General Safety and Health Hazards

Safety Hazards
• Machine hazards
  – Point of operation
  – Rotary and reciprocating movements
  – In-running nip points (pinch points)
• Kickbacks
• Flying chips, material
• Tool projection
• Fire and explosion hazards
• Electrical hazards

Health Hazards
• Noise
• Vibration
• Wood dust
• Chemical hazards—from exposure to coatings, finishings, adhesives, solvent vapors

Point of Operation
The point of operation is the place where work is performed on the material. This is where the stock is cut, shaped, bored, or formed. Most woodworking machines use a cutting and/or shearing action. A list of examples of how injuries can occur at the point of operation is shown below.

• Employees can be injured if their hands get too close to the blade, particularly when working on small pieces of stock. The size of the piece dictates that the operator’s hand be close to the blade. Accidents can occur when stock unexpectedly moves or when a worker’s hand slips.
• Stock can get stuck in a blade and actually pull the operator’s hands into the machine.
• Employees can be injured if the machine or its guard is not properly adjusted or maintained. An improperly adjusted radial saw, for example, might not return to its starting position after making a cut.
• If the machine has controls that are not recessed or remote, and the equipment is accidentally started, a worker’s hands may be caught at the point of operation.
• Contact also can occur during machine repair or cleaning if care is not taken to de-energize the machine—that is, if lockout/tagout procedures are not followed.
• An employee may be injured if he or she reaches in to clean a saw or remove a piece of wood after the saw has been turned off, but is still coasting or idling. Also, saw blades often move so fast that it can be difficult to determine whether they are moving.
Rotating and Reciprocating Movements
All machines operate by rotating or reciprocating motion or by a combination of these motions. For example, rotary cutting and shearing mechanisms, rotating wood stock, flywheels, shaft ends, and spindles all rotate. Rotating action is hazardous regardless of the speed, size, or surface finish of the moving part. Rotating parts and shafts, such as stock projecting from the chuck of a lathe, can catch hair or clothing and draw the operator in. This can seriously mangle or crush the operator. Rotating parts and stock can also force an arm or hand into a dangerous position, breaking bones and lacerating or severing a hand or other parts of a limb. Bolts, projecting keys, or screws on rotating parts increase the danger of getting caught by the rotary part. Operators can also be struck by a projecting bolt or key.

In-Running Nip Points
In-running nip points (or pinch points) are a special danger arising from rotating or reciprocating parts. They occur whenever machine parts move toward each other or when one part moves past a stationary object. Parts of the body may be caught between or drawn into the nip point and crushed, mangled, or severed. Most common body part to be injured by nip point is your fingers.

Kickbacks
Kickbacks occur when a saw seizes the stock and hurls it back at the operator. This can happen when the stock twists and binds against the side of the blades or is caught in the teeth. A blade that is not sharpened, or that is set at an incorrect height, can cause kickbacks. Poor-quality lumber (in other words, frozen lumber or lumber with many knots or foreign objects such as nails) can also result in kickbacks. Hazards due to kickbacks are most likely when there is a lack of safeguards, such as spreaders, anti-kickback fingers, and gauge or rip fences. Kickbacks occur more often when cutting parallel to the wood grain (ripping) than when cross-cutting.

Flying Chips
Employees may be exposed to splinters and chips that are flung by the cutting action of woodworking equipment.

Tool Projection (Unbalanced Cutter Heads)
Many pieces of woodworking equipment—such as routers, shapers, and molders—employ rotating cutter heads with multiple knives. Cutter heads that are not properly adjusted, or that are poorly mounted or have broken knives, can become unbalanced. Balance is critical for keeping knives secured to a rapidly moving cutter head. The centrifugal forces on an unbalanced cutter head can fling the knives from the tool, and severely or fatally injure the operator or other nearby personnel. Using the wrong tool on a cutter head or using a tool at a higher speed than it was designed to operate at also can cause tool breakage and projection.

Fire and explosion hazards
Woodworking facilities are inherently prone to fires and explosions, for the following reasons:
• They contain large quantities of fuel in the form of wood and wood products, sawdust, and flammable materials such as paints, oil finishes, adhesives, solvents, and liquid propane for internal combustion engines. Woodworking facilities are especially at risk for fire due to the
abundant production of sawdust, which will ignite and burn far more easily than whole pieces of lumber. Sanders, routers, and shapers in particular produce large amounts of fine dust. Very fine wood dust is especially hazardous. It can accumulate on rafters and other building structural components and in unexpected spots all around your facility, far from the point of generation.

- They contain ignition sources, such as potentially faulty electrical wiring, cutting and welding operations, sparking tools, propellant-actuated tools, and employee smoking. There is also the potential for static electrical discharges and lightning.

**Prevention of Dust Buildup**

Preventing the buildup of dust is one of the key means for controlling fire and explosion hazards. The principal engineering control technology for control of dust is exhaust ventilation. The primary work practice control is good housekeeping. Dust collection is best accomplished at the source—at the point of operation of the equipment, if feasible. For many pieces of equipment, well designed ducts and vacuum hoods can collect most of the dust generated before it even reaches the operator. Very fine dust that manages to escape point-of-source collection can be captured from above by general exhaust points located along the ceiling. These control technologies are effective for most equipment, excepting machines that commonly produce the very finest dust or large quantities of dust. Good housekeeping extends to periodic hand cleaning of your entire facility, as some dust will escape from even the best exhaust system and will eventually accumulate on rafters and other out-of-the-way spots. Also, it is extremely important to inspect and clean your exhaust ventilation system on a regular basis to maintain maximum efficiency.

You must also:
- Ensure the proper use and storage of flammable materials, such as paints, finishes, adhesives, and solvents.
- Segregate tasks particularly prone to fire and explosion hazards, such as spray painting, welding, and use of powder-actuated nail guns.
- Train employees to recognize, avoid, and correct potentially hazardous conditions and behaviors. Train employees so that they are acquainted with the special equipment and aspects of building design related to dealing with fires and explosions.
- Control ignition sources. This involves using electrical systems rated for the projected use and protected by appropriate circuit breakers, grounding all equipment prone to accumulating static electrical charges, grounding entire buildings against the possibility of lightning strikes, and controlling and banning smoking in and around the workplace.
- Never permit blow-down of accumulated dust with compressed air. Blowing dust with compressed air will create the very type of dust cloud that presents the greatest explosion hazard.
- Provide continuous local exhaust ventilation on all woodworking machines. The local exhaust systems must have a suitable collector. Dust collection systems must be located outside the building, unless the exceptions described in NFPA standards are met.
- Segregate combustible and flammable materials such as lumber stock and chemical solvents from each other and from ignition sources.
- Ensure that you use equipment with a hazard classification appropriately rated for your work environment.
**Electrical Hazards**
The following are common ways of avoiding electrical hazards:

- All of the metal framework on electrically driven machines must be grounded, including the motor, motor casing, legs, and frame. This includes other equipment such as lights that may be mounted on the machine.
- All circuit breakers and fuse boxes must be labeled to indicate their purpose—that is, what area of the plant they power or protect. Appropriately rated fuses must be used. All unused holes in electric boxes must be covered.
- Electrical cords, cables, and plugs must be kept in good repair. Flexible cords and cables must be fastened so that there is no direct pull on joints or terminal screws. Cords and cables must be free of splices and must not run through windows, doorways, or holes in the wall.
- Junction boxes, outlets, switches, and fittings must be covered.
- All electrical components must be approved by a Nationally Recognized Testing Laboratory for the specific location where the equipment will be used.
- A magnetic switch or other device to prevent automatic restarting of the machine after a power failure. Such an unexpected start-up could expose the worker to moving parts.
- An emergency stop device (panic bar or deadman switch) within reach of operators working in the normal operating position.
- Clearly marked controls that are within easy reach of the operator and away from the hazard area.
- All machines must have a main power disconnect for lockout/tagout.

**LockOut/TagOut**
Lockout/tagout refers to the process of shutting down and locking out machines before maintenance begins to prevent accidental start-up during machine maintenance, cleaning, or other similar operations. Locking out equipment provides a physical means (i.e., a lock) that ensures that power will not be restored to the machine and that the machine will not be started until work on the machine has been completed. Tagging the equipment warns others that someone is working on the machine and that power must not be restored to the machine until the work is completed and the person performing the work removes the tag.

**Controlling Machine Hazards**

1) Engineering Controls
2) Work Practices
3) Personal Protective Equipment (PPE)

**Engineering controls**
This involve physically changing the machine or work environment to prevent employee exposure to the potential hazard. Examples are using a guard on a machine, or using local exhaust ventilation to remove dust and other contaminants at the source.

**Work practice controls**
This involves removing your employees from exposure to the potential hazard by changing the way they do their jobs. For example, workers should always use push sticks to guide short
or narrow pieces of stock through saws. Using a push stick allows saw operators to keep their hands at a safe distance from the saw blades.

- **Use appropriate equipment for the job.**
  Workers can be seriously injured if they do not use the correct equipment for a job. Use machines only for work within the rated capacity specified by the machine manufacturer. Use the correct tools on a given machine. For example, when using a circular saw, use the correct blade for the required cutting action. Similarly, you must only mount blades, cutter heads, or collars on machine arbors that have been accurately sized and shaped to fit these parts.

- **Train workers on machine use and allow only trained and authorized workers to operate and maintain the equipment.**
  Workers should understand the purpose and function of all controls on the machine, should know how to stop the equipment in an emergency, and should be trained on the safety procedures for special set-ups. Operator training should include hazards associated with the machine, how the safeguards protect the worker from these hazards, under what circumstances the guard may be removed (usually just for maintenance), and what to do if the guard is damaged or not functioning properly. Employees should be able to demonstrate their ability to run the machine with all safety precautions and mechanisms in place.

- **Frequently inspect equipment and guards.**
  Ensure that: (1) the operator and machine are equipped with the safety accessories suitable for the hazards of the job, (2) the machine and safety equipment are in proper working condition, and (3) the machine operator is properly trained. Document the inspections and keep the records. Documentation should identify the machine, inspection date, problems noted, and corrective action taken. Noting problems helps to ensure that corrective action will be taken, that operators on all shifts will be made aware of any potential danger, and that any pattern of repeat problems on a particular machine can be detected and resolved as early as possible.

- **Use equipment only when guards are in place and in working order.**
  A worker should not be allowed to operate a piece of woodworking equipment if the guard or any other safety device, return device, spreader, anti-kickback fingers apparatus, guard on in-running rolls, or gauge or rip fence is not functioning properly.
  When guards cannot be used (during rabbeting or dadoing, for instance), you must provide combs, featherboards, or suitable jigs for holding the stock.

- **You must provide your employees with push sticks or other hand tools so that their hands are away from the point of operation when they work pieces of stock.**
  A push stick is a strip of wood or block with a notch cut into one end that is used to push short or narrow lengths of material through saws. Using push sticks keeps stock from tipping and prevents the operator's fingers from coming in contact with blades.

- **Use a brush or stick to clean sawdust and scrap from a machine.**
  Never allow your employees to clean a saw with their hands or while the machine is running.

- **Provide regular preventive maintenance.**
  Regularly clean and maintain woodworking equipment and guards. Ensure that blades are in good condition. Knives and cutting heads must be kept sharp, properly adjusted, and secured. Sharpening blades prevents kickback. You must also remove any cracked or damaged blades
from service. Keep circular saw blades round and balanced. You must remove dull, badly set, improperly filed or improperly tensioned saws from service, and immediately clean saws to which gum has adhered.

• **Never leave a machine unattended in the “on” position.**
  Make sure that workers know never to leave a machine that has been turned off but is still coasting.

• **Maintain proper housekeeping.**
  Workers have been injured by tripping and then falling onto the blades of saws. You must keep floors and aisles in good repair and free from debris, dust, protruding nails, unevenness, or other tripping hazards. Do not use compressed air to blow away chips and debris. Make sure you have a non-slip floor.

• **Do not allow workers to wear loose clothing or long hair.**
  Loose clothing or long hair can be easily caught up in rotating parts.

• **Never saw freehand. Always hold the stock against a gauge or fence.**
  Freehand sawing increases the likelihood of an operator’s hands coming in contact with the blade.

**Personal protective equipment**
This encompasses a wide variety of devices and garments designed to protect workers from injuries. Examples include respirators, goggles, safety shields, hard hats, gloves, earmuffs, safety shoes, and earplugs.
Woodworking Shop Safety
10 Safety Tips to Post in Your Shop

1) **Think Before You Cut** – The most powerful tool in your shop is your brain, use it. Thinking your cuts and movements through before acting can help save both fingers and scrap wood.

2) **Keep a Clean Shop** – A cluttered shop is an accident waiting to happen. Keeping your shop clean will help protect you, and your tools, from tripping hazards.

3) **Avoid Distractions** – Pay attention to your actions. Looking up to watch the shop TV or visitor can result in your hand contacting the blade. Always wait until you have completed your cut before you take your eyes off the blade.

4) **Don’t Rush** – Keep in mind that this is just a hobby and take a break when you feel rushed or frustrated with a project. Mistakes happen when we rush to complete a job.

5) **Don’t Force It** – If your saw is resisting the cut, stop and see what’s wrong. A misaligned rip fence or improperly seated throat plate can sometimes cause a board to get stuck in mid cut. Forcing the board in these situations may cause kickback or contact with the blade. Take a moment to evaluate the situation and determine the problem.

6) **Protect Yourself** – Wearing the proper shop protection is an important part of safe tool operation. Goggles, Ear Protection, and Lung Protection should be used when operating tools. Use push sticks when working close to the blade and make sure the tool’s safety features are in place.

7) **Let the Tool Stop** – Giving the power tool time to wind down after a cut is an often-overlooked safety mistake. Even without power, the spinning blade can still do a lot of damage.

8) **Fumes and Dust** – Solvent fumes and airborne dust can present health and explosion hazards. Care should be taken to ensure a supply of fresh air and use only explosion proof vent fans.

9) **Wear Appropriate Clothing** – Loose clothing or hair can get caught in power tools and cause severe injury.

10) **No Alcohol** – Too many woodworkers have been injured because Alcohol clouded their judgment. Avoid their mistakes and wait until after you’re done in the shop.
What should you do before using a band saw?
A band saw can be dangerous if not used properly.

- Read the owner's manual carefully.
- Make sure you understand the instructions before attempting to use any tool or machine.
- Learn the applications and limitations before use.
- Securely anchor the band saw to the floor (or a workbench of appropriate height) to reduce vibration.
- Refer to Woodworking Machines - General Safety Tips for general safety precautions.

What safety procedures should you follow when using a band 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.
- Make sure all guards are in place and properly adjusted. Ensure all band wheels are enclosed.
- Adjust blade guard height to about 3 mm or 1/8 inch above the top of the material being cut.
- Ensure the blade is tracking correctly and runs freely in and against the upper and lower guide rollers.
- Ensure the blade is under proper tension. A band saw equipped with automatic tension control is desirable.
- Use band saw blades that are sharp, properly set and otherwise suitable for the job (e.g., the right tooth pitch; tooth form; blade width).
• Hold stock firmly and flat on the table to prevent the stock from turning and drawing your fingers against the blade. Keep hands braced against the table.

• Use a push stick when you remove cut pieces from between the fence and saw blade or when your hands are close to the blade. Keep your hands on either side of the blade - not in line with the cutting line and the blade. See *Woodworking Machines - Push Sticks* for more information on push stick design.

• Make release (relief) cuts before tight curves when doing intricate scroll-type work.

• Keep the floor around a band saw clean and free of obstructions or clutter.

• Keep the machine properly oiled and serviced.

• Provide adequate lighting at the machine table. A light fixture with a flexible connection can provide essential lighting.

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

• Do not use excessive force when pushing the wood past the blade.

• Do not back the stock away from the blade while the saw is in motion if the work piece binds or pinches on the blade.

• Do not stop a band saw by thrusting stock against the cutting edge or the side of a blade immediately after the power has been shut off.

• Do not remove sawdust or cuttings from the table by hand or with compressed air. Use a stick or brush.

• Do not leave a saw running unattended. Turn off the power and make sure the machine has stopped running before leaving the area.
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.
- Refer to Woodworking Machines - General Safety Tips for general safety precautions.

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. See Woodworking Machines - Push Blocks for more information.
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 stock 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.
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.
- Refer to Woodworking Machines - General Safety Tips for more information.

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.
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.
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.

The following are samples of push blocks.

1. Simple push sticks are useful on a table saw when distance between the blade and fence is narrow.

   ![Simple push stick](image)

   **Simple push stick** useful on table saw when distance between the blade and fence is narrow.

   ![Double-handled hold-down push block](image)

   **Double-handled hold-down push block**

   ![Use of two push blocks on single application](image)

   **Use of two push blocks on single application**
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.
- Refer to Woodworking Machines - General Safety Tips for general safety precautions.

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 arbor. (An arbor 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:
  1. Upper hood type that covers arbor
  2. 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 infeed and outfeed) 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 a 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.
What should you do before using sanders?

Sanders 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.
- Refer to Woodworking Machines - General Safety Tips for general safeguards.

What safety procedures should you follow when using sanders?

- Wear goggles when operating sanders.
- Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area.
- Use sanders with the local exhaust ventilation (LEV) turned on. The LEV should be designed for the sander and well maintained to work effectively.
- Wear respiratory protection (e.g., dust masks) where required, during sanding operations and clean up.
- Keep hands away from the abrasive surface.
- Hold small or thin pieces of stock in a jig or holding device to prevent injuries to the fingers or hands.

- Inspect abrasive belts before using them. Replace belts worn, frayed, or excessively worn in spots.
- Sand on the downward side of a disc sander so that the wood is driven onto the table by the machine's rotation.
- Enclose all drums, disk or belt sanding machines with an exhaust dust hood that covers all portions of the machine but the portion designed for the work feed.

- Adjust work rests on all manually fed sanders to provide minimum clearance between the belt and the rest. The work rest should be secured properly.
- Install abrasive belts that are the same width as the pulley drum.
- Adjust abrasive belt tension to keep the belt running the same speed as pulley-drum when the wood is in contact with the belt.
- Guard feed rollers to allow boards to pass, but keep operators' fingers and arms out.
- Install guards to prevent contacts at:
  - in-running nip points,
  - power transmission
  - feed roll parts, and
  - the unused portion of the abrasion belt on the operator's side of the machine.

**What should you avoid when using sanders?**

- Do not sand small or thin hand-held work pieces.
- Do not wear loose clothing or jewelry while using revolving power tools. Tie back long hair or wear appropriate hair protection. These measures will prevent hair, clothing, or jewelry (like dangling neck chains) from being caught and pulled by sander belts and pulleys that are in motion.
- Do not operate sanders without the exhaust system operating.
- Do not operate sanders unless adequately guarded.
- Do not operate sanders unless the work rest is properly adjusted.
**What should you do before using shapers?**

Shapers 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. Only trained, experienced personnel should be allowed to operate wood shapers.
- Learn the applications and limitations before use.
- Refer to *Woodworking Machines - General Safety Tips* for general safeguards.

**What safety procedures should you follow when using shapers?**

- Wear safety glasses or face shield.
- Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area.
- Use the cutter (and spindle speed / RPM) suited for the job. Use sharp cutters only and keep them clean.
- Remove all wrenches and tools used in the set up from the table.
- Check moving parts of the shaper periodically such as belts and pulleys for signs of wear; also check the spindle for burrs or for excessive runout.
- Make sure all guards are in proper position.
- Before operating, check that the spindle is square with the shaper table; that the spindle top and knives are correctly adjusted and securely fastened; and that the spindle is free before turning on the power.

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Use jig fixtures, holders, and hold-down push blocks. Fasten the work securely in a jig. When a table guide pin is used, make sure it is adjusted and will not slip.
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- Cut with the grain rather than against it.
- Remove all other blades when one blade is removed from the shaper spindle. This will prevent the other blades from being hurled from the spindle if the machine is started.
- Turn off power; lock out a machine when doing set-ups or any other operation on or about the spindle.
- Shape only one piece of stock at a time.
- Use extra care in machining stock that contains cross grains or knots. These may pull the operator's hands into the knives or may cause kickbacks.
- Shape stock only if longer than 25 cm (10 in).```
Support long pieces of wood with extension tables or roller supports.

**What should you avoid when using shapers?**

- Do not leave a shaper machine running. Make sure that the power is shut off and that the cutter head has stopped revolving before leaving the area.
- Do not rest your hands near the edge of the stock being cut.
- Do not tamper with the guards or make them inoperative in any way.
- Do not back up the stock (check to see that the direction of rotation is as expected). Always feed against rotation of the cutter.
- Do not make deep cuts or feed the stock too rapidly.
- Do not distract or startle an operator during a shaping operation.
- Do not remove saw dust or cuttings around knives by hand or with compressed air. Use a stick or brush.
- Do not clear the table while the cutter is rotating.
- Do not accumulate stock or finished work on the table.
- Do not stand in line with the stock being fed.
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.
- Refer to *Woodworking Machines - General Safety Tips* for general safety precautions.

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 (outfeed) 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. See Woodworking Machines - Push Sticks for more information on push stick design.

• 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 lock out) 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.

What should you do before using a wood turning lathe?
A wood turning lathe 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. Only experienced and trained lathe operators should be allowed to operate lathes.
• Learn the applications and limitations before use.
• Refer to Woodworking Machines - General Safety Tips for general safety precautions.

What safety procedures should you follow when using a wood turning lathe?

• Wear safety goggles or face shield to protect yourself from flying chips.
• Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area.
• Wear a dusk mask when dust is generated (e.g., during sanding operations).
• Work in well-lighted area.
• Before the lathe is turned on, ensure that all clamps and fittings are secure and that the work piece is free to turn.
• Use stock free of defects.
• Hold tools firmly with both hands and against the tool rest.
• Hold the stock securely on the faceplate or between the centers.
• Use only furnished or approved tools.
• Use sharp, well-maintained chisels and gouges.
• Select a speed that is appropriate for the job. Operate the lathe at a low speed and use a moderate cut depth to prevent splinters from flying out during roughing operations. The actual speed of the lathe depends on type of wood, diameter of stock, nature of work being done and type of tool used.
• Adjust tool rests so that they are parallel and as close as possible to the stock. They should also be set high enough so that tools will cut into the wood slightly above the centre of the work being turned.
• Remove the tool rest when sanding or polishing.

• Hold the sandpaper in your fingers and press lightly against a small area at the top of the rotating shaft when hard sanding. This method will keep the sandpaper from catching and pulling your hand around the stock.

• To make a faceplate turning, the one hand steadies the tip of the chisel, which holds the edge against the tool rest while the other hand guides the tool. Keep the tip of the chisel held higher than the handle.

What should you avoid when working with a wood turning lathe?

• Do not wear gloves, loose clothing, rings or jewelry around the neck that can hang outside one’s clothing. Clothing should be comfortable but not so loose that it can catch on the machine or get entangled with any rotating parts or the wood being turned; shirts should be tucked in and long hair tied back.

• Do not leave a running lathe unattended - leave only after the lathe has been turned off and it has come to a complete stop.

• Do not use makeshift tools.

• Do not use stock containing checks, splits, cracks, or knots.
Drill Press Safety:

☐ Make sure that the belt guard is in place.
☐ Be sure that the table and head of the drill press are secure.
☐ Select the proper drill bits (avoid dull drill bits). Make sure that the correct speed is used for the bit selected. If uncertain, check with the instructor.
☐ REMOVE THE CHUCK KEY BEFORE THE POWER IS TURNED ON! If the chuck key is not removed it will be thrown from the chuck at tremendous speed when the power is turned on.
☐ Use the drill press vice or clamps whenever necessary to firmly secure the work.
☐ USE A BASE BLOCK UNDER THE WORK AT ALL TIMES! Set the stop so that the bit will never go through the base block.
☐ Make sure that no one but you are within the safety zone.
☐ Keep your hands away from the revolving spindle once the power is on.
☐ Operate the feed handle so that the drill cuts evenly into the work.
☐ Ease up on the pressure as the drill begins to break through.
☐ Back out the drill as soon as the hole is drilled.
☐ When boring to depth, use the lock nut on depth adjustment.
☐ Stop the drill press before attempting to remove work.
☐ Keep the floor clean around the drill press.
☐ If the work comes loose and is seized by the drill press, shut off the power immediately if possible without endangering yourself. If impossible to shut the machine off, move away from the machine and move others away.
☐ The drill bit should be backed out occasionally to clear shavings and cool the bit.
☐ Obtain approval of instructor for any special setups on the drill press before beginning the operation.

☐ ALWAYS WEAR YOUR SAFETY GLASSES!!!!!!