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AUTHORITY CITATIONS
CCR, Title 8, § 4184-4647  OSHA 3170-02R, 2007
CFR, Title 29, § 1910, Subparts O, P, Q  CFR, Title 29, § 1926, Subpart I

PURPOSE
The purpose of the machine guarding/shop safety program is to establish procedures for safe use and care of the equipment within the shops of Coast Community College District (CCCD). The program applies to all areas where welding, metal cleaning, paint spraying, and various types of fabrication and equipment are used. Additionally, safety measures and engineering controls are incorporated into the program to minimize machine shop hazards.


HAZARDOUS ACTIVITIES
Users which operate and care for machinery perform various activities that present potential amputation hazards include the following.

- Set-up/threading/preparation
- Inspection
- Production and operations
- Clearing jams
- Adjustments
- Cleaning
- Lubricating machine parts
- Scheduled and unscheduled maintenance

Mechanical Motions
Rotating motion: a circular motion such as action generated by rotating collars, couplings, cams, clutches, flywheels, shaft ends, and spindles that may grip clothing or otherwise force a body part into a dangerous location. Even smooth surfaced rotating machine parts can be hazards. Projections such as screws or burns on the rotating part increase the hazard potential.
Reciprocating motion: back-and-forth or up-and-down motion that may strike or entrap an employee between a moving part and a fixed object.

Transversing motion: motion in a straight, continuous line that may strike or catch a user in a pinch or shear point created by the moving part and a fixed object.

Cutting action: action that cuts material and the associated machine motion may be rotating, reciprocating, or transverse.

Punching action: action that begins when power causes the machine to hit a slide (ram) to stamp or blank metal or other material. The hazard occurs at the point of operation where the employee typically inserts, holds, or withdraws the stock by hand.
**Shearing action:** action that involves applying power to a slide or knife in order to trim or shear metal or other materials.

**Bending action:** action when power is applied to a slide to draw or stamp metal or other materials in a bending motion.

**In-running nip points:** nip points or “pinch points” develop when two parts move together and at least one move in rotary or circular motion. In-running nip points occur whenever machine parts move toward each other or when one part moves past a stationary object. Typical nip points include gears, rollers, belt drives, and pulleys.
EQUIPMENT OPERATIONS

A. Band Saw
   • Adjustable guards should be kept as close over the point of operation as the work permits.
   • When a band breaks, shut off the machine and stand clear until the machine has stopped.
   • Never stop a machine by pushing material against the band.

B. Circular Saw
   • Stand to one side -- never directly in line -- with work being fed through saw.
   • A rip saw shall not be used for cross cutting nor shall a crosscut saw be used for ripping.
   • See that saw is in good condition before using it. This means sharp, unbroken, free from cracks, and the proper saw for the job.
   • Never reach over the saw to obtain material from the other side.
   • Never oil the saw or change the gauge while the machine is running.
   • Do not allow material to accumulate on saw table. Keep the floor free from slipping and stumbling hazards.
   • When shutting off power, never stop the saw quickly by thrusting a piece of wood against it. Be sure the saw has stopped before leaving it.
   • A pusher stick shall be used whenever the size of shape of the piece requires the hands to be near the blade of the saw.
   • The appropriate guards must be kept in place at all times.
   • **Speed of saw:** The peripheral speed of circular saws shall not exceed 12,000 feet per minute unless the saw has been manufactured or hammered for a higher speed and is so marked. The following table shows revolutions per minute for various diameters of saws when the peripheral speed is 12,000 feet per minute.

C. Drill Press
   • When drilling, tapping, or reaming material, see that it is securely fastened by blocks or clamps so that it cannot spin or climb the drill. In no case should the operator rely on his hand to secure the material from turning.
   • When tightening drill or chuck of drill press be sure to remove release key before starting the machine.
   • Run the drill only at the correct speed. Forcing or feeding too fast may cause broken drills and result in serious injury.
   • An operator should never attempt to loosen the chuck of a tapered shank drill unless the power is turned off.
• When chucks are being removed from the spindle, the spindle should be lowered close to the table so the chuck will not fall.
• Never use the hands to remove drilling from the work.

D. Grinding
• All abrasive-wheel machinery shall be equipped with appropriate guards.
• Abrasive wheels shall be provided with protection hoods, which shall be of such design and construction as to effectively protect the employees from flying fragments of a bursting wheel insofar as the operation will permit.
• EXCEPTIONS. This requirement does not apply to the following classes of wheels and conditions:
  o Wheels 3 inches or less in diameter running at a peripheral speed not exceeding 3000 feet per minute
  o Mounted wheels, i.e. small wheels, usually 2 inches or less in diameter and of various shapes, which are securely and permanently mounted on the end of a steel spindle, mandrel or quill by cementing or other means. In use the spindle (mandrel or quill) is held in a chuck on the end of the grinding machine spindle
  o Threaded hole wheels (except cup-type), i.e. pot balls and other shapes, such as cones or plugs having a blind threaded hole, operating at normal speed and used for offhand cleaning of holes and corners
  o Special precision tool room grinders under the supervision of expert mechanics.
• Wear cup-type safety goggles or cover goggles (or face shield) over safety glasses when grinding.
• Grinding wheels shall be equipped with tool rests which are set not more than one-eighth inch from the stone.
• The side of an emery wheel shall not be used for grinding unless it is a special type wheel for that purpose.
• Stand to one side when starting up a machine and do not exert great pressure on the wheel until it has had time to warm up.
• Report to your supervisor immediately any broken, cracked, or otherwise defective wheel.
• Mounting a new wheel should be done only by an experienced person.
• Never use a wheel that has been dropped or has received a heavy blow, even though there is no apparent damage. The wheel may be weakened to point where it may fly apart.
• An abrasive wheel shall not be operated at a speed in excess of that recommended by the manufacture of the wheel.

E. Joints and Planar
• Stand to one side -- never directly in line -- with work being fed through the machines.
• When pieces shorter that 18 inches are machined, a safety pusher of suitable design shall be used.
• Do not take too heavy a cut as this will cause a kickback.
• Jointers
  o All jointers shall be equipped with cylindrical cutting heads.
  o A suitable guard which will automatically adjust itself to cover that portion of the cutting head not protected by material in process shall be used. The guard shall be capable of protecting the entire length of the cutting space in the table.
  o The exposed portion of the cutting head at the rear of the fence shall be covered.
  o Where equipped with automatic feed, the feeding mechanism shall be guarded.
  o Where knives are exposed beneath the table, they shall be guarded.
F. Lathe
- A chuck or face plate should never be put on a lathe by power operation.
- Make sure that all gear and belt guards are in place.
- Keep hands off chuck rim when lathe is in motion.
- Do not attempt to adjust a tool while the lathe is running.
- Never apply a wrench to revolving work or parts.
- Always use a brush to remove chips - never the hands.
- After adjusting the chuck remove the chuck wrench immediately.

G. Sanders
- Belt sanders shall have both pulleys and unused run of the sanding belt enclosed. Rim guards will be acceptable for pulleys with smooth disc wheels, provided that on-running nip points are guarded. Guards may be hinged to permit sanding on the pulley.
- Disc sanders shall have the periphery and back of revolving disc guarded, and the space between revolving disc and edge of table shall not be greater than one-quarter inch.
- The exposed parts of the drum, except that portion where the material comes in contact with the abrasive surfaces, shall be guarded.
- Feed rolls and pressure rolls shall be enclosed, except such part as may be necessary to feed stock.

H. Silver Soldering
- Provide exhaust ventilation, the worker should wear an approved respirator with a high efficiency particulate filter.
- Safety glasses should be worn when soldering with a torch.

I. Welding

General
- Only employees authorized by their supervisors can perform welding or burning.
- Personnel operating welding, cutting, or brazing equipment shall be instructed and judged competent by the supervisor before being allowed to operated equipment.
- When welding or cutting equipment is used away from authorized welding areas, a Hot Work Permit shall be secured from Environmental Health and Safety.
- Proper eye protection and protective clothing shall be worn by welders and their helpers. Adequate ventilation and respiratory protection shall also be provided. Environmental Health and Safety shall specify the appropriate type of protective equipment.
- Hot work with metals that are coated or fluxed with zinc, lead, fluorine, beryllium, and cadmium or their compounds requires local exhaust ventilation and/or approved respiratory equipment. EH&S shall specify the need for ventilation.
- Welding and cutting operations in areas containing flammable or combustible liquids, vapors, or dusts or on, or inside closed tanks or containers which have held such material require special precautions. EH&S shall ensure that the premises have been thoroughly ventilated before work begins, and if necessary, shall test for the presence of flammable vapors or gas before allowing welding or cutting operations to proceed. Hot work inside a confined vessel requires respiratory protection and is subject to the requirements of Confined Space Entry Program.
- Hot work on closed containers that have held flammable or combustible liquids is prohibited.
• Arc welding or cutting in or around vapor degreasing operations that use chlorinated solvents can produce toxic gas. Approval shall be obtained from EH&S before work begins.
• Workers or other persons adjacent to welding areas shall be protected from the rays by noncombustible screens or shields or shall be required to wear appropriate goggles.

Fire Prevention
• Cutting or welding shall be permitted only in areas that are or have been made firesafe.
• Where combustible materials such as wood shavings are on the floor, the floor shall be kept clean for a radius of 35 feet. Combustible floors shall be covered with sand or protected by fire resistant shields.
• Where objects to be welded or cut are not movable and fire hazards cannot be removed, then guards shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards and nearby personnel.
• A portable fire extinguisher rated for the hazards at the worksite shall be kept within easy reach of the welder.
• A fire watch shall be maintained for 30 minutes after any welding or cutting operations to detect and extinguish smoldering fires.

MACHINE GUARDING
Machines that have a grinding, shearing, punching, pressing, squeezing, drawing, cutting, rolling, mixing or similar action in which a user comes within the danger zone shall be guarded at the point of operation in one or a combination of ways that will provide protection for the user. In general, machine guards must not create potential hazards and must be attached to the machine where possible, and if the guards cannot be attached to the machine, they are to be attached elsewhere. The following are a list of general requirements for common equipment that require machine guards.

• Guarding devices must be in conformity with any appropriate standards.
• 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.
• Special hand tools 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.
• Guillotine cutters, shears, alligator shears, power presses, milling machines, power saws, jointers, portable power tools, and forming rolls generally require point of operation guarding.
• 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.
• 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 (½) inch.
• A machine designed for a fixed location must be securely anchored to prevent walking or moving.
• Eye and face protection must be provided to each employee when exposed to eye or face hazards from flying particles.
• Lockout/tagout methods must be implemented to protect users from the energy source.

Point of Operation: operation where work is performed on the material such as cutting, shaping, boring, or forming a stock.

Power-Transmission Device: all components of the mechanical system which transmits energy to the parts of the machine performing the work. These components include flywheels, pulleys, belts, connecting rods, couplings, cams, spindles, chain, cranks, and gears.

Operating Controls: other parts on the machine which move when the machine is in operation. These moving parts can be reciprocating, rotating, or transverse.
### Types of Machine Guards

<table>
<thead>
<tr>
<th>Type</th>
<th>Method of Safeguarding</th>
</tr>
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<tbody>
<tr>
<td>Fixed</td>
<td>Barrier that allows for stock feeding but does not permit operator to reach the danger area.</td>
</tr>
<tr>
<td>Adjustable</td>
<td>Barrier that adjusts for a variety of production operations.</td>
</tr>
<tr>
<td>Self-Adjusting</td>
<td>Barrier that moves according to the size of the stock entering point of operation. Guard is in place when machine is at rest and pushes away when stock enters the point of operation.</td>
</tr>
<tr>
<td>Interlocking Barrier Guards</td>
<td>Shuts off or disengages power and prevents machine start-up when guard is open. Should allow for inching of machine.</td>
</tr>
<tr>
<td>Pullback Devices</td>
<td>Cords connected to operator's wrists and linked mechanically to the machine automatically withdraw the hands from the point of operation during the machine cycle.</td>
</tr>
<tr>
<td>Restraint Devices</td>
<td>Wrist are connected by cords and secured to a fixed anchor point which limits operator's hands from reaching the point of operation at any time.</td>
</tr>
<tr>
<td>Presence-Sensing Devices</td>
<td>Interlock into the machine's control system to stop operation when the sensing field (photoelectric, radio frequency, or electromagnetic) is disturbed.</td>
</tr>
<tr>
<td>Presence-Sensing Mats</td>
<td>Interlock into machine's control system to stop operation when a predetermined weight is applied to the mat. A manual reset switch must be located outside the protected zone.</td>
</tr>
<tr>
<td>Two-Hand Control</td>
<td>Requires concurrent and continued use of both hands, preventing them from entering the danger area.</td>
</tr>
<tr>
<td>Two-Hand Trip</td>
<td>Requires concurrent use of both hands, prevents them from being in danger area when machine cycle starts.</td>
</tr>
<tr>
<td>Type “A” Gate</td>
<td>Applicable to mechanical power presses. Provides barrier between danger area and operator (or other employees) until completion of machine cycle.</td>
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<tr>
<td>Type “B” Gate</td>
<td>Applicable to mechanical power presses and press brakes. Provides a barrier between danger area and operator (or other employees) during the down stroke.</td>
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### GENERAL SHOP RULES

- Appropriate eye/face protection must be worn while employees are in designated areas or during the performance of hazardous operations. All eye/face protection must conform to American National Standards Institute (ANSI Z87.1)
- Safety glasses shall be worn in areas where there is a risk of eye injury from flying particles or sharp projections.
- Chemical splash goggles with baffled vents shall be worn in all areas where there is a limited risk of chemical splashing.
- Safety goggles of the appropriate optical density shall be worn in the presence of injurious radiation from welding operations.
  - Safety Shields must be worn in areas where there is substantial risk of chemical splashing and injury to the eye and face due to flying particles or projectiles.
- The following sign must be posted where eye protection is required: **“CAUTION: EYE PROTECTION REQUIRED”**
- Employee shall only operate equipment he/she has been trained on and authorized.
• Foot protection (steel-toe safety shoes) should be worn where there is a possibility of dropping heavy objects. Closed-toed stable shoes shall be worn in machine shops, laboratories, and all assembly areas. Spike heels, sandals, or open-toed shoes are not permitted in these areas.
• Heat-resistant leggings with metatarsal protection shall be worn where molten metals are poured.
• Heat-resistant aprons or clothing shall be worn in areas exposed to intense heat or molten metal.
• Gloves shall not be worn around rotating equipment such as lathes, bandsaws, etc.
• Work clothing must not present a safety hazard. Shorts, loose or bulky clothing is not permitted.
• Safety signs must be observed.
• Appropriate hard hats must be worn on all construction sites, areas with overhead hazards, and on high-voltage electrical work.
• Do not wear finger rings when working with machinery.
• Loose fitting clothing, ties, or gloves must not be worn around moving machinery.
• Long hair must be tied back so it does not swing freely.
• All machines must be operated with machine guards and shields in place.
• Keep fingers clear of point of operation of machines by using special tools or devices, such as push sticks, hooks, pliers, etc.
• Keep the floor around machines clean, dry, and free of tripping hazards. Do not allow turnings to accumulate.
• Machines designed for a fixed location shall be securely anchored to prevent shifting or movement.
• All equipment shall be equipped with adequate means, whereby the operator can disconnect the power promptly in case of emergency (lockout/tagout).

DIVISION OF RESPONSIBILITIES

EH&S Office
The EH&S Office is responsible for the implementation and maintenance of this program as described above including the following.
• Monitor work areas and assess the need for local exhausted ventilation systems, fire hazards, and Personal Protective Equipment (PPE)
• Provide training and maintain adequate documentation
• Inspect safety guards to ensure their stability and protection
• Recommend any safety procedures to supervisors and departments

Maintenance and Operations
The Maintenance and Operations department for each CCCD facility are responsible for the provisions in this program which include the following.
• Assure that only authorized personnel operate the appropriate equipment they have been trained on
• Provide training and appropriate PPE to employees that are expected to use power or hand tools
• Ensure that machine shop equipment is maintained properly
• Report and address any malfunctioning equipment to all employees

Employees
Employees are responsible for understanding the content in this program as well as the following.
• Receive proper training with documentation of understanding this program as well as PPE and Lockout/Tagout
• Report equipment deficiencies to supervisors
• Observe all safety regulations relative to the machine
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<th>Notes</th>
<th>Author</th>
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<td>10/1/1993</td>
<td>Program created</td>
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<td>8/11/2014</td>
<td>Program revision; forms created</td>
<td>Kevin Pegg</td>
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APPENDIX A: Jointers and Planers

JOINTERS AND PLANERS

What should you do before using jointers and planers?
Jointers and planers can be dangerous if not used properly.
- Read the owner’s manual carefully.
- Make sure you understand instructions before attempting to use any tool or machine.
- Learn the applications and limitations before use.

What should you check before starting your machine?
- Are the knives set for the proper clearance and depth of cut? Are they sharp, balanced, and fastened securely?
- Is the fence anchored in the proper position?
- Can the guard (swing or overhead) move freely and return over the cutting head?
- Is the equipment properly lubricated?
- Are the parts or accessories in proper working condition?

What safety procedures should you follow when using jointers and planers?
- Wear safety glasses or goggles. Wear hearing protection when necessary.
- Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area.
- Allow only experienced and trained personnel to operate jointers and planers.
- Use only sharp, balanced and joined knives.
- Replace old square cutting heads with round heads as they are much safer.
- Ensure start and stop buttons are within easy and convenient reach of the operator.
- Make sure the swing guard pushes beside the stock as it passes over the cutting heads and returns against the fence after the stock is removed.
- Remove all wrenches and tools used in the set up from the table.
- Provide a minimum clearance of at least 3 feet greater than the length of the longest stock being worked.
- Construct hold-down push blocks to do beveling and surface operations.
- Use hold-down (double-handed) push blocks. This keeps hands well away from the cutting head.
- Maintain an adequate amount of downward and forward force with push blocks as the knife blades on a revolving cutting head can take the stock from an operator’s hands.
What should you avoid when using a jointer or planer?

- Do not leave the machine running unattended. Shut off the power and make sure that the cutting head has stopped revolving.
- Do not make cuts deeper than .3 cm (1/16") in one pass.
- Do not join (edge) stock of pieces less than 30 cm (12") long, 2 cm (3/4") wide and less than .6 cm (1/4") thick.
- Do not surface stocks less than 30 cm (12") long, 2 cm (3/4") wide or more than 15 cm (6") wide or less than 1.5 cm (5/8") thick.
- Do not pass hands over the cutters.
- Do not remove dust or particles of wood from a table by hand or with compressed air. Use a stick or brush.

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APPENDIX B: Miter Saw

MITER SAW

What should you do before using a miter saw?
- Miter saws can be dangerous if not used properly.
- Read the owner’s manual carefully.
- Make sure you know and understand the instructions before attempting to use any tool or machine.
- Learn the applications and limitations before use.

What safety precautions should you follow when using a miter saw?
- Wear safety glasses or a face shield. If work is dusty, use a respirator or dust mask.
- Wear appropriate hearing protection.
- Attach the saw firmly on a workbench or other rigid frame and operate saw at waist height. The saw can also be taken to remote locations by mounting it on a piece of plywood 13 mm (1/2 in.) or thicker. This must be clamped to a waist high work surface on the job site with large "C" clamps.
- Keep one hand on the trigger switch and handle and use the other hand to hold the stock against the fence.
- Keep hands out of the path of the blade.
- Keep guards in place and in working order.
- Remove adjusting keys and wrenches.
- Use a crosscut or combination blade.
- Ensure that the blade rotates in the correct direction.
- Ensure that the blade and arbor collars are secure and clean. Recessed sides of collars should be against blade.
- Keep blade tight, clean, sharp and properly set so that it cuts freely and easily.
- Allow motor to reach full speed before cutting.
- Follow instructions for lubricating and changing accessories.
- Keep the work area clean. Cluttered areas and benches invite accidents.
- Keep the work area well lit.
- Reduce the risk of unintentional startup. Make sure saw switch is in OFF position before plugging in.
- Unplug tools before servicing and when not in use.
- Check for damage. Repair or replace damaged parts.
- Keep motor air slots clean and free of chips.
- Use only the accessories designed for the specific saw and job.

What should you avoid when using a miter saw?
- Do not operate the saw on ground.
- Do not cut pieces smaller than 20 cm (8 in.) in length.
- Do not cut “free hand.” The stock should lie solidly on the table against the fence.
- Do not reach around or behind the saw blade.
- Do not take your hand away from the trigger switch and handle until the blade is fully covered by the lower blade guard.
- Do not overreach. Keep proper footing and balance at all times.
- Do not force the saw. The saw cuts better and more safely at the rate for which it was designed.
- Do not leave the saw until it has stopped completely. Turn the power off and unplug the saw.
• Do not use electric tools in damp or wet locations.
• Do not operate electric tools near flammable liquids or in gaseous or explosive atmospheres. Sparks may ignite fumes.

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APPENDIX C: Push Sticks

PUSH STICKS

When should you use push sticks?
Push sticks or push blocks should be used when operating standard woodworking machinery, including table saws, band saws, radial arm saws, jointer/planers and shapers. These sticks protect the hand while allowing good hand control of the stock as it is pushed through the cutting head or blade. Push blocks for Jointer/Planers should be constructed for two-handed positioning.

What are some features of a push block?
Hold-down push blocks should:
- Be rigid
- Enable the operator to protect both hands
- Allow the operator to exert a firm and steady pressure on the work piece.

Examples of Push Blocks
Simple push sticks are useful on table saws when the distance between the blades and fence is narrow.

Double-handed-hold down push block

Frontal and Side push blocks

Two push blocks on a single application
APPENDIX D: Radial Arm Saw

RADIAL ARM SAW

What should you do before using a radial arm saw?

- A table saw can be dangerous if not used properly.
- Read the owner’s manual carefully.
- Make sure you understand instructions before attempting to use any tool or machine.
- Learn the applications and limitations before use.

What safety procedures should you follow when using a radial arm saw?

- Wear safety glasses or a face shield.
- Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area.
- Feed stock against the direction of the blade (the blade should move downward when viewed by the operator).
- Only use saw blades rated at or above the speed of the saw arbour. (An arbour is the attachment from motor to blade)
- Use only the accessories designed for that specific saw and application.
- Ensure the guard consists of two parts
  - Upper hood type that covers the arbour
  - Lower guard that rides on the stock, adjusting automatically to the thickness being cut
- Stand on the handle side when cross cutting. Pull the cutting head with the hand nearest the handle and maneuver the stock with the other hand.
- Make sure the hand holding the stock is never in line with the blade.
- Return the cutting head completely to the back of the saw table after each cut. The saw should be designed so that the blade will not move forward under its own weight or if the machine is vibrating.
- When ripping, make sure that the overall length of the saw table (both in-feed and out-feed) is twice the length of the longest pieces of lumber.
- When ripping, make sure that the stock is fed against the direction of the blade (from the side where the saw blade rotates upward toward the operator). The blade should extend slightly into the table. The motor head must be locked at the correct height and angle.
- Clamp stock to the table on one side of the saw blade, when making miter, bevel, or compound miter cuts. Clamping prevents the wood from sliding along the fence during the cut.
- Turn off the saw when making any adjustments or changes in the set up.
- Make measurements by placing the wood to be cut against the stop gauge. When measuring with tape measure or ruler is necessary, turn off the saw until the measuring is complete.
What should you avoid when working with a radial arm saw?

- Do not use radial arm saws for ripping unless the spreader (riving knife) and anti-kickback devices are provided and properly adjusted.
- Do not take your hand away from the operating handle unless the cutting head is behind the fence.
- Do not remove the stock from a saw table until the blade has been returned to its "resting" position at the back of the saw table. Use a stick or brush to remove scrap from the saw table.
- Do not cut "free hand". Use the back guide or fence, or other device to keep the work piece from moving.
- Do not use cracked or dull blades.
- Do not leave a running saw unattended - leave only after the saw has been turned off and it has come to a complete stop.

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APPENDIX E: Table Saw

**TABLE SAW**

**What should you do before using a table saw?**

A table saw can be dangerous if not used properly.
- Read the owner's manual carefully.
- Make sure you understand instructions before attempting to use any tool or machine.
- Learn the applications and limitations before use.

**What safety procedures should you follow when using a table saw?**

- Wear safety glasses or a face shield.
- Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area.
- Pay particular attention to the manufacturer’s instructions on reducing the risk of kickback (when the wood can be violently thrown back toward the operator).
- Choose proper blades for the type of work being done.
- Keep blades clean, sharp, and properly set so that they will cut freely without having to force the work piece against the blade.
- Use the guards provided with the saw or ones designed for use with the saw that you are using. Keep them in place and in good working condition.
- Use a guard high enough to cover the part of the blade rising above the stock and wide enough to cover the blade when it is tilted. The blade height should be set so it does not extend more than about 3 mm (1/8 in) above the height of the piece being cut.
- Ensure that the fence is locked in position after the desired width has been set.
- Hold the work piece firmly down on the table and against the fence when pushing the wood through.
- Ensure that there is adequate support to hold a work piece; use extension tables or roller supports at the side or back for larger pieces. If an assistant is at the back (out-feed) end of the saw, an extension table should be in place so the back edge is about 1.2 m (4 ft) from the saw blade. The assistant should wait for the work piece to reach the edge of the extension table and should not reach toward the saw blade.
- Feed stock into the blade against the direction of its rotation.
- Move the rip fence out of the way when cross cutting. Never use it as a cut off gauge.
- Use a push stick when ripping narrow or short stock (e.g., when the fence is set less than about 15 cm (6 in) from the blade; when the piece is less than 30 cm (12 in) long or when the last 30 cm (12 in) of a longer piece is being cut). Refer to ripping applications in the manufacturer's instruction manual.
- Keep hands out of the line of a saw blade.
- Use guard with a spreader (riving knife) and anti-kickback fingers for all ripping or cross-cutting operations.
- Keep the body and face to one side of the saw blade out of the line of a possible kickback.
- Provide adequate support to the rear and sides of a saw table for wide or long stock.
• Be careful when waxing, cleaning, or servicing the table. Shut off and unplug (or lockout) a saw before doing any work on the saw.
• Keep area clean and clutter-free. Operate machines in a non-congested, well-lit area.
• Use the proper sawdust exhaust systems as required by operation.

**What should you avoid when working with a table saw?**

• Do not saw freehand. Always hold the stock firmly against the miter gauge or a rip fence to position and guide the cut.
• Do not reach around and over moving blades.
• Do not feed the work piece faster than the saw can accept.
• Do not leave a saw running unattended. Turn off the power and make sure the machine has stopped running before leaving the area.

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APPENDIX F: Woodworking Machines

WOODWORKING MACHINES

What should you do before using woodworking machines?

• Woodworking tools can be dangerous if not used properly.
• Only use woodworking machines that you have been trained to use properly and safely.
• Read the owner's manual carefully.
• Make sure you understand instructions before attempting to use any tool or machine. Ask questions if you have any doubts about doing the work safely.

What safety procedures should you follow when using woodworking machines?

• Always wear safety glasses or goggles
• Wear dust masks when required.
• Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area. If you have trouble hearing someone speak from three feet away, the noise level from the machine is too high. Damage to hearing may occur.
• Use gloves to protect hands from splinters when handling wood but do not wear them near rotating blades and other machinery parts where the gloves can catch.
• Make sure the guard is in position, is in good working condition, and guards the machine adequately before operating any equipment or machine. Check and adjust all other safety devices.
• Make sure the equipment is properly grounded before use.
• Check that keys and adjusting wrenches are removed from the machine before turning on the power.
• Inspect stock for nails or other materials before cutting, planing, routing or carrying out similar activities.
• Make sure all cutting tools and blades are clean, sharp, and in good working order so that they will cut freely, not forced.
• Turn the power off and unplug the power cord (or lock out the power source) before inspecting, changing, cleaning, adjusting or repairing a blade or a machine. Also turn the power off when discussing the work.
• Clamp down and secure all work pieces when drilling or milling.
• Use good lighting so that the work piece, cutting blades, and machine controls can be seen clearly. Position or shade lighting sources so they do not shine in the operator's eyes or cause any glare and reflections.
• Ensure that the floor space around the equipment is sufficient to enable you to machine the size of work piece being processed safely without bumping into other workers or equipment.
• Woodworking machines should be fitted with efficient and well-maintained local exhaust ventilation systems to remove sawdust or chips that are produced.
• Electric power cords should be above head level or in the floor in such a way that they are not tripping hazards.
• Keep work area free of clutter, clean, well swept, and well lit. Spills should be cleaned up immediately. Floor areas should be level and non-slip. Good housekeeping practices and workplace design will reduce the number of injuries and accidents from slips, trips, and falls.
**What should you avoid when working with woodworking machines?**

- Do not wear loose clothing, work gloves, neckties, rings, bracelets or other jewelry that can become entangled with moving parts.
- Avoid awkward operations and hand positions where a sudden slip could cause your hand to move into the cutting tool or blade.
- Do not remove sawdust or cuttings from the cutting head by hand while a machine is running. Use a stick or brush when the machine has stopped moving.
- Do not use compressed air to remove sawdust, turnings, etc. from machines or clothing.
- Do not leave machines running unattended (unless they are designed and intended to be operated while unattended). Do not leave a machine until the power off is turned off and the machine comes to a complete stop.
- Do not try to free a stalled blade before turning the power off.
- Do not distract or startle an operator while he or she is using woodworking equipment.
- Horse play should be prohibited. It can lead to injuries.

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