Intro:
Over the past year the School of Art along with all departments on campus has played an important part on the newly formed campus safety committee. This group has come up with new rules that help ensure safety within our shops, and provided guidelines for how students can access the spaces. These rules have been approved by the university and EH&S.

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Questions/ Safety Training:
Terry Hritz 412 268 2203
Matt Forrest 412 268 5984

Emergency Contact: University Police 412-268-2323

Hazardous spill
Jeffrey Harris 412 268 7501
Michael Fouch 412 268 3221

Health Services 412-268-2157

Custodial Services If a student is cut and you have blood on the floor or tabletops please call 412 268 2910 after hours 412 268 2910
Please do not try to clean up blood

Report safety issue in CFA
Cindy Lammert 412 268 6707
**General Intro**

**Do the Job Safely**
- Use the power tool accessories only for the jobs for which they were designed. Secure and support the workpiece. Use clamps and a stable work surface. Do not hold the work by hand or against your body.
- Keep guards in place and working properly.
- Do not force the tool. Use the correct tool for your job. It will do the job better and safer.
- Use only accessories recommended by the tool manufacturer. Accessories that may be suitable for one tool may become hazardous when used on another tool. Do not touch the drill bit, blade, cutter or the work piece immediately after operation; they may be very hot and may burn you.
- If a method of dust collection is available with the power tool, it should be used to reduce the risk of dust-related hazards.

**Maintenance Keeps Tools Working Safely and Effectively**
- Do not use a tool if the switch does not turn it on and off. It must be repaired. Look at the tool before using it. Are moving parts misaligned or binding? Is anything broken? Damaged tools must be fixed before using them.
- Maintain accessories carefully. Keep blades and bits sharp and clean.
- Take your tool to be serviced by qualified repair people.

**While Cutting ...**
- Do not use cutting fluids on the blade, wheel or workpiece.
- Allow the motor to reach full speed before contacting the workpiece. Never place your body or fingers in line with the blade or wheel while cutting.
- Use only the edge (not the sides) of the abrasive wheel for cutting. Do not allow the abrasive wheel to twist or bind.
- Do not force cutting. Always start the cut gently. Do not bump or bang an abrasive wheel or blade down on the work piece to start a cut. Excessive force only causes operator fatigue, increased wear and reduced control.
- Make sure the blade or wheel contacts the center of the workpiece for the safest, most efficient cutting.
- If the blade or wheel binds or stops rotating, or the motor sounds like it is straining, release the switch immediately to reduce the risk of damage to the machine. Never reach under the machine or workpiece. The blade is exposed under the workpiece and the guard cannot protect your body there.
- Never remove the machine from a cut while the wheel or blade is rotating. When making a partial cut, or if power is interrupted, release the switch immediately. Do not remove the machine from the workpiece until the wheel or blade has come to a complete stop.
- Release the switch immediately if the wheel or blade binds or the machine stalls.
- Turn off the machine after a cut is complete, and keep the blade or wheel away from your body until it has stopped. Be aware that blades and wheels may coast after the machine is turned off.

**Always Remember...**
- Be alert at all times, especially during repetitive operations. Do not be tempted into carelessness due to a false sense of security. Blades are extremely unforgiving. When cutting metals, sparks or hot fragments could cause fires or burns. Never touch a work piece until it cools. Let the blade or wheel cool properly before changing.
- When starting the machine after an idle period, always let the machine run with the blade or wheel completely retracted into the guard for one full minute before making a cut. If an abrasive wheel wobbles or vibrates, discard it and replace immediately.
- To reduce the risk of injury, always unplug the machine when leaving a workstation. Lock machines in the down position before transporting or when not in use.

**What Is PPE?**

The term "personal protective equipment" refers to any device or garment worn by a worker on the job to safeguard against injuries and/or the harmful effects of hazardous substances. A wide variety of effective PPE can be readily obtained to protect workers' eyes, hearing, respiratory
tracts, and body parts (for example, head, feet, hands, and arms). Table 5 lists some of the PPE items typically required in woodworking facilities.

| Hard hats  |
| Safety glasses, goggles, and face shields |
| Gloves (including chemically protective gloves) |
| Padded kickback aprons; vests; and arm, groin, and leg guards |
| Lower-back supports |
| Steel-shanked, steel-toed safety shoes with slip-resistant soles |
| Earplugs and earmuffs |
| Particulate-resistant and/or chemically resistant overalls |
| Respirators |

Information provided is from the O.H.S.A. Guide for *Protecting Workers from Woodworking Hazards*, and Power Tool Institute, which provided safety requirements for industry standards. 2012

**Power Equipment Hand Out**

**Table Saw:**

**Before Cutting...**

Before working with a table saw, make sure the tool and its accessories are in proper working order. Failure to do so may increase your risk of injury and may result in kickback, blade pinching, binding or stalling, and loss of control. These situations may cause the workpiece to jump back at the operator that can result in an injury.

The saw should always be turned off and disconnected from its power source before making adjustments, installing accessories or making repairs.

Check blades carefully before each use for proper alignment and possible defects. Never use a bent, broken or warped saw blade.

- Make sure the blade has adequate blade set. Blade set provides clearance between the sides of the blade and the workpiece, thus minimizing the probability of binding.
- Be sure the blade flanges (washers) are clean and correctly assembled on the shaft and that the blade is properly supported.
- Check often to assure that the blade guard functions properly and returns quickly to its rest position. If a guard seems slow to return or “hangs up”, adjust, repair or replace it immediately.
- Be sure the tool switch works properly. Do not use a tool if the switch does not turn it off when returned to the off position.
- The rip fence must be parallel to the saw blade to prevent binding and possible kickback. Make sure the blade is installed to rotate in the proper direction – towards the front of the saw.

Do not use grinding wheels, wire brushes,

**While Cutting ...**

Concentrate on what you are doing and be aware of kickback (a sudden reaction to a pinched, bound or misaligned blade). Kickback can cause an uncontrolled workpiece to be thrown toward the operator and is the result of tool misuse and/or incorrect operating procedures or conditions. Take these specific precautions to help prevent kickback:

- Always keep the fence parallel to the blade.
- Always push the workpiece through the cut.
- Set blade height to no more than 1/8 in. to 1/4 in. greater than the thickness of the material being cut.
- Use the riving knife or the spreader for all “through-sawing” operations (where the sawblade cuts through the thickness of the workpiece).
- When using the table saw for non-through cutting operations, such as dadoing, grooving or
moding, use pushsticks, pushblocks, featherboards, jigs or fixtures to keep your hands and fingers away from the saw blade. See fig 10, 3

- Do not use the fence as a cut-off stop when cross-cutting.
- Always use the miter gauge when cross-cutting, and hold the workpiece firmly against the miter gauge to assure a straight and even cut.
- When you start your saw, allow the blade to reach full speed before contacting the workpiece. Be alert to the possibility of the blade binding and kickback occurring.
- Do not cut “freehand”. Always use the miter gauge or rip fence to ensure a straight cut.
- Use pushsticks to keep your fingers away from the saw blade for short or narrow ripping operations.
- Use featherboards to firmly hold the workpiece against the fence and table when ripping narrow stock.
- Always use a spreader / splitter for through-sawing. This prevents the material from closing and pinching the blade. Make sure the spreader is properly aligned with the blade.
- Always use the anti-kickback pawls/fingers. If a kickback should occur, they are designed to engage the workpiece and keep it from being thrown back toward the operator. Keep the teeth of the pawls/fingers sharp.
- Feeding work too aggressively can overheat a saw blade causing it to bind or warp and create a kickback. Buildup of sap on the blades, insufficient set, dullness, and “freehand” cuts can all result in an overheated blade.

Never reach over or behind the saw. Keep arms, hands and fingers away from the blade.

- The saw blade may coast after the saw is turned off.

When Done...
- Turn off the saw after each completed job. When done cutting, unplug the tool and lock the switch in the “off” position to prevent unauthorized use.

Brush the tool down before leaving it

Dill presses:
Choose the Right Tool and Bit
Choosing the correct tool and the proper accessory for your application can help to reduce the risk of serious injury. When used according to the manufacturer’s instructions, the proper tool and accessory will do the job safer and faster.
Does the bit shank fit properly into the chuck?
Check the tool’s operator’s manual for the type of shank necessary (e.g., SDS, Hex,
Is the drill’s capacity adequate for the accessory?
* Make sure the size of the bit is equal to or less than the capacity on the tool’s nameplate.

**Know your Workpiece**

Take time to review your work and make sure that all necessary precautions have been taken before drilling. Never hold the work piece by hand. Secure the work piece with a clamp or another appropriate fixture if it is not long enough to be braced against the table column.

- Do not use bits with screw tips. These bits will pull the workpiece up from the table and start to spin, causing a serious risk of injury.

**Before Drilling...**

Before working with a drill press, make sure the tool and its accessories are in proper working order. Failure to do so may increase your risk of injury and may result in binding, stalling, and loss of control. These situations may cause an accessory to break, causing an injury.

- Be sure belt guards are installed and working properly.
- Be sure the chuck is tightly secured to the spindle.
- Tighten the bit securely in the chuck. Remove all chuck keys or wrenches before starting the drill. The key can be thrown at a high velocity if not removed, causing risk for injury.
- Carefully set the drill press speed for both the type of material and bit size you are using.
- Remove material or debris from the area that might be ignited by hot chips.

**When Drilling...**

- To prevent the workpiece and backup material from spinning, clamp material to table surface or set them against the left side of the drill support column.
- NEVER overreach! Never reach around or under the working head, or grab the chuck to stop a drill press. This can result in hand puncture or other serious injury.
- Do not force drilling. The tool will do the job better and safer at the rate for which it was intended.
- As you get close to breaking through the bottom of the workpiece, reduce pressure and allow the bit to pass through the hole easily. Set a piece of scrap wood under your workpiece to reduce splintering and to protect the bit tip.
- Do not attempt to free a jammed bit by starting and stopping the tool.

**When Done...**

Do not touch the drill bit or cuttings. The drill bit and cuttings are hot immediately after drilling.

- Always shut off, unplug, and lock the drill press, if a lock is available, and store the key.

Store drill bits with care. Do not drop them or subject them to excessive heat, cold or humidity

**Jointer/Planer:**

**Choose the Right Tool and Accessory**

Choosing the correct tool and the proper accessory for your application can help to reduce the risk of serious injury. When used according to the manufacturer's instructions, the proper tool and accessory will do the job safer and faster.

- Always keep cutter blades (knives) sharp and clean of rust and pitch to avoid excessive blade friction.
- Use only cutter blades (knives) recommended by the tool manufacturer. This is extremely important for your personal safety.
- Never operate the tool without the cutter blade (knife) cover securely in position.
- Do not attempt to sharpen blades while they are installed in the cutter head unless a proper blade sharpening attachment is provided.
- Do not use cracked or damaged blades. Check blades for cracks or damage before use. Replace cracked or damaged blades immediately.
- Make sure that the blade flange fits in the arbor hole when installing the blade.

**Know your Workpiece**
Take time to review your work and make sure that all necessary precautions have been taken before making a cut. Examine the workpiece carefully before cutting. Do not joint or plane chipboard, panel board or any stock containing nails, paint or varnish.

- Be cautious of knots in wood. Knots can be thrown out of the workpiece or cause kickback.
- Properly support long lengths of material to maintain control. Use work supports or stands as needed.
- Never joint or plane wood narrower than ¾ inch or thinner than ¾ inch. Never joint or plane wood shorter than 12 inches.

When using a portable jointer/planer, always place the workpiece on a stable workbench and secure it firmly with a clamp or vise to avoid losing control.

### Before Cutting...

Before cutting with a jointer/planer, make sure the tool and its accessories are in proper working order. Failure to do so may increase your risk of injury, and may result in tool damage.

- Obtain advice from a qualified person if you are not thoroughly familiar with the operation of this tool.
- Do not operate the tool until it is completely assembled and installed according to the manufacturer instructions.
- Check that all guards are in place and return quickly to normal rest positions. If a guard seems slow to return or “hangs up”, have it adjusted, repaired or replaced immediately. Never use a tool without a properly operating guard.
- Set up and secure blades and worktables according to the operator’s manual.
- Make sure blades are securely locked in the cutter head and that the unused portion of the blade is covered with the guard before tool use.
- Maintain proper adjustment of infeed and outfeed tables.
- Avoid awkward operations and hand positions where a sudden slip could cause a hand to move into the blade.
- Hold the tool firmly with both hands.
- Run the tool for a while without the blade pointing toward anybody. Check for vibration or wobbling that could indicate poor installation or a poorly balanced blade.
- Never reach your hands underneath the workpiece while the blade is rotating.

### While Cutting ...

- Never make freehand cuts. Holding the workpiece by hand is unstable and may lead to loss of control.
- Keep your hands, fingers and body away from the cutting area. Contact with a blade will cause serious injury.
- Do not try to remove too much material in one pass. Never remove more than 1/8 inch per pass.
- Keep the exhaust port pointed away from yourself and bystanders.
- Don’t reach into the exhaust chute to unplug it from the power source. After making sure that the blade has stopped, clear the chute with something other than your bare hand.
- Always be sure that the tool is switched off and unplugged before making any adjustments. Never feed the workpiece in the direction of cutting blade rotation. It can cause the cutter blade to grab and pull the workpiece.
- Use push blocks to hold down the workpiece to protect your hands and fingers. Your hands and fingers should never pass directly over the cutter head when feeding a workpiece.

### When Done...

- When done, lock the switch in the “off” position to prevent unauthorized use.

### Miter Saw:

#### Before Cutting...

Before working with a miter saw, make sure the tool and its accessories are in proper working order. Failure to do so can increase your risk of injury and result in kickback, blade pinching, binding or stalling, and loss of control.

- Set the saw securely on a flat, level surface.
- Before installing a blade, always inspect it for damage. Visually check blade teeth for damage.
Replace damaged blades immediately.

- Make sure the blade has adequate blade set. Blade set provides clearance between the sides of the blade and the workpiece, thus minimizing the probability of binding. Some saw blades have hollow ground sides instead of blade set to provide clearance.
- Make sure that all mounting flanges, related washers, fasteners and other mounting hardware are in good condition and are properly positioned and secured on the arbor before each use. Always use mounting hardware supplied with the saw.
- Never alter a guard or use the tool with a guard missing. Be sure all guards are in place and working properly before each use. Do not defeat guards.
- If the lower guard appears loose or if it does not move to cover the blade when the head is up, take the saw to an authorized service center for repairs. Clean the lower guard often to help visibility and movement.
- Be sure angle mechanisms are tightened securely before making a cut.

**While Cutting …**

Concentrate on what you are doing and be aware of kickback (a sudden reaction to a pinched, bound or misaligned blade). Kickback can cause the head of the tool to lift up and out of the workpiece toward the operator and is the result of tool misuse and/or incorrect operating procedures or conditions. Take these specific precautions to help prevent kickback when using any type of miter saw:

- When you start your saw, allow the blade to reach full speed before the workpiece is contacted.
- Do not force cutting. Always start the cut gently. Do not bump or bang a blade down on the workpiece. Your saw will perform best at the rate for which it was designed. Excessive force only causes operator fatigue, increased wear and reduced control.
- If the blade stops rotating or if the motor sounds like it is straining, release the trigger switch immediately to reduce the risk of damage to the saw.
- Be alert to the possibility of the blade binding and kickback occurring.
- Never remove the saw from a cut while the blade is rotating. When making a partial cut, or if power is interrupted, release the trigger immediately.
- Do not remove the saw from the workpiece until the blade has come to a complete stop. A saw tooth could grab the work piece, causing loss of control.
- Release the switch immediately if the blade binds or the saw stalls.
- Never reach under the saw blade or perform “cross handed” operation, i.e. with your left hand supporting the workpiece on the right side of the blade.
- Switch the tool off after completing a cut, and keep your body away from the blade until it stops. The blade may coast for a time, posing a risk for serious cuts.

Overheating a saw blade can cause it to warp and result in kickback. Buildup of sap on the blades, insufficient blade set, dullness, and unguided cuts, can all cause an overheated blade and kickback.

**When Done…**

To reduce the risk of injury, always unplug the saw when moving from a workstation. Lock miter saws in the down position before transporting or when not in use.

- Unplug, clean and store the tool in a safe, dry place after use.

**Always Remember…**

- Be alert at all times, especially during repetitive operations. Don’t be tempted into carelessness due to a false sense of security.

**Radial Arm Saw:**

**Choose the Correct Tool and Accessory**

Choosing the correct tool and the proper accessory for your application can help to reduce the risk of serious injury. When used according to the manufacturer’s instructions, the proper tool and accessory will do the job safer and faster.

- Use sharp, clean blades. A sharp blade will tend to cut its way out of a pinching condition. A buildup of pitch or sap on the surface of the saw blade increases blade thickness and friction.
- Use the correct blade for your tool. The saw blade should never extend beyond the saw table in any operation you perform.
- Never use a bent, broken or warped saw blade. Throw it away immediately and get a new one.
• Only use accessories specifically recommended in the tool operator's manual. Make sure the speed marked on the blade is at least as high as the no load RPM marked on the tool.
• Some accessories, such as a dado or molding head, require special safety precautions and equipment. Refer to the tool's operator's manual and instructions that come with the accessory.

Do not use grinding or wire brush wheels on your radial arm saw. Radial arm saws are not equipped with the proper guards to use grinding wheels or wire brush wheels.

**Know your Workpiece**
Radial arm saws are used to cut a variety of materials, each having its own specific setup requirements. Take the time to review your work and make sure that all necessary precautions have been taken before making a cut.
• Do not cut wet wood. It produces higher friction against the blade. The blade will also tend to load up with wet sawdust increasing the risk of kickback.
• Cut only wood, wood-like, or plastic materials. Do not cut metal.
• Do not cut more than one piece at a time. Be very cautious of stock which is pitchy, knotty or warped. These are most likely to create pinching conditions and possible kickback.

**Before Cutting...**
Before using a radial arm saw, make sure the tool and its accessories are in proper working order. Failure to do so may increase your risk of injury and may result in kickback, blade pinching, binding or stalling, and loss of control. These situations may cause the workpiece and/or the motor and carriage to jump and can result in an injury. Always unplug the tool before installing, adjusting, and changing any accessory. Do not set up the work with the blade rotating. Turn off and unplug the tool before making adjustments.
• Check blades carefully before each use for proper alignment and possible defects. Never use a bent, broken or warped saw blade.
• Make sure the blade is installed to rotate in the correct direction.
• Make sure the blade has adequate blade set. Blade set provides clearance between the sides of the blade and the workpiece, thus minimizing the probability of binding. Some saw blades have hollow ground sides instead of blade set to provide clearance.
• Check for proper blade guard operation before each cut. The guards should return to their normal position quickly. If a guard seems slow to return or "hangs up", repair or adjust it immediately.
• Be sure the tool switch works properly. Do not use a tool if the switch does not turn it off when returned to the off position.
• When ripping, make sure the blade is exactly parallel to the fence. If the fence closes in toward the rear of the blade, it will tend to wedge the wood against the blade and may cause kickback.
• Anti-kickback devices should be positioned to just clear the workpiece.
• When ripping, the upper guard must be positioned to hold down the workpiece on the table. Make certain that the anti-kickback device fingers are sharp, free-moving and adjusted to stop kickback and assure proper operation. See your operator's manual.
• Keep your radial arm saw in correct adjustment and alignment. Use only sharp accessories that were designed for your saw. Follow your operator’s manual carefully.

**While Cutting ...**
Concentrate on what you are doing and be aware of kickback (a sudden reaction when a workpiece binds between the saw blade and the fence during a ripping operation). Kickback can cause the workpiece to be thrown back toward the operator. Kickback is the result of tool misuse and/or incorrect operating procedures or conditions. Take these specific precautions to help prevent kickback when using any type of radial arm saw:
• Feeding a workpiece in the wrong direction when ripping is extremely dangerous. Follow the instructions provided with and on the saw very carefully.
• Do not release your feed pressure on a workpiece when ripping until it clears the blade.
• If a guard jams, shut off tool power and allow the blade to stop before freeing the guard.
• Position the workpiece so the cut off piece falls away from the table.
• Anti-kickback devices may not work when cutting smooth, hard surfaces. Always cut with the
smooth, hard surface down, on the table.

- A spreader should always be used when rip cutting. The spreader must be precisely lined up with the blade.
- For ripping short or narrow stock, always use a pushstick between the blade and the fence. Do not rip a workpiece that is shorter than the diameter of the saw blade.
- Do not cut freehand (failing to use the fence to stabilize the workpiece.) Free-handing a workpiece can cause crooked cuts and potential kickback.
- Always hold the workpiece firmly against the fence when crosscutting. Pull the saw toward you and through the workpiece just far enough to complete the cut.
- When you start your saw allow the blade to reach full speed before contacting the workpiece.
- Avoid standing or permitting others to stand directly behind the workpiece when making a ripping cut.
- Never reach near, along side, or around the saw blade. This is particularly dangerous. Never place arms, hands or fingers in the path of the blade. This is especially dangerous during a crosscutting job.
- Hold onto the saw handle until the blade comes to a complete stop.

**When Done...**

- When a crosscut job is complete, return the carriage to the full rear position behind the fence.

Unplug, clean and store the tool in a safe, dry place after use.

**Wood Lathes:**

**Choose the Correct Tools**
Choosing the correct tool and the proper accessory for your job can help to reduce the risk of serious injury.
When used according to the manufacturer’s instructions, the proper tool and accessory will do the job safer and faster.
- Check the operator’s manual for proper speed recommendations for the intended purpose and use.
- A lathe should not be altered in any way, or set up to perform any operation not covered in the operator’s manual.
- Keep accessories sharp. Dull accessories can dig into the wood, causing the workpiece to be thrown.

**Know your Workpiece**
- Use only defect-free stock, without cracks, checks, knots and splits. Knots, for example, can fly out and cause serious injury.
- It is recommended that you rough out faceplate workpiece on a band saw or with hand tools before installing them on the lathe faceplate to prevent jams, slips, or thrown workpieces.
- Never remount a turned piece once it is removed from the faceplate.

**Before Cutting...**
- Make certain that the belt guard or cover is in place and the workpiece is free but firmly mounted between centers. Check that all clamping devices (locks), such as on the tailstock and tool rest, are tight and that the workpiece clears the tool rest and other machine parts before operating the tool.

*Placing wood within the lathe.*
Do not run a lathe in the wrong direction. This can cause the turning tool to be thrown from your hands. The lathe spindle must rotate so the top of the workpiece turns toward you.

- The clearance between the workpiece and the tool rest should be only about 1/8". Rotate the workpiece by hand to be sure it clears the tool rest.
- Remove the tool rest before you sand a workpiece by hand.
- Clear the lathe bed of all objects before turning on the tool.

**While Cutting ...**

- Never adjust the tool rest with the lathe turned on.
- Hold turning chisels level and securely on the tool rest, and hold the handle of the chisel firmly.

*How to hold lathe tools*

- Always use the lowest speed when starting a new workpiece. Lathes should be operated at slow speeds until the workpiece is cylindrical. This helps avoid the possibility of an unbalanced piece jumping out at high speed and striking the operator.
- Clamp workpieces securely. Check frequently to be sure clamps remain secure. A moving workpiece can cause loss of control and result in injury.

**When Done...**

Unplug the lathe and lock the switch when not in use. Make sure the switch is in the off position to prevent accidental start-up.
Clean and store the tool in a safe, dry place.

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**Sanders (stationary and portable):**

**Choose the Right Tool and Accessory**

Choosing the correct tool and the proper accessory for your application can help to reduce the risk of serious injury. When used according to the manufacturer's instructions, the proper tool and accessory will do the job safer and faster.

- Always unplug the sander before changing any accessories.
- Stationary sanders may have multiple features, such as belt and disc sanding. Portable sanders are normally single feature sanders (disc, pad, or belt). Exercise caution and alertness to avoid injuries, such as skin abrasions or pinching, that can result from contacting the sanding medium or other moving parts – belts, pulleys, and arbors.
- Don't use small sanders for big jobs or large sanders for small jobs.
- Abrasive belts should be the width recommended by the manufacturer.
- Do not use excessively oversized sanding disc paper. Follow tool manufacturer’s recommendations when selecting sanding paper.

Sanders come in wide variety of designs, such as belt sanders, drum sanders, disc sanders, random orbit sanders or pad sanders. Sanding is often a long job. For this reason, it is very important that you do not lose concentration and that your working environment is set up correctly. If you use the sander unsafely or incorrectly, you could be injured.

**Know your Workpiece**

Take time to review your workpiece and make sure that all necessary precautions have been taken before sanding.
- Always support your workpiece on a stationary sander with the table or backstop.
Use jigs or fixtures to hold your workpiece in position whenever possible.
• Never hold the workpiece by hand, as this is unstable and may lead to loss of control.
• Avoid working on small pieces of material which can’t be properly secured. Injury could result from small pieces being thrown by the spinning sanding pad.
• Remove material or debris from the area that might be ignited by sparks from sanding metal.
• On stationary sanders, maintain a 1/16 inch maximum clearance between the table and the sanding disc or belt.

Before Sanding...
Before working with a sander, make sure the tool and its accessories are in proper working order. Failure to do so may increase your risk of injury.
• Adequate ventilation of your work area is very important when using any type of sander. The use of exhaust type systems or bag collection is also recommended. Dust can explode if the concentration becomes too great. Wood dust and the finishes from woodwork are very combustible.
Do not use the dust collection bag when sanding metal. Using the dust collection bag when sanding metal creates a fire hazard, which could damage the tool and lead to serious personal injury.
• Before connecting the sander to the power supply, be sure the switch and switch lock (if provided) are in the “OFF” position. If not, the sander will start immediately and could result in injury.
Keep power supply and cords from entanglement with the moving parts of the sander. Damaged cords can result in an electrical shock.
• Do not work with a faulty tracking belt sander. Stop using it until the problem is fixed.
• When adjusting the tracking of a portable belt sander, be sure that the sander is supported and positioned properly to avoid accidental contact with yourself or nearby objects.

While Sanding...
• Always keep your body well clear of moving parts such as belts, pads and pulleys.
• Hold portable sanders firmly with both hands. Never lock a portable sander in the “ON” position when the job may require stopping the sander quickly, such as using a sanding disc on a car fender. The rotating disc could get jammed and cause injury.
• It should never be necessary to force a portable sander. The weight of the tool applies adequate pressure. Forcing too much pressure can cause stalling, overheating of the tool, burning of the workpiece, and possible kickback of the tool or workpiece.
If sander is equipped with a dust bag, empty it frequently and when you are done sanding. Spontaneous combustion may result from a mixture of some wood finishing chemicals with dust particles. Be extremely careful of dust disposal, as materials in fine dust may be explosive.

When Done...
• When you are finished sanding, switch the tool to the “OFF” position and hold the tool motionless until the sanding disc comes to a complete stop.
Never try to remove sand paper while the sanding pad is still rotating.
• Never lay down the portable tool until the sanding pad or belt has come to a complete stop.
The spinning pad or belt may grab a work surface and pull the tool out of your control.
Unplug, clean and store the tool in a safe, dry place after use.

Bandsaw:

Choose the Right Tool and Blade
Choosing the correct tool and the proper accessory for your application can help to reduce the risk of serious injury. When used according to the manufacturer’s instructions, the proper tool and accessory will do the job safer and faster.
Use sharp blades. Damaged or dull blades could throw teeth, posing a serious injury risk. A sharp blade will tend to cut its way out of a pinching condition.
• When installing or changing a blade, be sure the blade is aligned properly and the teeth are running in the right direction. Check blade tension regularly and carefully. This helps prevent blade breakage.
• Be sure the blade is properly seated on the pulleys of the band saw before starting.
• Use clean blades. Buildup on the surface of the blade increases blade thickness and also increases blade friction.

**Know your Workpiece**
Take time to review your work and make sure that all necessary precautions have been taken before making a cut.
• Support long workpieces at the same height as the saw. Always place the workpiece securely in a vise or clamp when making cuts. Never make freehand cuts. Holding the workpiece by hand is unstable and may lead to loss of control.
• Never try to remove or clamp the workpiece while the blade is rotating.

**Before Cutting...**
Before working with a bandsaw, make sure the machine and its accessories are in proper working order. Failure to do so can increase your risk of injury and result in blade or wheel pinching, binding or stalling, and loss of control.
• Make sure the blade has adequate blade set. Blade set provides clearance between the sides of the blade and the workpiece, thus minimizing the probability of binding. Some saw blades have hollow ground sides instead of blade set to provide clearance.
• Be sure all guards are in place and working properly before each use. Do not defeat guards.
• Never attempt to cut materials larger than the rated capacity listed in the band saw operator’s manual, as this may result in personal injury. Always check maximum operating speeds established for blades against band saw speed.

**Stationary Band Saw:**
• Adjust the blade guard, upper blade guide, and thrust bearings so only the necessary length of the blade is exposed. The upper blade guide should just clear your workpiece. This will prevent blade breakage and assure a smooth cut.

**While Cutting ...**
Concentrate on what you are doing and be aware of kickback (a sudden reaction to a pinched, bound or misaligned blade). Kickback can cause an uncontrolled tool to lift up and out of the workpiece toward the operator and is the result of tool misuse and/or incorrect operating procedures or conditions.
Take these specific precautions to help prevent kickback when using any type of band saw:
NEVER overreach! Always, hold the saw firmly with both hands after securing the workpiece.
• When you start the saw, allow the blade to reach full speed before the workpiece is contacted. Be alert to the possibility of the blade binding and kickback occurring.
• Keep your hands away from all cutting edges and moving parts. Never reach under the saw or workpiece. The blade is exposed under the workpiece and the saw guard cannot protect your body here.
• Keep hands and body away from and to the side of the blade. Contact with blade will result in serious injury.
• Never remove the saw from a cut while the blade is rotating. When making a partial cut, or if power is interrupted, release the switch immediately and don’t remove the saw from the workpiece until the blade has come to a complete stop. A saw tooth could grab the workpiece, causing loss of control.
• Release the switch immediately if the blade binds or the saw stalls.
• Switch the tool off after a cut is completed, and keep the saw away from your body until the blade stops. The blade may coast for a time, posing the risk of serious cuts.
• Overheating a saw blade can cause it to warp and result in kickback. Buildup of sap on the blade, insufficient blade set, dullness, and unguided cuts, can all cause an overheated blade and kickback.

**Stationary Band Saw:**
• Do not make curved cuts with too small a radius for the width of blade being used. This can also cause unnecessary binding and possible blade breakage. Be attentive to thin cut-off pieces hitting the end of the slot in the table, or jamming in the slot. Use a push stick to free workpieces. Never place your fingers in line with the blade.

**Always Remember...**
Be alert at all times, especially during repetitive operations. Do not be tempted into carelessness
due to a false sense of security. Blades are extremely unforgiving. Be aware that workpieces and other work fragments are hot and could cause fires or burns. Never touch a workpiece until it cools. Let the blade cool properly before changing.

- To reduce the risk of injury, always unplug the saw when moving from a workstation.
- Never use liquid coolants to lubricate your band saw. Liquid coolants can increase the risk of electric shock and may cause damage to the saw.
- Do not overfill the gear chamber with lubricant. Any excess pressure in the chamber will force lubricant into the motor, and may result in damage to the band saw.

**OHSA TIPS**

- Never stop the saw too quickly or thrust a piece of metal or wood against the cutting edge of the teeth after the power has been shut off.
- Periodically examine blades; remove cracked or defective blades immediately.
- Make cuts only when the power is on and not while the saw is coasting.
- Set the guard to just clear the stock being cut.
- Use a push stick to control the stock when it is near the blade.
- Use a special jig or fixture when cutting small pieces of stock.

**Power Hand Tools Handout**

- **Always** wear safety goggles or safety glasses with side shields. Use a dust mask for dusty operations, and wear hearing protection if you'll be using the tool for an extended period of time.
- Dress right, and remember that looks *don't* count. No loose-fitting clothing, no neckties, no jewelry, no dangling objects of any kind.

Long hair must be tied back out of your way. Non-slip footwear is recommended.

- Never use power tools if you are tired, sick, distracted, or under the influence of drugs or alcohol.
- Make sure your work area is neat and clean and free of any debris that might get in your way or be ignited by hot tools, chips or sparks.
- Make sure your work area has plenty of bright, shadow-free light.
- Before you plug in any power tool, **make sure the power switch is off**.
- Be sure all appropriate guards are in place and working.
- Always turn off and unplug the tool before you make any adjustments or change accessories.
- Never use any accessory except those specifically supplied or recommended by the manufacturer. They should be described in the tool's Instruction Manual.
- Never use power tools in wet or damp conditions.
- Never use a tool that is damaged or malfunctioning in any way.
- Need an extension cord? Make sure it's a heavy duty cord and don't use indoor rated cords outside.
- If the tool has a three-pronged plug, make sure you use a three-pronged extension cord plugged into a three-pronged outlet.
- Make sure cutters or blades are clean, sharp and securely in place. Never use bent, broken, or warped blades or cutters.
- Never overreach when using a power tool. Stay firmly planted on both feet.
- Never rush what you are doing. Always pay close attention. Don't let anything distract you. Think ahead!
- When using hand-held power tools, always keep a firm grip with both hands. Losing control creates a hazardous situation. Do not use any tool that is too heavy for you to easily control.
- Always use the right tool for the right job. No substitutions allowed!
- Always unplug, clean and store the tool in a safe, dry place when you are finished.

*Every tool has rules and precautions that apply to it. In the case of power tools, many of these are the same for each tool every time. Learn these by heart and you will always be off to a safe start.*
Hand Drills:

Following good safety practices when using drills and hammers is a must. Make a habit of including safety in all your activities. Always read and understand the tool’s operator’s manual, tool markings and the instructions packaged with the accessory before starting any work. Always wear safety goggles or safety glasses with side shields complying with current national standards, and a full face shield when needed. Use the appropriate mask or respirator in dusty work conditions. Wear proper hearing protection, as needed.

- Dress right. Do not wear gloves, loose clothes or jewelry. Contain long hair. Loose clothes, gloves, jewelry, or long hair can be caught in moving parts.
- Crowded, cluttered work areas that can cause tripping or loss of balance are particularly dangerous.

What Type of Tool do you Have?

Using the right tool will get the job done faster and more safely. Drills are used to create a hole with a rotating drill bit in wood, metal and plastics. Drills are rated by the maximum bit capacity of their chuck (1/2", 3/8", etc.). These tools are often well suited for driving screws. Hammer Drills and Rotary Hammers use impacting action in combination with rotation of the specially designed “percussion bit” to drill holes in masonry materials. In the rotary mode they can also be used to drive fasteners into concrete, masonry, pavement, and similar materials. Often, these tools have different operating modes; hammering with rotary motion, rotation only, and hammering-only. Hammers (also called breakers, chipping hammers or percussion hammers) have a back-and-forth hammering action, without rotation. They are most often used for light-to-medium demolition or shaping of concrete, masonry, asphalt and similar materials.

Choose the Right Tool and Bit

Choosing the correct tool and the proper accessory for your application can help to reduce the risk of serious injury. When used according to the manufacturer’s instructions, the proper tool and accessory will do the job safer and faster. Does the bit shank fit properly into the chuck? Check the tool’s operator’s manual for the type of shank necessary (e.g., SDS, Hex, Round, Spline).

- Is the drill’s capacity adequate for the accessory? Make sure the size of the bit is equal to or less than the capacity on the tool’s nameplate.

Know your Workpiece

Know what is behind a workpiece before you do the job. Do not cut into existing walls or other blind areas where electrical wiring, water, or gas pipes may exist. If this situation is unavoidable, disconnect all fuses/circuit breakers, and shut off any water and gas lines feeding this work site.

Before Drilling or Hammering...

Before working, make sure the tool and its accessories are in proper working order. Failure to do so may increase your risk of injury and may result in binding, stalling, and loss of control. These situations may cause the tool to twist or an accessory to break, causing an injury.

- Be sure the trigger turns the tool “on” when it is pulled and “off” when it is released. A trigger “lock-on” and lock release must also work correctly. Check carefully for loose power cord connections and frays or damage to the cord and plug.

Replace damaged tool/extension cords immediately.

For grounded tools, equipped with a three prong plug, make sure the grounding prong is in good condition.

- For tools with a chuck, be sure the chuck is tightly secured to the spindle. This is especially important on reversible type drills. The chuck could loosen and come off the drill. Tighten the bit securely in the chuck. Remove all chuck keys or wrenches before starting the drill.
- Tighten any auxiliary (side) handles provided with the tool.

When Drilling or Hammering...
Firmly grasp the trigger handle and auxiliary handle (if provided) to maintain control.

- Always hold or brace the tool securely. Brace against stationary things for maximum control.
- In a binding situation, the tool will react in the opposite direction of the turning bit. When drilling into the workpiece (clockwise), the tool will try to spin counterclockwise.
- Don't force the tool apply enough pressure to keep the bit cutting or chipping smoothly. If the motor slows down, relieve the pressure. Too much pressure can damage the bit and cause you to lose control of the tool.
- If the bit binds in the workpiece, release the trigger immediately. Unplug the tool, and then free the bit from the workpiece. Do not use a lock-on button when drilling in warped, pitched, knotty, or imbedded materials (e.g., reinforcing bars in concrete) where binding may be more common. Do not try to free a jammed bit by starting and stopping the tool.
- As you get close to breaking through the workpiece, reduce pressure and allow the bit to pass through the hole easily.
- Always keep a firm footing when using power tools. Be sure you have balance and control before you start the job.
- Remove material or debris from the area, especially if it could be ignited by hot chips or friction.

**When Done...**

Unplug tool immediately after use, before removing or changing the bit and before performing any service or maintenance on the tool.

Store the tool in a dry place.

**Reciprocating Saws:**

The reciprocating saw can be used to cut metal, pipe, wood, nail-embedded wood and other materials.

**Choose the Right Tool and Blade**

Choosing the correct tool and the proper accessory for your application can help to reduce the risk of serious injury. When used according to the manufacturer's instructions, the proper tool and accessory will do the job safer and faster.

Use sharp blades. Dull blades can produce excessive heat, make cutting difficult, result in forcing the saw, and possibly cause an accident.

- When changing blades, be sure the spindle and blade clamp areas are clean. Metal chips and sawdust may prevent the blade from being held securely.
- Blades can break. Use the blade and accessories recommended for the job being done. Check your operator's manual carefully about this.
- To minimize blade flexing and provide a smooth cut, use the shortest blade that will do the job but will extend beyond the workpiece throughout the stroke. Blades may shatter if they impact the work or shoe. Do not use the saw without the shoe for secure control and to avoid damage to the
tool and blade.
• When cutting metal, choose a blade that will allow for at least three blade teeth to be in the material at all times. Less than three teeth will result in teeth snagging and breakage. However, using blades with too fine a tooth will slow your cut.
• Use clean saw blades.

*Never plunge the blade into your cutting surface.*

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**Know your Workpiece**

Take time to review your work and make sure that all necessary precautions have been taken before making a cut. Reciprocating saws are used to cut a variety of materials, each having its own setup requirements. Know what is behind a workpiece before you do the job. Do not cut into existing walls or other blind areas where electrical wiring, water, or gas pipes may exist. If this situation is unavoidable, disconnect all fuses/circuit breakers, and shut off any water and gas lines feeding this work site.
• Support large workpieces so they will not pinch the blade. Use a straight edge as a guide for ripping.
• Avoid cutting small workpieces that can’t be properly secured, and workpieces on which the base of the saw (shoe) can not properly rest. Injury could result from small pieces being thrown at the operator if the blade pinches and binds.
• Be very cautious of stock which is pitchy, knotty or warped. These are most likely to create pinching conditions.

When possible, avoid cutting above shoulder height.

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**While Cutting …**

• Position yourself to maintain full control of the saw. When possible, avoid cutting above shoulder height.
Keep hands away from the blade and shoe. Before starting, be sure the power cord and extension cord are out of the blade path and are long enough to freely complete the cut. A sudden jerk or pull on the cord can cause loss of control of the saw and a serious accident. Clamp workpieces securely. Check frequently to be sure clamps remain secure. A moving workpiece can cause loss of control and result in injury.
• Never hold a workpiece in your hand or across your leg when sawing.
• NEVER overreach! For maximum control, hold the saw firmly with both hands after securing the
workpiece.
• When you start your saw allow the blade to reach full speed before contacting the workpiece.
• Always hold the shoe of the saw firmly against the work to prevent operator injury and blade breakage. Striking the blade end against the workpiece can cause loss of control and damage to the saw.
• Be alert to the possibility of the blade binding.
• When making anything other than a through cut, allow the saw to come to a complete stop before removing the blade from the workpiece. This prevents blade breaking and possible loss of saw control.
• When plunge cutting, maintain firm contact between the saw’s shoe and the workpiece. Lower the blade into the workpiece using the shoe as a pivot. Once the shoe is flat against the workpiece, begin the desired cut.
• Do not plunge cut into a metal workpiece. Instead, using a drill or chisel, make a pilot hole larger than the widest portion of the blade. Insert the blade, placing the shoe flat against the workpiece, and begin the desired cut.

When Done...
• Switch off the tool after a cut is completed, and keep the saw away from your body until the blade stops. The blade may coast for a time, posing the risk of serious cuts.
Remember that the blade and blade clamp may be hot immediately after cutting. Avoid contact until they have cooled.

Unplug, clean and store the tool in a safe, dry place after use.

Routers:

Choose the Right Tool and Accessory
Choosing the correct tool and the proper accessory for your job can help to reduce the risk of serious injury.
When used according to the manufacturer’s instructions, the proper tool and accessory will do the job safer and faster.
Use only those accessories with speeds rated at least as high as the no-load RPM on the tool.
The wrong accessory can shatter during use, possibly causing injury.
• Never use dull or damaged bits. Sharp bits must be handled with care. Damaged bits can snap during use. Dull bits tend to over load, causing possibility of bit breakage.
• Never use bits that have a cutting diameter greater than the opening in the router base.

Know your Workpiece
Take time to review your workpiece and make sure that all necessary precautions have been taken before cutting.
Always make sure the work surface is free from nails and other foreign objects. Cutting into a nail can cause the bit and the tool to jump and damage the bit.
• Never lay the workpiece on top of hard surfaces like concrete, stone, etc. The bit may hit the surface and cause the tool to jump up. This can be very dangerous.
Always place the workpiece securely in a vise or other recommended clamping device. Holding the work piece by hand is unstable and may lead to loss of control.

Before Routing...
Before working with a router, make sure the tool and its accessories are in proper working order. Failure to do so may increase your risk of injury.
• After changing the bits or making any adjustments, make sure the collet nut and any other adjustment devices are securely tightened. Loose adjustment devices can unexpectedly shift, causing loss of control; loose rotating components will be violently thrown. Install router bits securely and according to the operator’s manual.
• Always use the wrenches provided with the tool to make adjustments. Using the correct wrench enables a more secure grip on the tool and may prevent slipping leading to potential injury.

While Routing...
• Never start the tool when the bit is touching the workpiece. The bit may grab the workpiece and
cause loss of control. Follow the tool manufacturer’s procedure for setting the depth of cut.
Tighten adjustment locks. Make certain that the bit shaft is engaged in the collet at least ½ inch.
• Always inspect the router bit before each use and NEVER use a bit if the carbide is cracked or
appears damaged in any way.
• Never use a router with the bit pointing toward you. If the router should slip, the bit could cause
serious injury. Always face the bit away from your body.
• If the router does not run smoothly, the bit may be bent or out of balance. Replace the bit
immediately.

For maximum control, hold the router firmly with both hands. The reaction torque of the motor
can cause the tool to twist.
Keep your hands and fingers away from the work area. Contact with the bit will cause serious
injury.
• Always feed the bit into the workpiece in the same direction as the bit rotation (same direction
as the chips are being thrown). When the router is positioned between your body and the side of
the routed workpiece, the direction of the router feed is to the right. If the router is positioned on
the side of the workpiece away from your body the direction of the router feed is to the left.

The direction of the router feed is to the left.

• Feeding the tool in the wrong direction causes the cutting edge of the bit to climb out of the
work piece and pull the tool toward the operator, and may result in loss of control and injury.
Follow the instructions provided with and on the tool very carefully.

When Done...
Unplug, clean and store the tool in a safe, dry place after use.
Never touch the bit during or immediately after use. The bit is too hot to be touched with bare
hands.
• Never lay the tool down until the motor and bit have come to a complete standstill. The spinning
bit can grab a surface and pull the tool out of your control.

Grinders:

Choose the Correct Tool and Accessory
Choosing the correct tool and the proper accessory or your application can help to reduce the risk
of serious injury. When used according to the manufacturer’s instructions, the proper tool and accessory will do the job safer and faster.
When it is recommended to use a guard with a wire brush, do not allow the wire brush to rub
against the guard. The wire wheel or brush may expand in diameter due to work load and
spinning.
• Wheels must be used only for their recommended jobs. For example, do not grind with the side
of a cut-off wheel. It will shatter.
• The outside diameter and the thickness of your accessory must be within the capacity rating of
your power tool (e.g., don’t use an 8” wheel on a 7” grinder). Incorrectly sized accessories cannot
be adequately guarded or controlled.
• Use the correct accessory for your tool. Check this carefully: Does it fit the spindle of the power
tool. Be careful not to over-tighten the spindle nut. Too much pressure will deform the flanges
and stress the wheel. Accessories with arbor holes that do not match the tool will wobble, vibrate
excessively and may cause loss of control.
• Always use undamaged wheel flanges that are the correct size and shape to properly support
your accessory.
• Make sure the speed marked on the accessory is at least as high as the no load RPM marked on the tool. Accessories running faster than their rated speed can fly apart.
• Do not use accessories that require liquid coolant, unless your tool has been specifically designed for operations with liquid coolant. Using water or other liquid coolants may result in electrocution or shock.

**Portable Grinders:**
• Determine the type of tool needed for the job. Portable grinders come in various types, such as: “straight” grinders, “vertical” grinders or “angle” grinders.
• Do not use a grinder that is too heavy for you to easily control.
• When sanding, do not use excessively oversized sanding disc paper. Follow tool manufacturer’s recommendations when selecting sanding paper.

**Know your Workpiece**
• Avoid working on small pieces of material which can’t be properly secured. Injury could result from small pieces being thrown by the spinning accessory.

**Portable Grinders:**
Know what is behind a workpiece before you do the job. Do not cut into existing walls or other blind areas where electrical wiring, water, or gas pipes may exist. If this situation is unavoidable, disconnect all fuses/circuit breakers, and shut off any water and gas lines feeding this work site.

**Before Grinding...**
Before working with a grinder, make sure the tool and its accessories are in proper working order. Failure to do so may increase your risk of injury.
• Handle accessories carefully to prevent damage or cracking. Do not use a damaged accessory.
• Before each use, inspect:
  • Abrasive wheels for chips and cracks
  • Backing pad for cracks, tear or excess wear
  • Wire brush for loose or cracked wires.
  • Test grinding wheels before mounting. Tap the wheel lightly with a nonmetallic implement such as the handle of a screwdriver. If it produces a ringing sound, it is in good condition. If it sounds dull, replace the wheel. **DO NOT USE A CRACKED WHEEL.**
  • Tuck away or trim any loose portion of a polishing bonnet or its attachment strings. After inspecting and installing an accessory, position yourself and bystanders away from the rotating accessory and run the power tool at maximum no load speed for one minute. Damaged accessories will normally break apart during this test time.
  • Keep bystanders a safe distance away from the work area. Anyone entering the work area must wear personal protective equipment. Pieces of a workpiece or a broken accessory may fly away.
  • Be sure the tool switch works properly. Do not use a tool if the switch does not turn it off when returned to the off position.

*Always stand behind the grinder.*

**Portable Grinders:**
• Be sure the guard is securely attached to the tool and positioned for maximum safety, so the least amount of wheel is exposed toward the operator during use.
• Position the cord away from the spinning accessory. If you lose control, the cord may be cut or snagged and your hand or arm may be pulled into the spinning accessory.
• Bench grinder wheels should be trued and dressed when worn out of round, or the surface
face is clogged or worn smooth. This provides a clean sharp grinding surface and rebalancing of the wheel.

- New bench grinder wheels should be balanced by dressing and truing to eliminate vibration and possible mishap. Check your operator's manual. Do not operate a grinder unless you are certain the grinder, its base and/or stand are securely mounted.

**While Grinding...**
Concentrate on what you are doing and be aware of kickback (a sudden reaction to a pinched or snagged accessory). Pinching or snagging causes rapid stalling of the rotating accessory. This forces the uncontrolled power tool in the direction opposite the accessory's rotation at the point of binding. It can also cause an uncontrolled workpiece to be thrown.
- For example, when using a portable grinder, if an abrasive wheel is snagged or pinched by the workpiece, the edge of the wheel entering the pinch point can dig into the surface of the material causing the wheel to climb or kick out of the workpiece. The wheel may either jump toward or away from the operator, depending on direction of the wheel's movement at the point of pinching. Abrasive wheels may also break under these conditions.
- Kickback is the result of power tool misuse and/or incorrect operating procedures or conditions, and can be avoided by taking proper precautions. Never place your hand near the rotating accessory.
- Do not attach a saw chain, woodcarving blade, or toothed saw blade. Grinders are not designed for these types of blades.
- Do not “jam” a cut-off wheel or apply excessive pressure. Do not attempt to make an excessive depth of cut. When using wire brushes, wire bristles are thrown during ordinary operation. Do not overstress the wires by applying excessive load to the brush.
- When stopping a cut, switch off the tool and hold the tool motionless until the wheel comes to a complete stop. Never attempt to remove the cutoff wheel from the cut while the wheel is in motion.
- Do not restart the cut in the workpiece. Let the wheel reach full speed and then carefully reenter the cut.

**Portable Grinders:**
- Maintain a firm grip on the power tool and position your body and arms to allow you to resist kickback forces.
- Always use an auxiliary (side) handle, if provided, for maximum control over kickback or a torque reaction during startup. The operator can control torque reactions or kickback forces, if proper precautions are taken.
- Do not position your body in the area where the power tool will move if kickback occurs. Kickback will propel the tool in the direction opposite to the wheel's movement at the point of snagging.
- Support panels or any oversized workpiece to minimize the risk of wheel pinching and kickback. Large workpieces tend to sag under their own weight. Supports must be placed under the workpiece near the line of cut and near the edge of the workpiece on both sides of the wheel.
- When it is recommended to use a guard with a wire brush, do not allow the wire brush to rub against the guard. The wire wheel or brush may expand in diameter due to work load and spinning.

**When Done...**
Unplug, clean and store the tool in a safe, dry place after use. Never lay the power tool down until the accessory has come to a complete stop. The spinning accessory may grab the surface and pull the power tool out of your control.
- Do not run the power tool while carrying it at your side. Accidental contact with the spinning accessory could snag your clothing, pulling the accessory into your body.
- Regularly clean the power tool's air vents. The motor's fan will draw the dust inside the housing and excessive accumulation of powdered metal may cause electrical hazards.
- Store accessories with care. Do not drop them or subject them to excessive heat, or cold
**Circular Saws:**

**Choose the Correct Tool and Blade**
Choosing the correct tool and the proper saw blade for your application can help to reduce the risk of serious injury. When used according to the manufacturer's instructions, the proper tool and accessory will do the job safer and faster.

- Do not use a circular saw that is too heavy for you to easily control.
- Use sharp blades. Damaged or dull blades could throw teeth, posing a serious injury risk. A sharp blade will tend to cut its way out of a pinching condition.
- Use the correct blade for your tool. Check this carefully: Does it have the proper size and shape arbor hole?
- Make sure the speed marked on the blade is at least as high as the no load RPM marked on the tool.
- Use clean saw blades. A buildup of pitch or sap on the surface of the saw blade increases blade thickness and also increases blade friction and the likelihood of kickback.

**Know your Workpiece**
Take time to review your work and make sure that all necessary precautions have been taken before making a cut. Circular saws are used to cut a variety of materials, each having its own specific setup requirements.

Know what is behind a workpiece before you do the job. Do not cut into existing walls or other blind areas where electrical wiring, water, or gas pipes may exist. If this situation is unavoidable, disconnect all fuses/circuit breakers, and shut off any water and gas lines feeding this work site.

- Support large panels (as illustrated) so they will not pinch the blade.
- Use a straight edge or rip fence as a guide for ripping.
- Avoid cutting small workpieces that can't be properly secured, and workpieces on which the base of the saw (shoe) can not properly rest. Injury could result from small pieces being thrown back at the operator if the blade pinches and binds.

Portable circular saws are not designed for cutting logs, roots, trimming trees or shrubs. Be very cautious of stock which is pitchy, knotty or warped. These are most likely to create pinching conditions and possible kickback.

**Before Cutting...**
Before working with a circular saw, make sure the tool and its accessories are in proper working order. Failure to do so can increase your risk of injury and result in blade pinching, binding or stalling, kickback and loss of control. These situations can cause the saw to jump back at the operator and result in a serious injury. Check blades carefully before each use for proper alignment and possible defects. Never use a bent, broken or warped saw blade.

- Make sure the blade has adequate blade set. Blade set provides clearance between the sides of the blade and the workpiece, thus minimizing the probability of binding. Some saw blades have hollow ground sides instead of blade set to provide clearance.

**While Cutting ...**
Concentrate on what you are doing and be aware of kickback (a sudden reaction to a pinched, bound or misaligned blade). Kickback can cause an uncontrolled tool to lift up and out of the workpiece toward the operator and is the result of tool misuse and/or incorrect operating procedures or conditions.

Take these specific precautions to help prevent kickback when using any type of circular saw:
- Before starting a circular saw, be sure the power cord and extension cord are out of the blade path and are long enough to freely complete the cut. A sudden jerk or pull on the cord can cause loss of control of the saw and a serious accident. Clamp workpieces securely. Check frequently to be sure clamps remain secure. A moving workpiece can cause loss of control and result in injury.
- Never hold a workpiece in your hand or across your leg when sawing.

**NEVER overreach!** Always, hold the saw firmly with both hands after securing the workpiece. Keep hands and body away from and to the side of the blade. Contact with blade will result in serious injury.

- Set blade depth to no more than 1/8 in. to 1/4 in. greater than the thickness of the material being cut. Less than a full tooth should be visible below the workpiece.
• Minimize blade pinching by placing the saw shoe on the clamped, supported portion of the workpiece, and allowing the cut off piece to fall away freely.
• When you start your saw allow the blade to reach full speed before contacting the workpiece. Be alert to the possibility of the blade binding and kickback occurring. Hold the saw with two hands and position your arms to resist kickback. If a fence or guide board is used, be certain the blade is kept parallel with it.
• Never remove the saw from a cut while the blade is rotating. When making a partial cut, or if power is interrupted, release the switch immediately and don’t remove the saw from the workpiece until the blade has come to a complete stop. Removing the saw with a rotating blade could result in a saw tooth grabbing the workpiece, causing loss of control.
• Never reach under the saw or workpiece. The blade is exposed under the workpiece and the saw guard cannot protect your body here.
• Release the switch immediately if the blade binds or the saw stalls.
• When restarting a saw in the workpiece, center the saw blade in the kerf and check that saw teeth are not touching the material when the saw is turned on.
• Turn off the tool after a cut is completed and keep the saw away from your body until the blade stops. The blade may coast for a time, posing the risk of serious cuts.

Overheating a saw blade can cause it to warp and result in kickback. Buildup of sap on the blades, insufficient blade set, dullness, and unguided cuts, can all cause an overheated blade and kickback.

How to setup a circular saw on saw horses

When Done...
Unplug, clean and store the tool in a safe, dry place after use.

Always Remember...
Tighten depth levers securely
Set the depth of cut 1/8" to 1/4" greater than the thickness of the stock
Secure the workpiece to sturdy supports
Always rest the larger portion of the saw’s baseplate on the supported portion of the workpiece. Allow the unsupported portion to fall away.

Wear safety glasses
Grip saw with both hands, keeping hands away from the blade
No loose clothing
Keep the cord away from the blade and kerf.
Firm footing in a clean area
GAS WELDING AND CUTTING

Transporting, Moving, and Storing Compressed Gas Cylinders

- Valve protection caps shall be in place and secured.
- When cylinders are hoisted, they shall be secured on a cradle, slingboard, or pallet. They shall not be hoisted or transported by means of magnets or choker slings.
- Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dropped, struck, or permitted to strike each other violently.

Use of Fuel Gas

The employer shall thoroughly instruct employees in the safe use of fuel gas, as follows:

- Fuel gas shall not be used from cylinders through torches or other devices which are equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.
- Before a regulator to a cylinder valve is connected, the valve shall be opened slightly and closed immediately. (This action is generally termed "cracking" and is intended to clear the valve of dust or dirt that might otherwise enter the regulator.) The person cracking the valve shall stand to one side of the outlet, not in front of it. The valve of a fuel gas cylinder shall not be cracked where the gas would reach welding work, sparks, flame, or other possible sources of ignition.
- The cylinder valve shall always be opened slowly to prevent damage to the regulator. For quick closing, valves of fuel gas cylinders shall not be opened more than 1/2 turns. When a special wrench is required, it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel gas flow can be shut off quickly in case of an emergency. In the case of manifolded or coupled cylinders, at least one such wrench shall always be available for immediate use. Nothing shall be placed on top of a fuel gas cylinder, when in use, which may damage the safety device or interfere with the quick closing of the valve.
- Before a regulator is removed from a cylinder valve, the cylinder valve shall always be closed and the gas released from the regulator.
- If, when the valve on a fuel gas cylinder is opened, there is found to be a leak around the valve stem, the valve shall be closed and the gland nut tightened. If this action does not stop the leak, the use of the cylinder shall be discontinued, and it shall be properly tagged and removed from the work area. In the event that fuel gas should leak from the cylinder valve, rather than from the valve stem, and the gas cannot be shut off, the cylinder shall be properly tagged and removed from the work area. If a regulator attached to a cylinder...
valve will effectively stop a leak through the valve seat, the cylinder need not be removed from the work area.

- If a leak should develop at a fuse plug or other safety device, the cylinder shall be removed from the work area.

**Fuel Gas and Oxygen Manifolds**

Fuel gas and oxygen manifolds shall bear the name of the substance they contain in letters at least 1-inch high which shall be either painted on the manifold or on a sign permanently attached to it. These manifolds shall be placed in safe, well ventilated, and accessible locations and not be located within enclosed spaces.

Manifold hose connections, including both ends of the supply hose that lead to the manifold, shall be such that the hose cannot be interchanged between fuel gas and oxygen manifolds and supply header connections. Adapters shall not be used to permit the interchange of hose. Hose connections shall be kept free of grease and oil.

When not in use, manifold and header hose connections shall be capped.

Nothing shall be placed on top of a manifold, when in use, which will damage the manifold or interfere with the quick closing of the valves.

**Hose**

Fuel gas and oxygen hose shall be easily distinguishable from each other. The contrast may be made by different colors or by surface characteristics readily distinguishable by the sense of touch. Oxygen and fuel gas hoses shall not be interchangeable. (See accompanying figure for example.) A single hose having more than one gas passage shall not be used.

When parallel sections of oxygen and fuel gas hose are taped together, not more than 4 inches out of 12 inches shall be covered by tape.

All hose in use, carrying acetylene, oxygen, natural or manufactured fuel gas, or any gas or substance which may ignite or enter into combustion, or be in any way harmful to employees, shall be inspected at the beginning of each working shift. Defective hose shall be removed from service.

Hose which has been subject to flashback, or which shows evidence of severe wear or damage, shall be tested to twice the normal pressure to which it is subject, but in no case less than 300 p.s.i. Defective hose, or hose in doubtful condition, shall not be used.

Hose couplings shall be of the type that cannot be unlocked or disconnected by means of a straight pull without rotary motion.

Boxes used for the storage of gas hose shall be ventilated.

Hoses, cables, and other equipment shall be kept clear of passageways, ladders, and stairs.

**Torches**

Clogged torch tip openings shall be cleaned with suitable cleaning wires, drills, or other devices designed for such purpose.
Torches in use shall be inspected at the beginning of each working shift for leaking shutoff valves, hose couplings, and tip connections. Defective torches shall not be used.

Torch shall be lighted by friction lighters or other approved devices, and not by matches or from hot work.

**Regulators and Gauges**
Oxygen and fuel gas pressure regulators, including their related gauges, shall be in proper working order while in use.

**Oil and Grease Hazards**
Oxygen cylinders and fittings shall be kept away from oil or grease. Cylinders, cylinder caps and valves, couplings, regulators, hose, and apparatus shall be kept free from oil or greasy substances and shall not be handled with oily hands or gloves. Oxygen shall not be directed at oily surfaces, greasy clothes, or within a fuel oil or other storage tank or vessel.

**Welding and Cutting:**

**MIG (Metal Inert Gas)**

**Choose the Right Tool**
Choosing the correct tool and the proper accessories for your application can help to reduce the risk of serious injury. When used according to the manufacturer’s instructions, the proper tool and accessories will do the job safer and faster.

**Before Welding...**
Before working with a MIG welder, make sure the machine and its accessories are in proper working order. Failure to do so can increase your risk of injury.

- Inspect all equipment before use. Do not use damaged, defective, or improperly adjusted equipment.
- Perform work only in an area with fireproof floor, and on fireproof surfaces.
- Do not use if grease or oil is present on equipment or materials
- Remove all flammables with 35 ft of the welding operation. If this is not possible, tightly cover them with approved covers.
- Wear oil-free protective garments such as welding jacket, cuffless trousers, high shoes, leather gloves and a cap.
- Open gas cylinder slowly by turning handle counterclockwise.
- Stabilize work piece on table or floor.
- Clamp ground clamp to welding table or area on your piece away from the area you are welding.
- Turn power supply on and adjust wire feed speed and voltage to appropriate settings for material and thickness.
- Position helmet/faceshield to protect eyes and face.
While Welding....
- Maintain a contact tip to work distance of 3/8” to ½”.
- Use a uniform travel speed and fill crater by pausing or using a slight back step motion.
- To restart a weld, by back stepping into the last weld’s crater and continue moving forward.
- If required, clamp materials to table or each other. Make sure not to weld piece to table.

When Done....
- Unclamp ground clamp from table or work piece.
- Bleed hose line by closing gas cylinder (clockwise turns), turning wire speed to 0 and press trigger until regulators read 0 psi.
- Turn welder off and wrap up hoses/wires to keep off floor.

ARC (‘Stick’ Welding)

Choose the Right Tool
Choosing the correct tool and the proper accessories for your application can help to reduce the risk of serious injury. When used according to the manufacturer’s instructions, the proper tool and accessories will do the job safer and faster.

Before Welding...
Before working with a ARC welder, make sure the machine and its accessories are in proper working order. Failure to do so can increase your risk of injury.
- Inspect all equipment before use. Do not use damaged, defective, or improperly adjusted equipment.
- Perform work only in an area with fireproof floor, and on fireproof surfaces.
- Do not use if grease or oil is present on equipment or materials.
- Remove all flammables with 35 ft of the welding operation. If this is not possible, tightly cover them with approved covers.
- Wear oil-free protective garments such as welding jacket, cuffless trousers, high shoes, leather gloves and a cap.
- Stabilize work piece on table or floor.
- Clamp ground clamp to welding table or area on your workpiece away from the area you are welding.
- Choose the appropriate electrode for your operation and securely clamp into holder.
- Turn power supply on and adjust amperage to appropriate settings for material and thickness.
- Position helmet/faceshield to protect eyes and face.

While Welding....
- Strike an arc by either scratch or tap start method and maintain a 1/8” distance between electrode and workpiece.
- Use a uniform travel speed and fill crater by pausing or using a slight back step motion.
- If required, clamp materials to table or each other. Make sure not to weld piece to table.
When Done….
• Remove remaining piece of electrode from holder.
• Unclamp ground clamp from table or work piece.
• Turn welder off and wrap up hoses/wires to keep off floor.

PLASMA CUTTING

Before Cutting...
Before working with a Plasma cutter, make sure the machine and its accessories are in proper working order. Failure to do so can increase your risk of injury.
• Inspect all equipment before use. Do not use damaged, defective, or improperly adjusted equipment.
• Perform work only in an area with fireproof floor, and on fireproof surfaces.
• Do not use if grease or oil is present on equipment or materials.
• Remove all flammables with 35 ft of the welding operation. If this is not possible, tightly cover them with approved covers.
• Wear oil-free protective garments such as welding jacket, cuffless trousers, high shoes, leather gloves and a cap.
• Stabilize work piece on table.
• Clamp ground clamp to welding table or area on your workpiece away from the area you are welding.
• Turn power supply on and adjust current to appropriate settings for material and thickness.
• Position helmet/faceshield to protect eyes and face.

While Cutting….
• Hold torch nozzle approximately 1/8” to 3/16” above the workpiece and tilt at about 15-30º.
• Maintain a forward 5-15º angle, while using a uniform travel speed.

When Done….
• Unclamp ground clamp from table or work piece.
• Turn cutter off and wrap up hoses/wires to keep off floor.

SANDBLASTING

Before Sandblasting...
Before working with a Sandblasting cabinet, make sure the machine and its accessories are in proper working order. Failure to do so can increase your risk of injury.
• Inspect all equipment before use. Do not use damaged, defective, or improperly adjusted equipment.
• Do not use if grease or oil is present on equipment or materials.
• Wear safety glasses, dust mask and appropriate hearing protection.
• Turn on dust collection.
• Choose appropriate abrasive grit for.
• Place workpiece inside cabinet and securely close door. Be careful not to drop on blasting gun.

While Sandblasting….
• Point Sandblaster gun away from gloves, observation window and door.

When done….
• Turn dust collector off and remove workpiece from cabinet. Be careful not to drop on Gun.