>The following recommendations apply to safeguarding for operations performed at the rear of the shear:</p> <p>Install fixed guards on the back side of shears.</p> <p>Install an awareness barrier guard with an interlocking gate, a presence-sensing device (light curtain), or a safety trip control (safety tripwire cable or safety tripod) on the back the shear.</p>



Figure 11: Manual shear



Figure 12: Powered shear



Milling machine

Hazards	Safeguards
<p>Milling and CNC machines cut away material using rotating blades, which can throw or eject dust and chips at high speed.</p> <p>Flying chips present an eye injury hazard.</p> <p>Fine dust can be a respiratory hazard.</p> <p>Heat from friction causing skin burns</p> <p>Sharp edges of workpieces</p> <p>Mills can also be very loud, which can impact hearing as well as drown out voices and alarms.</p> <p>Rotating machinery presents a serious hazard due to entanglement and crush hazards resulting in lacerations, amputations, and fractures.</p>	<p>CNC Milling Machine Focus Sheet</p> <p>Mills have guards to prevent exposure to cutting heads (spindle and workpiece), flying debris or tools; some are completely enclosed when running.</p> <p>Door enclosure interlock for CNC milling machines.</p> <p>Secure workpiece and tooling parts</p> <p>Wear gloves to prevent exposure to burn hazards or sharp edges. Do not wear gloves when spindle is operating.</p> <p>E-stop</p> <p>Hearing protection</p>

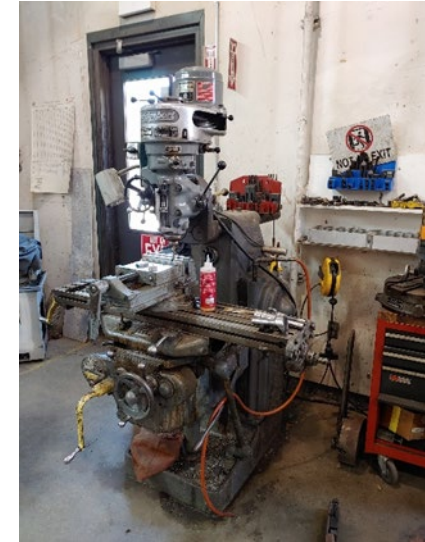


Figure 13: Machine guard for vertical milling machine

Figure 14: CNC Milling Machine

Roller/Bending machine - sheet metal.

Hazards	Safeguards
<p>Manual metal roll machines are designed to form rounded sections from flat pieces of metal. At the point of operation are nip-points between the moving set of rollers. Entanglement can occur if caught between the nip points. Cuts, lacerations, and punctures can result due to contact sharp edges, corners, and burrs. This can occur when feeding the piece of metal and collecting the formed metal piece on the back end of the machine.</p> <p>Power metal rollers can cause severe injuries (crushing, amputation, lacerations) if caught in moving parts. Metal rolling/bending operations can be noisy.</p>	<p>UW Metal Roller SOP Template</p> <p>Metal guards may be impracticable when rolling metal between the rollers.</p> <p>To protect the worker from entanglement injuries a foot-operated pedal is placed away from the point of operation so that the operator does not get too close to the rollers.</p> <p>Use work holding devices such as tongs to hold smaller pieces.</p> <p>An emergency trip wire is placed around (front and back) the machine in front of the rollers and acts as an emergency stop. Access to the trip wire must be readily accessible and the machine must be manually reset if safety trip wire is activated.</p> <p>Gloves should not be worn unless they are fingerless.</p> <p>Hearing protection may be required to address high noise hazards.</p>



Figure 15: Power sheet metal roller/bending machine



Figure 16: Manual sheet metal roller/bending machine

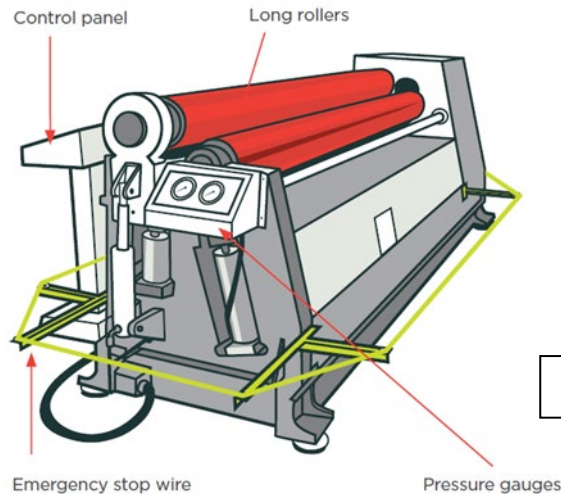


Figure 17: Powered roll bender machine

Table saw

Hazards	Safeguards
<p>Many serious injuries (severe cuts/amputations) are the result of using the table saw without the point-of-operation guarding. These injuries are often a direct result of operating an unguarded machine in combination with other hazardous practices, such as placing hands very close to the blade to guide stock (e.g., not using a push stick to guide stock through a cut), not firmly holding the stock causing the hands to slip off, diverting attention away from the cut (e.g., focusing on something other than the cutting operation), or removing small scraps (tailings) or finished pieces of stock from around the blade while the blade is moving. Exposure to the blade underneath the table and kickback from the stock being caught and thrown back at the operator are other hazards. Wood dust and particulates High noise</p>	<p>UW Table Saw SOP Template</p> <p>There are three guards needed on a table saw:</p> <ul style="list-style-type: none"> • a self-adjusting guard over the blade; • an anti-kickback guard; and • a guard or cover below the table to protect exposure to moving parts. <p>The top of the teeth of the table saw blade shall not extend 1/4 inch above the material being cut. A push stick/block must be used when the stock being cut is small.</p> <p>Dust collection system Hearing protection Do not wear gloves due to entanglement hazard.</p>



Figure 18: Table saw unguarded (Art shop 115)

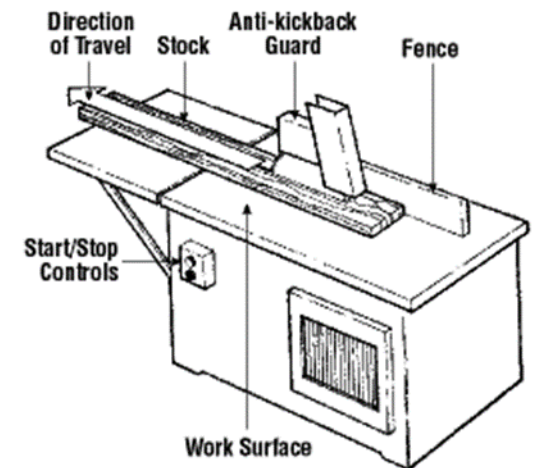


Figure 19: [Table saw](#) with self-adjusting blade and anti-kick guard, and fence

Vertical band saw

Hazards	Safeguards
<p>The fast-moving blade can result in cuts, lacerations, amputations at the point of operation.</p> <p>Any gloves, loose fitting clothing, dangling jewelry, long hair can get entangled and cause severe injury.</p> <p>Rotating blade pulleys – pinch points, entanglement</p> <p>Flying objects (chips, particulates) – eye, face, skin injuries</p> <p>Kickbacks if the stock binds the blade.</p> <p>High noise can result when cutting metal.</p>	<p>UW Band Saw SOP Template</p> <p>Guard the blade as much as possible. Adjust the blade guard between 1/8 inch and 1/4 inch above the workpiece. This will help stabilize the blade.</p> <p>Fully enclose the entire blade pulley system.</p> <p>E-stop, accessible single action hand switch, or foot-operated switch</p> <p>Anti-restart mechanism to prevent automatic restart if power is lost.</p> <p>Blade plus extension, if needed</p> <p>Support longer workpieces to prevent tipping during cutting operation.</p> <p>When cutting a smaller piece of stock, utilize a push stick/block to push the workpiece through.</p> <p>Keep table and point of operation clean and free of obstructions.</p> <p>Dust collection system</p> <p>Hearing protection</p> <p>Do not wear gloves due to entanglement hazard</p>

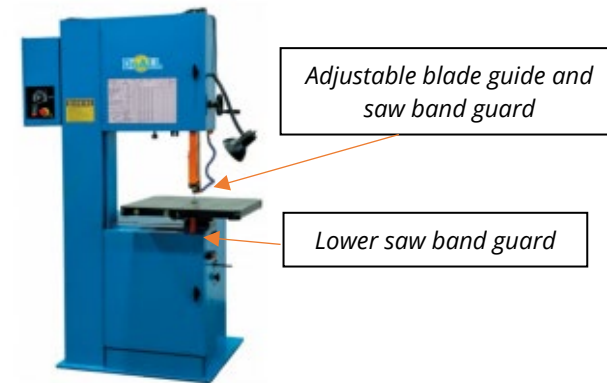


Figure 20: Vertical Band Saw
[OSHA](#)

Visit the [Shop and Maker Space Safety page](#) on the EH&S website or contact ehshop@uw.edu for more information.