

MACHINE SHOP SAFETY PLAN

INTRODUCTION

In the academic teaching and research environment, machine shops pose a unique set of challenges in terms of risks to users. The current safety protocols established by the Center for Environmental Health and Safety do not specifically address these risks or associated hazards. The purpose of this Machine Shop Safety Plan is to provide guidance to all students and employees in the _____ (**Name of work unit**) at Southern Illinois University (SIU) Carbondale who work with machining tools and equipment in order to ensure a safe and productive work environment.

The Dean (or supervisor, responsible party, etc.) will designate and authorize an individual the Machine Shop Safety Administrator (MSSA). The MSSA will have thorough knowledge of proper machine operation and safe working procedures. The MSSA will manage all activities that impact machine shop safety, including user training, proper use of personal protective equipment, project set up, removal of unsafe machines from service, posting of appropriate signage at work areas, and approval of users in the shop. After a user has gone through basic safety training and training of a specific piece of equipment or machinery, the MSSA will approve individuals to use specific equipment, and maintain records of the training. The MSSA will have the authority to determine who is allowed into the shop. The MSSA will also serve as a liaison to the Center for Environmental Health and Safety.

EMERGENCY PROCEDURE

Immediately contact 9-1-1 via SIU landline or 453-3771 via cellphone to get the Department of Public Safety (DPS).

If a 911 is dialed via cellphone, you will get the state police

Next, report the incident to the MSSA and complete the "Report of Injury/Incident/Hazard Form" on the Center for Environmental Health & Safety (CEHS) website (http://cehs.siu.edu/occupational_health/forms.html)

FILES

A binder will be kept in the machine shops with the following information:

- Machine Shop Safety Plan
- Records of Training
- Annual Inspection Forms

Students will be issued a card that shows their training. Students will be required to have this card on them when they are working in the machine shop.

STUDENT RESPONSIBILITY

- Must use the buddy system when working in the shop
- Must complete the general training and arrange with the MSSA for machine specific training before using any machine.
- Must observe all shop safety rules
- Must report all injuries to the MSSA, regardless of seriousness.
- Must promptly report unsafe conditions, actions or near-miss incidents to the MSSA

SHOP EQUIPMENT HAZARD CLASSIFICATION MATRIX (APPENDIX A)

A hazard analysis of the most common types of equipment used in the _____ (**Name work unit**) has been completed. This analysis has resulted in various pieces of shop equipment being placed into one of three hazard categories: low, medium, or high. The type of equipment present within a given shop will therefore determine the corresponding hazard category.

The matrix located in Appendix A of this document details a number of shop requirements associated with each hazard category. These requirements have been established in order to provide a safe working environment within University shops. The points within the table include the following:

- The three hazard levels (low, medium, and high) are noted at the top of the matrix.
- The “general design” category contains a basic explanation of the size and power of shop equipment categorized in each hazard level.
- The “common examples” category is a listing of the common equipment types that fit the criteria for each hazard level.

GENERAL SAFETY TRAINING

Refer to Appendix C

MACHINE AND EQUIPMENT TRAINING

The following information is provided as a guide for the minimum safety training that shall be provided to personnel prior to authorized use of any machining tools or pieces of equipment. An authorized user must score 100% on the General Safety Training prior to testing on any of the machinery or equipment. An authorized user must score 100% on a safety test in order to use any individual piece of machinery or equipment.

NOTE: Machine shop personnel have been asked to provide a list of basic safety tips for each piece of machinery in their shop.

FAILURE TO FOLLOW MACHINE SAFETY PROTOCOLS

- First time failure to observe all safety procedures will result in a warning.
- Second time failure to observe all safety procedures will result in a loss of access to the machine shop.
- Access can only be reinstated with a petition to and approval by the Dean and Department Chairs (or supervisor, responsible party, etc.).

DEFINITIONS

Adequate Facility – a facility which provides satisfactory clearance, power, light and ventilation

Authorized User – an employee or student who has received both general machine shop safety training and specific machine tool and equipment training administered by the appropriate machine shop personnel

Buddy System – a system designed to protect and assist the user in case of injury. During off-hours when the machine shop is unsupervised, a “buddy” would be present so that, in the event of an injury, emergency assistance is not delayed.

Guard – an enclosure designed to restrain pieces of abrasive wheels, wheel pulley assemblies, or other moving parts or working stock, and to protect the employee in the event of breakage or accidental contact with the moving part.

Machine Shop – a facility which may contain at least one of the following pieces of equipment: drill press, lathe, band saw, table saw, mill, grinder buffer, shear, metal punch, jointer, portable power tools, swing arm saw, radial arm saw, planer, slitter, roll-form machine, cold header, multi-slide machines, drum sanders, belt sanders, splicers and alligator sheers.

Machine Shop Safety Administrator – person designated to maintain the safety of the machine shop.

REFERENCE

This guide is adapted from the best practices outline for the Shop Safety Policy of Columbia University, the Occupational Safety and Environmental Health guidelines for Machine Shop Safety for Academic Departments used at the University of Michigan and the Machine Shop Safety Program at Pennsylvania State University.

Appendix A is attached separately.

Appendix B

General Shop Information

Shop Personnel:

1. The MSSA is _____
2. MSSA contact information (phone and office number) _____
3. The shop supervisor is _____
3. Shop supervisor contact Information is _____
4. Additional contact names and information (If Applicable):

Emergencies:

1. From landline call 9-1-1 or via cell phone call 453-3771
 - Calling 9-1-1 from cell phone will get you the state police.
2. Location of the shop phone(s) (if available) are as follows: _____

Injury:

Life threatening (large cut, uncontrollable bleeding, amputation, head injury, etc.) call 9-1-1 from landline or 453-3771 from cell phone.

Non-Life threatening (small cut, burn, scrape, contusion, etc.) contact MSSA and seek medical treatment (if needed).

Emergency Equipment Location:

1. Fire extinguisher(s) _____
2. First aid kit(s) _____
3. Eyewash/Shower _____

Documentation and Reporting Requirements:

In the event of emergencies and/or injury, a "Report of Injury/Incident/Hazard Form" must be completed (http://cehs.siu.edu/occupational_health/forms.html).

Appendix C

General Shop Safety Training

This document must be reviewed by all authorized users who utilize machine shops. These authorized users will participate in a test and must score 100% in order to have access to the shop.

- Never use a machine if you are not trained. You must pass a basic safety test and specific training on the machine you intend to use.
- Never be too shy to seek help. Always ask if you are unsure about the safe operation of a tool or piece of equipment, or need refresher training.
- Never work without proper eye protection. Safety glasses with side shields must be worn at all time. Eye protection must be labeled with the ANSI Z87 designation.
 - Individuals that wear prescription glasses must 1) use goggles that can fit comfortably over there corrective eyeglasses without disturbing the alignment of the eyeglasses OR 2) use goggles that incorporate corrective lenses mounted behind protective lenses.
- Protect your feet. At a minimum, closed-toed shoes that cover the entire foot must be worn. Do not wear thin fabric shoes, sandals, open toed shoes or high heeled shoes. Tools, chips, and fixtures are sharp and often hot.
- Remove or secure anything you are wearing that might get caught in moving machinery. Do not wear loose clothing, loose neckwear, lanyards, or exposed jewelry while operating machinery. Long sleeves on shirts should be rolled up above the elbows. Pull back and secure long hair.
- Never wear gloves when using rotating equipment. Gloves can become entangled in rotating machine parts and cause serious injury.
- Never work alone in the machine shop. Use the buddy system.
- Never use a machine or equipment when impaired - be sober and smart. This includes prescription drugs.
- Loose objects can become flying particles. Remove all loose items (wrenches, chucks, rags, etc.) from machinery before starting.
- Keep your work area clean and dry. Dispose of all debris and waste materials by placing them in the appropriate containers (e.g. oily rags in approved metal containers, trash in trash can). Remove chips, oil and obstacles that can cause someone to slip or trip. Shop equipment and/or materials must be placed in the proper storage location.
- Machines must be turned off when cleaning debris.
- Never lean on your machine. Stand away when the machine is running.

Appendix C: Continued

General Shop Safety Training

- Never remove safety guards from equipment. You must ensure that all safety guards are in place before using equipment.
- Always keep hands and other body parts a safe distance away from moving machine parts, work pieces, and cutters.
- Report defective machinery, equipment or hand tools immediately to the MSSA. Machinery and equipment must only be serviced by the MSSA.
- Foods and drinks are only allowed in designated areas.
- Horseplay within shop areas is strictly forbidden.

The majority of the equipment in this shop requires further instruction from the MSSA before you are you are allowed to operate the equipment.

Anyone who 1) disregards the shop rules OR 2) works unsafely will have their shop privileges suspended.

I have read the “General Shop Information” and the “General Shop Safety Training” documents and understand that I must follow all the above safety rules when working in this machine shop and not operate any equipment until I have complete the General Safety test.

Student/Employee:

Print: _____

Signature: _____

MSSA

Print: _____

Signature: _____

Recordkeeping information:

- MSSA must keep a copy
- A copy must remain in the machine shop that the student/employee uses.
- A copy must also be provided to the student/employee.

Appendix D

Equipment Specific Safety Training

This form documents that an individual has been trained to operate certain shop equipment.

The procedure is as follows:

1. The trainer must be the MSSA for the _____ (**Name of work unit**) at SIU.
2. The trainee must go through General Shop Safety Training before Equipment Specific Training can take place.
3. The trainer must provide an overview of the equipment and hands-on training, which must include the following:
 - How to properly use the machine, including a description and identification of the hazards associated with the machine;
 - Proper personal protective equipment (PPE) to use, while using the machine;
 - How to use the safeguards and why, including how they provide protection and the hazards for which they are intended;
 - Under what circumstances safeguards can be removed, and by whom (in most cases, repair or maintenance personnel only); and
 - What to do (e.g., contact MSSA) if a safeguard is damaged, missing or unable to provide adequate protection.

This training certification is permanent unless any of the following occur:

1. Changes in the workplace render previous training obsolete.
2. Changes in the type of shop equipment used render previous training obsolete.
3. The operator has been observed using the equipment in an unsafe manner.
4. The operator has been involved in an accident or near miss.

Appendix D: Continued

Tool Specific Safety Training-“Proof of Training”

Initial and date all of the shop equipment that the individual has been trained on and in is permitted to operate.

<u>Tool</u>	<u>Trainer's Initials</u>	<u>Date</u>	<u>Tool</u>	<u>Trainer's Initials</u>	<u>Date</u>
Angle Grinders			Nail Gun (all types)		
Band Saw (Standing)			Open CNC mill		
Belt/Disc Sander (standing)			Planer		
Bench Grinder			Plastic injection molding		
Chop/Miter Saws			Power Press Brake		
Circular Saw			Power Shear		
Drill Press (Bench Top)			Radial Arm Saw		
Drill Press (standing)			Reciprocating Saw (cordless or corded)		
Enclosed CNC Machine			Robot (Fully Enclosed)		
Horizontal Band Saw			Robot (not fully enclosed)		
Hydraulic/Mechanical Power Press			Routers		
Jointer			Shaper/moulder		
Laser cutting			Surface grinder		
Larger than 3/8" drills (cordless and corded)			Table Saw		
Lathes			Vertical Band Saw		
Manual Brake			Water Jet Machining Center		
Manual Shear			Welding/Brazing		
Milling Machines (Bench Top)			<i>Other:</i>		
Milling Machine (Standing)			<i>Other:</i>		

Appendix D: Continued

Tool Specific Safety Training-“Proof of Training”

<u>Student/Employee</u>	<u>MSSA:</u>
Print:	Print:
Sign:	Sign:

Recordkeeping information:

- MSSA must keep a copy
- A copy must remain in the machine shop that the student/employee uses.
- A copy must also be provided to the student/employee.

Appendix E

Machine Guarding Reference Guide

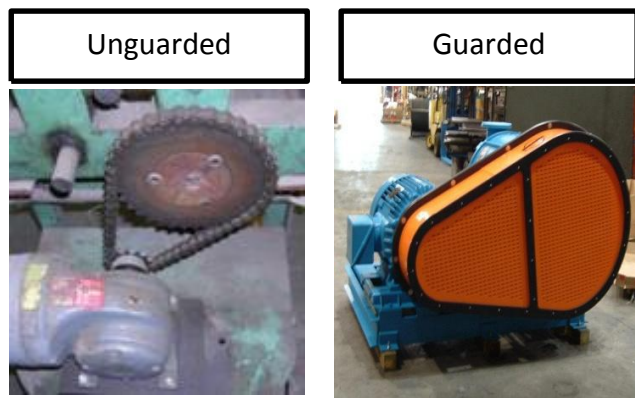
The following are general guidelines regarding machine guarding. In many cases there are more than one way to achieve proper machine guarding. This is not intended to be an all-inclusive list of shop equipment.

Consult with the MSSA, equipment manufacturer and/or CEHS for additional machine guarding information.

Guarding Requirements for All Shop Equipment

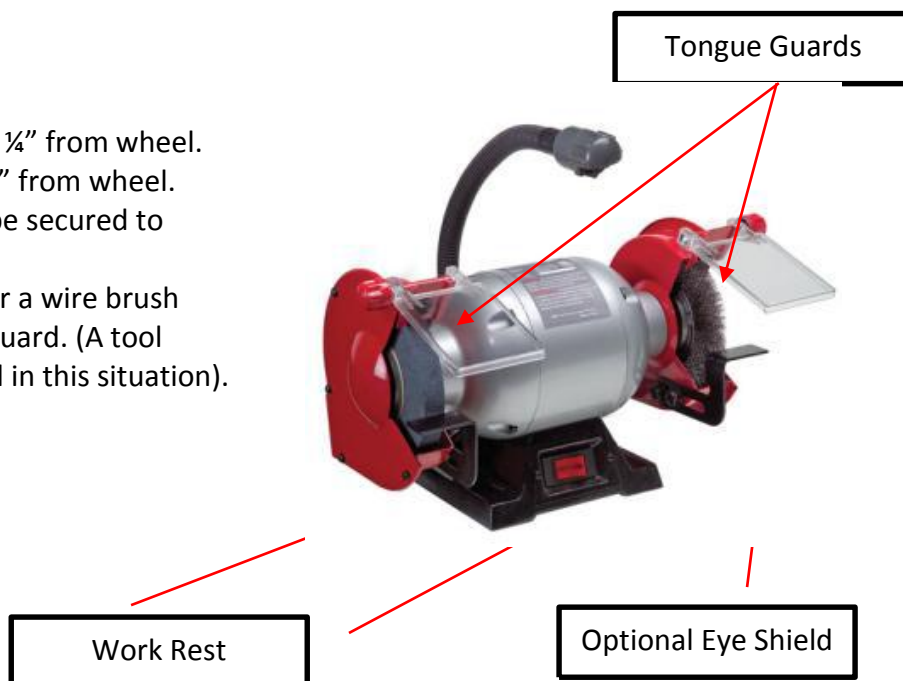
The following points must be adequately guarded on all types of shop equipment:

- **Point of operation**
 - Area where the machine performs work. (An example would be where a saw blade meets the material being cut).
- **Power transmission devices:**
 - Elements of mechanical system that transmits energy. (Examples would include flywheels, belt, chains and pulleys).
- **Other moving parts:**
 - Other parts of the machine that move when the machine is in cycle.



Bench Grinder

- Guarding Requirements
 - Adjustable tongue guard ¼" from wheel.
 - Adjustable work rest 1/8" from wheel.
 - Bench grinder needs to be secured to work surface.
 - The required guarding for a wire brush attachment is a tongue guard. (A tool rest is not recommended in this situation).



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- Safe Work Practices
 - Grinding wheel must be dressed to prevent a ridge from forming
 - Perform a ring test before mounting an abrasive wheel.
 - The abrasive wheel must not be used if a dull sound is noted.
 - If the grinding wheel is cracked, do not use it because it could shatter.



Grinder Dresser
Tool

Band Saw

- Guarding Requirements
 - Adjustable guard. Set the guard as close as possible to the stock.

Blade Guard



Milling Machine

- Guarding Requirements
 - Point of operation guard.



Point of operation
guard

Belt/Disc Sander

- Guarding Requirements
 - Fixed guards at pinch and nip points.

Fixed Guards



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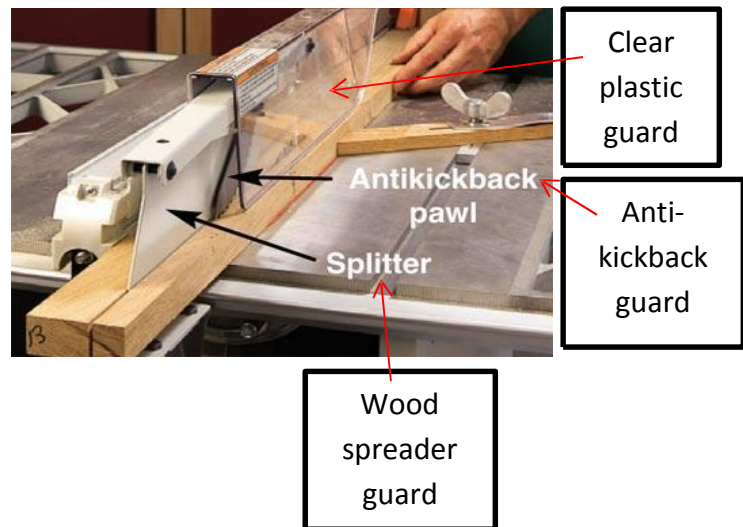
Angle Grinders

- Guarding requirements
 - A fixed guard must be on the grinding wheel enclosing one-half or 180° of the grinding wheel.



Table Saw

- Guarding Requirements
 - There are three guards needed on a table saw: a wood spreading guard, anti-kickback guard and a self-adjusting guard over the blade.
- Safe Work Practices
 - A push stick must be used when the stock being cut is small.
 - The top of the teeth of the table saw blade shall not extend ¼" above the material being cut.



Saw Stop – Table Saw

- Guarding Requirements
 - The guarding requirements for a "Saw Stop" table saw are the same as those for a standard table saw.

Saw Stop Table Saw



Appendix E

Radial Arm Saw

- Guarding Requirements
 - A self-adjusting guard below the blade
- Safe Work Practices
 - The radial arm saw must be returned to the original position after a cut is finished.
 - Saw should only be used for cross cutting. A table saw is a better tool for ripping

Self-adjusting guard



Jointer (manual)

- Guarding Requirements
 - Self-adjusting blade guard.
- Safe Work Practices
 - If the wood stock is small, use a push stick to feed the stock.

Self-adjusting blade guard



Planer/Moulder (Automatic)

- Guarding Requirements
 - Cutter heads must be completely enclosed, except for the opening needed to feed the stock into the tool.

Completely enclosed



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Circular Saw

- Guarding Requirements
 - Self-adjusting blade guard.
- Safe Work Practices
 - If the saw cut is stopped before the cut is finished, the saw must be turned off before being removed. If the saw is pulled out before stopping, kickback could occur.

Self-adjusting blade guard



Routers

- Guarding Requirements
 - Self-adjusting guard above cutting bit on bench version. Fixed guard on hand held version.

Self-adjusting blade guard



Welding and Brazing

- PPE
 - Fire resistance clothing
 - Coat
 - Pants
 - Welding helmet or tinted face shield
 - Tinted number depends on what type of welding or torch is being used.
 - If face shield is used, safety glasses are required.
 - Leather gloves
 - Heat resistant
 - Respiratory Protection (site specific)
- Safety Work Practices
 - Oxygen and acetylene cylinders must be secured to a cart by using a chain or webbing strap.

Oxygen Acetylene Torch



- If a cylinder does not have a regulator attached, it must be capped.
- Inspect work area for any combustibles.



Stick Welding

Chop/Miter saws

- Guarding Requirements
 - Both saws must have self-adjusting blade guards.
- Safe Work Practices
 - Only use the recommended blade based on size and revolutions per minute (RPM)

Chop Saw-self adjusting guard



Miter Saw –self adjusting guard



Reciprocating Saw

- Guarding Requirements
 - Must be equipped with hand/finger guard.



Hand/finger guard

Jig Saw

- Guarding Requirements
 - Upper portion of the blade, above the tool rest, must be guarded.

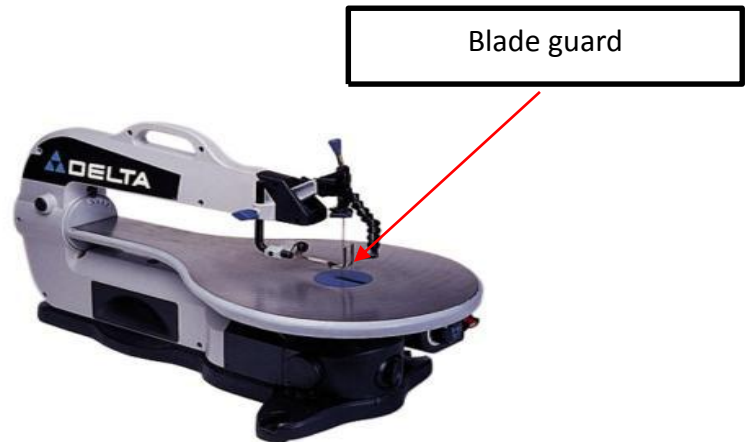
Blade guard



Appendix E

Scroll Saw

- Guarding Requirements
 - Blade guard



Power Press Brake

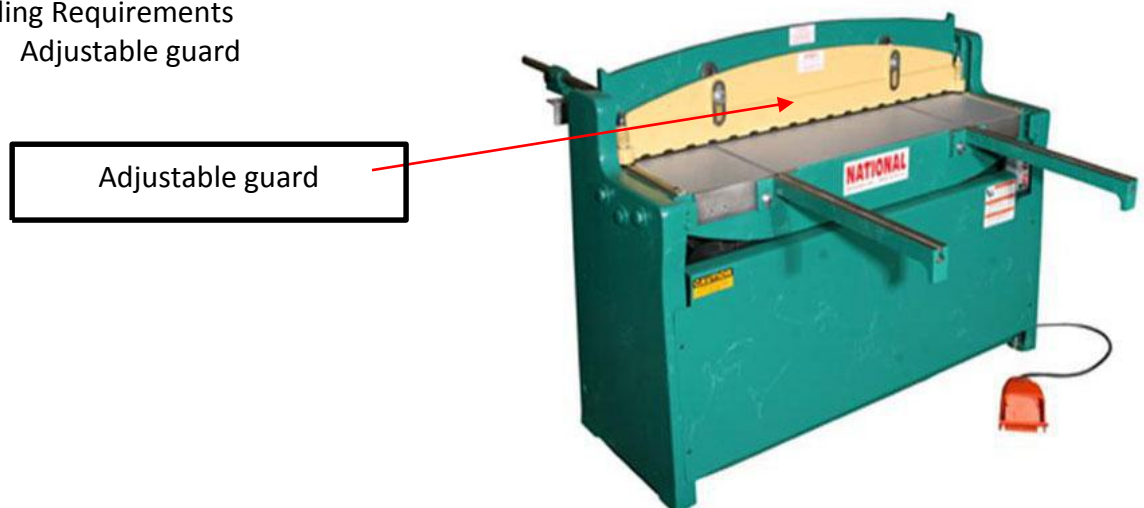
- Guarding Requirements
- Note: There are many different methods which can be used to effectively guard this equipment. They are listed below. The best means of guarding will depend on how the press brake is used.
 - Moveable barrier guards
 - Fixed guards
 - Presence-sensing devices
 - Pull back devices
 - Restraint devices
 - Two-hand trip devices

This press is equipped with a properly designed two-hand control



Power Shear

- Guarding Requirements
 - Adjustable guard

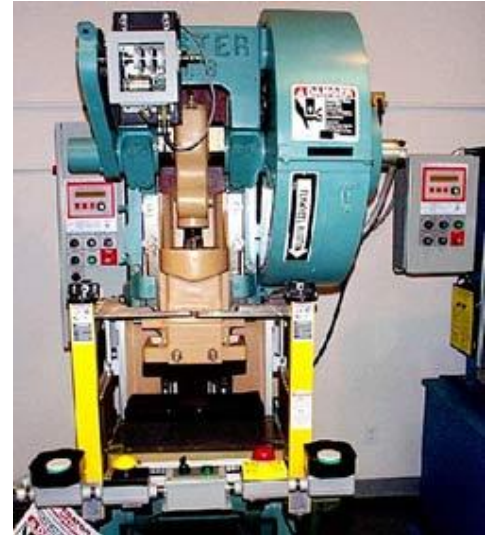


Appendix E

Power Press (Mechanical and Hydraulic) (Part Revolution and Full Revolution)

- Guarding Requirements
 - Note: Depending on the size and type of power press a variety of guarding methods are available. The following are examples of such methods. Contact the equipment manufacturer for consultation.
 - Point of operation guard
 - Pull back device
 - Restraint device
 - Gate type guards (A and B types)
 - Two-hand trip
 - Two-hand control
 - Presence-sensing device
- Safe Work Practices
 - Operators must never place their hands in the die area (point of operation) while performing normal production operations.
 - Hand tools designed for freeing or removing work or scrap pieces from the die must be used.
 - OSHA has a specific standard on Mechanical Power Presses. (CFR 1910.217 – Mechanical Power Presses)

Mechanical Power Press



Hydraulic Power Press

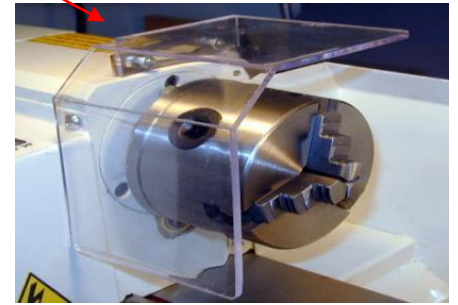
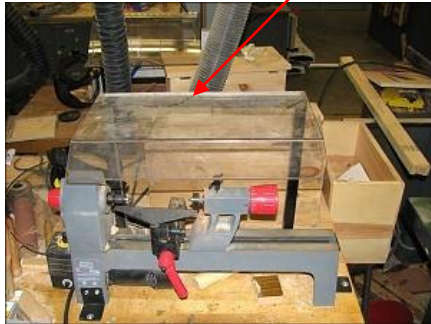


Lathe (Automatic and Manual) (Wood and Metal)

- Guarding Requirements
 - A guard over the chuck.
 - For lathes used for turning long stock, a guard over top of the stock.
- Safe Work Practices
 - Tie back hair and no loose clothing so it doesn't get caught on the spinning chuck.
- After making adjustments to the machine, remove the

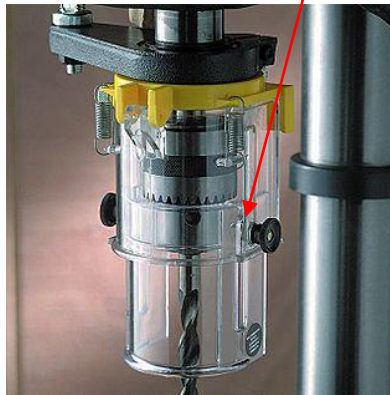


chuck key.



Drill Press

- Guarding Requirements
 - Chuck guard
- Safe Work Practices
 - Small material being cut shall be clamped to prevent any spinning.
 - The drill press machine must be secured so it will not “walk”.



Milling Machine

- Guarding Requirements
 - Adjustable or permanent chip/coolant shield
- Safe Work Practices
 - Tie back hair and no loose clothing so it doesn't get caught on the spinning chuck.
 - Do not allow large quantities of chips to accumulate around the work piece or machine table.



Appendix E

Compressed Air Tools

- Guarding requirements
 - Safety tips must be installed to relieve air pressure in the event the nozzle is “dead-ended”.
 - Air pressure must be less than 30 PSI when using compressed air for cleaning.
- Safe Work Practices
 - Compressed air tools shall never be used to remove dirt from clothing or skin.

Safety Tip

