SAFETY

Construction

Toronto
District
School
Board

Acknowledgements

Carmen Camuti
Program Coordinator
Experiential Learning Department

Joe Flynn
Oakwood C.I.

James Corbett
North Albion C.I.

Ed Sedlak
Central Technical School

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GENERAL SAFETY RULES - CONSTRUCTION

- ✓ Absolutely no horseplay or running is permitted in the shop area.
- ✓ Students must report any damaged or broken equipment or tools to the teacher.
- ✓ Students are responsible for returning tools to the appropriate place and cleaning up the shop area.
- ✓ Stay focused on your work while operating machinery. Do not distract others when they are operating machinery.
- ✓ Electronic entertainment devices will not be permitted in the shop areas
- ✓ Should you have any doubts about the operation or safe set-up of the machinery always ask the qualified technical teacher for clarification and assistance.
- ✓ A qualified construction teacher must be present in the machining area while equipment is in use.
- ✓ All loose clothing, hair, or jewelry must be secured safely while using machines.
- ✓ Safety glasses must be worn at all times.
- ✓ Never leave a machine running unattended. Ensure the machine has come to a complete stop.
- ✓ Disconnect power supply to machines before making adjustments. Ask the qualified technical teacher to inspect your adjustments before restoring power.
- ✓ Ask permission before using any machine.
- ✓ Report all accidents, no matter how small, to the teacher.

I have read the above rules and guidelines. I understand them and agree to abide by them at all times to ensure a safe shop for everyone.

Name:_____ Signature: _____

Date:_____ Teacher Initials: _____

POWER SAWS: GENERAL

A power saw is an extremely useful tool that, when using the appropriate blade, can be used to cut wood, metal, concrete and a host of other materials. The two main categories of hand-held power saws are reciprocating (sabre saws) and rotary (circular saws). Extreme care must be taken when using these tools.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Hearing protection
- Dust mask
- Apron
- Face protection where necessary

Operating Procedures

- Wear protective clothing and equipment – eye protection is essential, and hearing protection should also be worn.
- Where ventilation is inadequate, wear a dust mask for protection against the dust.
- Electric saws operated outside or in wet locations must be protected with a GFCI.
- Never wear loose clothing, dangling jewelry, or anything else that might get caught in the saw.
- Leave all safety devices and guards in place and properly adjusted on the saw.
- Change and adjust blades with the power OFF – disconnect the saw from the source.
- Do not operate any saw before receiving and understanding instructions from your teacher.
- Be sure no one is standing in front of the saw as you make the cut.
- Concentrate on your work – do not become careless, or allow yourself to be distracted.
- Allow the saw to reach full speed before starting a cut.

Specific Hazards

- Muscle strain from poor posture/stance/grip during use of tool.
- Power saws can cause various accidents and injuries, including cuts, amputations, gashes, puncture wounds, burns, and eye injuries from flying particles or broken bits.
- Use extreme caution whenever using a power saw – be aware of your cut path, and ensure that it is free of electrical wires or other foreign objects.

CIRCULAR SAWS

There are two different types of hand-held circular saw: direct drive, and worm drive. A direct-drive saw sees the blade attached directly to the motor shaft (arbor), whereas a worm-drive saw sees the blade attached to a drive shaft that is driven by the motor through a worm-drive gear.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Hearing protection
- Dust mask
- Apron
- Face protection where necessary

Operating Procedures

- Wear protective clothing and equipment – eye protection is essential, and hearing protection should also be worn.
- Where ventilation is inadequate, wear a dust mask for protection against the dust.
- Electric saws operated outside or in wet locations must be protected with a GFCI.
- Never wear loose clothing, dangling jewelry, or anything else that might get caught in the saw.
- Leave all safety devices and guards in place and properly adjusted on the saw.
- Choose the right blade for the job.
- Change and adjust blades with the power OFF – disconnect the saw from the source
- Do not operate any saw before receiving and understanding instructions from your teacher.
- Be sure no one is standing in front of the saw as you make the cut.
- Allow the saw to reach full speed before starting a cut.
- Ensure the material is free of nails, screws, concrete, and other foreign objects.
- Concentrate on your work – do not become careless, or allow yourself to be distracted
- Take special care to ensure that blades are installed in the proper rotational direction – remember that electrical circular saws cut with an upward motion.
- Never operate saw with the blade guard tied or wedged open.
- Never place the saw on the floor while the motor is spinning down – hold it in your hand until it has stopped completely.
- When setting the depth of cut, the blade should project the depth of *one full tooth below the material*: this keeps blade friction to a minimum, removes sawdust from the cut, and results in cool cutting.

CIRCULAR SAWS (Continued)

Changing, Adjusting, and Setting Blades

1. Disconnect the saw from the power source.
2. Place the saw blade on a piece of scrap lumber and press down until the teeth dig into the wood. This prevents the blade from turning when the locking nut is loosened or tightened. Some machines are provided with a mechanical locking device.
3. Use manufacturer-provided arbor wrench to remove arbor nut.
   Note: arbor bolts characteristically are a reverse-thread: that is, the nut is turned to the *right* to loosen, and to the *left* to tighten. This is counter to the usually - accurate Golden Rule: “Righty-tighty: Lefty-loosey”
4. Install new blade, ensuring proper fit on arbor. Tighten arbor bolt firmly.
5. Make sure that keys and adjusting wrenches are removed before operating the saw.

Basic Operation

- Place the material to be cut on a rigid support such as a bench or two sawhorses.
- Check the cut-path to make sure that the blade will clear the supporting surface and the power cord.
- The wide part of the saw shoe should rest on the supported side of the cut if possible.
- Large sheet stock should be supported in at least three places, with one support next to the cut.
- Short pieces of material (less than 24” in length) should not be held by hand – use some form of clamping to hold the material down when cutting it (preferable to use two clamps as this negates the possibility of the clamp becoming an unhelpful pivot-point when force is placed on the work piece through the saw.
- The material should be placed with its good side down, if possible: because the blade cuts *upward* into the material, any splintering will be on the side which faces up)
- Use just enough force to let the blade cut without laboring.
- Hardness and toughness can vary in the same piece of material, and a knotty or wet section can put a heavier load on the saw – when this happens, reduce pressure to keep the speed of the blade constant (listen to the sound of the tool for this).
- Use extra caution when cutting plywood, wet lumber, and lumber with a twisted grain, as they tend to tighten around a blade and may cause kickback.
- Forcing the blade beyond its capacity will result in rough and inaccurate cuts - it will also overheat the motor and the saw blade.
- If the cut gets off line, don’t force the saw back onto line: withdraw the blade and either start over on the same line or begin on a new line.
- If cutting right-handed, keep the cord on that side of your body.
- Stand to one side of the cutting line while working.
- Never reach under the material being cut.
- Always keep your free hand on the long side of the lumber and clear of the saw – maintain a firm, well-balanced stance.

Specific Hazards

- Muscle strain from poor posture/stance/grip during use of tool.
- Power saws can cause various accidents and injuries, including cuts, amputations, gashes, puncture wounds, burns, and eye injuries from flying particles or broken bits.
- Use extreme caution whenever using a power saw – be aware of your cut path, and ensure that it is free of electrical wires or other foreign objects.

SABRE SAWS: GENERAL

There are two different types of hand-held sabre saw: a jigsaw or reciprocating saw (commonly known by its' trade name "Sawzall"). The reciprocating action of the blade means that it cuts on an up-and-down stroke. A wide variety of blades are available for use on materials like plywood, dimensional lumber, drywall, certain metals, stone, cement, and some plastics/laminates.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Hearing protection
- Dust mask
- Apron
- Face protection where necessary

Operating Procedures

- The portable jig saw is designed for cutting internal and external contours – the saw should not be used for continuous or heavy cutting that can be done more safely and efficiently with a circular saw.
- The reciprocating saw is a heavier type of sabre saw with a larger and more rugged blade – the tool is often used by drywall workers and demolition workers to cut holes in ceilings and walls.
- The reciprocating saw must be held with both hands to absorb vibration and to avoid accidental contact.
- Use caution when cutting through walls – beware of electrical wiring and other services in or behind the wall.
- Use the proper blade for the task at hand.
- These saws cut on the upstroke – splintering will therefore happen on the top side of the material being cut (consequently, the good side should be facing down).
- When cutting, material must be clamped and supported as close to the cutting line as possible.
- Before starting a cut make sure that the saw will not contact clamps, the vise, workbench, or other support.
- Never reach under the material being cut.
- Never lay down the saw until the motor has stopped.
- Do not try to cut curves so tight that the blade will twist and break (use *relief cuts* to accomplish tighter curves)
- Always hold the base plate or shoe of the saw in firm contact with the material being cut.

SABRE SAWS: GENERAL (Continued)

External Cuts

- To start an external cut (from the outside in), place the front of the shoe on the material.
- Make sure that the blade is not in contact with the material or the saw will stall when the motor starts.
- Hold the saw firmly and switch it on.
- Feed the blade slowly into the material and maintain an even pressure.
- When the cut is complete, do not lay down the saw until the motor has stopped.

Inside Cuts

- To start an inside cut (pocket cut), first drill a pilot hole slightly larger than the saw blade in the waste stock.
- With the saw switched off, insert the blade into the hole until the shoe rests firmly on the material.
- Do not let the blade touch the material until the saw has been switched on.
- Never try to insert a blade into, or withdraw a blade from, a cut or a pilot hole while the motor is running.

Specific Hazards

- Muscle strain from poor posture/stance/grip during use of tool.
- Power saws can cause various accidents and injuries, including cuts, amputations, gashes, puncture wounds, burns, and eye injuries from flying particles or broken bits.
- Use extreme caution whenever using a power saw – be aware of your cut path, and ensure that it is free of electrical wires or other foreign objects.

RECIPROCATING SAW – "SAWZALL"

The Reciprocating saw, commonly known by one manufacturer's brand name: Sawzall, is one of the most commonly used tools in construction and demolition. It is used by carpenters, plumbers, electricians and other construction trades to cut holes in wood, metal and plastic and to cut metal and plastic pipe. As with all tools it must be treated with respect and operated safely or it can cause serious injury.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Hearing protection
- Dust mask
- Apron
- Face protection when necessary

Operating Procedures

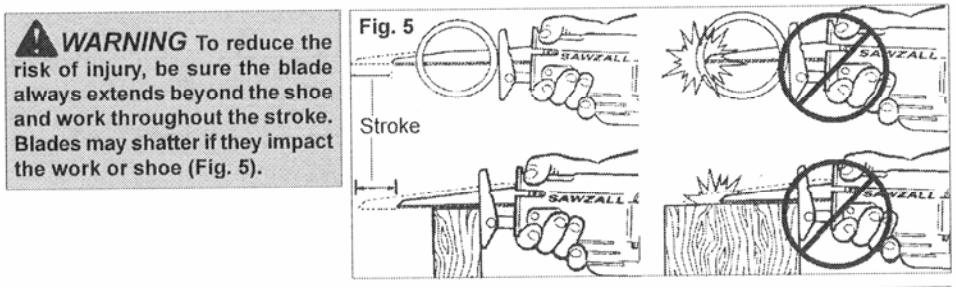
- Hold power tools by insulated gripping surfaces when performing an operation where the cutting tool may contact hidden wiring its own cord. Contact with a "live" wire will make exposed metal parts of the tool "live" and shock the operator.
- Use clamps or another practical way to secure and support the work piece to a stable platform.
- Holding the work by hand or against your body leaves it unstable and may lead to loss of control.
- Keep hands away from all cutting edges and moving parts.
- Prevent unintentional starting. Ensure the switch is in the off-position before connecting to power source and/or battery pack, picking up or carrying the tool. Carrying power tools with your finger on the switch or energizing power tools that have the switch on invites accidents.
- Remove any adjusting key or wrench before turning the power tool on. A wrench or a key left attached to a rotating part of the power tool may result in personal injury.
- Do not overreach. Keep proper footing and balance at all times. This enables better control of the power tool in unexpected situations.
- Dress properly. Do not wear loose clothing or jewellery. Keep your hair, clothing and gloves away from moving parts. Loose clothes, jewellery or long hair can be caught in moving parts.
- If devices are provided for the connection of dust extraction and collection facilities, ensure these are connected and properly used. Use of dust collection can reduce dust-related hazards.
- Keep children and bystanders away while operating a power tool. Distractions can cause you to lose control.

RECIPROCATING SAW – "SAWZALL" (Continued)

Functional Description

Hold power tools by insulated gripping surfaces when performing an operation where the cutting tool may contact hidden wiring or its own cord.

Warning:
Contact with a "live" wire will make exposed metal parts of the tool "live" and shock the operator.



See the diagram above: *Make sure the end of the blade will go all the way through the material or pipe. A blade may break and become a dangerous projectile.*

Warning

Some dust created by power sanding, sawing, grinding, drilling, and other construction activities contains chemicals known to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are:

- Lead from lead-based paint.
- Crystalline silica from bricks and cement and other masonry products, and arsenic and chromium from chemically-treated lumber.
- Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: work in a well ventilated area, and work with approved safety equipment, such as those dust masks that are specifically designed to filter out microscopic.

Electrical Safety

- Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with earthed (grounded) power tools. Unmodified plugs and matching outlets will reduce risk of electric shock.
- Avoid body contact with earthed or grounded surfaces such as pipes, radiators, ranges and refrigerators. There is an increased risk of electric shock if your body is earthed or grounded.
- Do not expose power tools to rain or wet conditions. Water entering a power tool will increase the risk of electric shock.
- Do not abuse the cord. Never use the cord for carrying, pulling or unplugging the power tool.
- Keep cord away from heat, oil, sharp edges or moving parts. Damaged or entangled cords increase the risk of electric shock.
- When operating a power tool outdoors, use an extension cord suitable for outdoor use. Use of a cord suitable for outdoor use reduces the risk of electric shock.
- If operating a power tool in a damp location is unavoidable, use a residual current device (RCD) protected supply. Use of an RCD reduces the risk of electric shock.

RECIPROCATING SAW – "SAWZALL" (Continued)

Power Tool Use and Care

- Do not force the power tool. Use the correct power tool for your application. The correct power tool will do the job better and safer at the rate for which it was designed.
- Do not use the power tool if the switch does not turn it on and off. Any power tool that cannot be controlled with the switch is dangerous and must be repaired.
- Disconnect the plug from the power source and/or the battery pack from the power tool before making any adjustments, changing accessories, or storing power tools. Such preventive safety measures reduce the risk of starting the power tool accidentally.
- Store idle power tools out of the reach of children and do not allow persons unfamiliar with the power tool or these instructions to operate the power tool. Power tools are dangerous in the hands of untrained users.
- Stay alert, watch what you are doing and use common sense when operating a power tool.
- Do not use a power tool while you are tired or under the influence of drugs, alcohol or medication.

PORTABLE ELECTRIC PLANE

A portable electric plane is a tool used to reduce the thickness of a board, straighten lumber, smooth its surface, and also to trim or square an edge. The portable electric plane has a cylindrical cutterhead mounted above the fence, which rotates toward the front of the tool.

Personal Protection Equipment (PPE) Requirements

- Dust mask
- Eye protection
- Hearing protection
- Apron

Operating Procedures

- Always wear eye protection, remove loose clothing.
- Hold with both hands to avoid contact with the cutter blades.
- Always keep both hands on the plane until the motor stops completely.
- Always use the edge guide to direct the plane along the desired cut – never try to guide the plane with your fingers.
- Inspect the work piece before beginning to ensure it is free of nails, screws, loose knots, and other flaws.
- Keep blades in good condition and sharp.
- Always disconnect the plane from the power source before adjusting or changing blades or the cutter head.
- Support work securely for safety and accuracy.
- When planning door edges and large pieces of plywood, use a jack to keep edges clear of dirt and grit.
- To start a cut, rest the in-feed table firmly on the material with the cutter head slightly behind the edge.
- Take a light cut with the grain of the wood.

Specific Hazards

- Planer blades are razor sharp and can lead to serious nicks and cuts.
- Debris from the planer can lead to eye and respiratory injuries.
- Because of the danger of kickback, always stand to the side of the planer – never directly behind it.

PORTABLE SANDERS

There are many different portable sanders on the market today, and they can be placed in a few categories: orbital sanders, random orbital sanders, belt sanders, and disc sanders. In all cases, the tool uses a mechanical action to move an abrasive sheet across the surface of the material being worked.

Orbital ¼ Sheet

Random Orbital


Belt

Orbital ½ Sheet

Personal Protection Equipment (PPE) Requirements

- Dust mask
- Eye protection
- Hearing protection
- Apron

Operating Procedures

- Wear eye protection and a dust mask.
- Use the right abrasive for the job.
- Never touch the edge of a moving belt, disk, or pad.
- Clamp small pieces securely in a vise or to the bench.
- Be sure the abrasive belt is installed in the right travel direction, with correct tension and tracking.
- Never place the sander on the bench while it is still running.
- Hold the sander securely, with both hands if possible.
- Always operate the tool in the same direction as the grain of the wood being sanded (only a random orbital sander can operate properly regardless of grain direction).

Specific Hazards

- Abrasions and scrapes can result from skin contact with operating sanding pads.
- Burns can result from skin contact with moving parts, and in some cases, with the work piece itself.
- Repetitive strain injuries can result from prolonged use of rapidly-vibrating machinery.

ROUTER AND LAMINATE TRIMMER

A portable router is a tool used to trim edges of millwork, and is used in joining operations.

Plunge Router


Laminate Trimmer

Personal Protection Equipment (PPE) Requirements

- Dust mask
- Eye protection
- Hearing protection
- Apron
- Face protection where necessary

Operating Procedures

- Routers operate at very high speeds (0 – 25,000 rpm) and turn clockwise – because of the speed and power; it must be operated with both hands.
- Select the proper bit or cutter for the specific job.
- When starting a router, get a good grip on the tool to absorb the counterclockwise starting torque.
- Always support and secure the work in a fixed position by mechanical means such as a vise or clamps – never try to hold the work with your hand or knee.
- Never rely on a second person to hold the material – human grip is no match for the torque and kickback that a router can generate.
- Use the proper wrenches to make sure that the bit is securely mounted in the chuck and the base is tight.
- Adjust the bit or cutter depth.
- For work along edges such as bevels and moldings, make sure that the cutting edge of the router bit contacts the material to the left of the cutting direction.
- When routing outside edges, guide the router around the work counterclockwise.
- Feed the router bit into the material at a firm but controllable speed.
- Listen to the motor – when the router is fed into the material too slowly, the motor makes a high-pitched whine; push too hard and the motor makes a low growling noise.
- Cutting through knots may cause slowdown or kickback.
- When the type of wood or size of bit requires going slow, make two or more passes to prevent the router from burning out or kicking back.
- Don't try to force the tool to do more work per pass than it is capable of: for deeper cuts (dadoes, rabbets, etc.), make multiple passes that deepen each time.
- When the cut is complete, switch off power and keep both hands on the router until the motor stops.
- In lifting the tool from the work, avoid contact with the bit.

Specific Hazards

- Router bits have very sharp edges, and can inflict deep cuts (even at a standstill).
- Loose clothing or jewelry can become entangled around the high-speed bit, forcibly drawing the operator to the tool.
- Router and laminate trimmers typically operate at speeds of 20,000 rpm or more – this demands hearing protection.
- Eye injuries are a risk from flying debris as the tool works.

AIR COMPRESSORS

Air compressors are used in some cases to drive pneumatic tools, like air nailers and staplers. They can run on electricity or gasoline, and usually have a large storage tank where air pressure can be maintained at a constant level.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Hearing protection
- Apron

Operating Procedures

- Inspect before use, check hoses and fittings, and never use a damaged unit.
- When using a gas or diesel powered unit, make sure there is adequate ventilation.
- Use caution when transporting a compressor that's been running – it can heat up enough to cause serious burns.
- Never use compressed air to clean debris from skin or clothing – use a vacuum or brush instead.
- Take care to calibrate the compressor to match the tool and application being used.
- Make sure hoses are clear of traffic areas and pose no tripping hazards.
- Always drain a portable compressor completely when finished or when transporting, allowing water from condensation in the tank to escape.

Specific Hazards

- Potentially deadly air embolism can occur if compressed air is directed at the skin.
- Compressor pump motor head assembly can burn the skin if contact is made.
- Damaged tanks can rupture, with potentially dangerous shrapnel being sent flying.

AIR NAILERS AND STAPLERS

Power nailers drive many types of fasteners, including framing nails, finish nail, roofing nails, drywall nails, brads, and corrugated fasteners; power staplers are used primarily for installing sheathing, subflooring, and roofing.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Hearing protection
- Apron
- Face protection where necessary

Operating Procedures

- Eye protection is essential.
- Keep bystanders away from the immediate work area – power driven fasteners sometimes ricochet, causing injury.
- Never carry a nailer or stapler with your finger on the trigger.
- Never attempt to override the safety mechanism.
- Never operate a nailer or stapler at a pressure higher than it was designed to handle.
- Make sure the tool is pointed to the ground when you connect a pressurized air hose.
- Pay particular attention to hoses while using pneumatic tools on a roof – hoses are easy to trip over, and can also sweep tools off the roof.
- Never try to clear a jammed tool while it is still connected to an air supply or power source.

Specific Hazards

- Puncture wounds from mis-driven nails, accidental firing.
- Eye injuries from flying particles.

ANGLE GRINDER

This is a hand-held tool with a right-angle drive, used with abrasive discs, for the hand grinding of metal or masonry. There are a wide variety of abrasive discs and cut-off wheels for this tool, depending on the material being worked.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Hearing protection
- Dust mask
- Apron
- Face protection where necessary
- Foot protection where necessary
- Gloves where necessary

Operating Procedures

- Always wear eye protection – hearing and respiratory protection are also recommended, particularly for longer operating times; gloves, aprons, and foot protection may also be advisable, depending on the job.
- Don't wear loose clothing or jewelry.
- Make sure the maximum speed of the grinder (RPM) doesn't exceed the disc speed – failure to do so may result in the abrasive disk disintegrating with the potential for causing a serious injury.
- Always unplug the tool before making grinder/cutter installations.
- Make sure the safety guards are in place and operating properly before you begin work
- Always stand aside when starting a grinder, especially with a newly mounted wheel.
- Use light pressure when starting the grinder, especially with a cold wheel.
- Don't use grinders in the vicinity of flammable materials.
- Keep a solid grip on the tool at all times, especially when starting it up - the high-speed motor has a tendency to want to "torque" out of your hands, so hold on tight.

Specific Hazards

- Muscle strain from poor posture/stance/grip during use of tool .
- Always check the condition of the disc or cut-off wheel being used: a damaged abrasive can shatter and disintegrate, sending broken pieces flying at a tremendous speed.
- Cuts, scrapes, amputations, and burns can all result from unsafe operating procedures.

BISCUIT JOINTER

Sometimes called a "plate jointer", this tool uses a small rotary cutterhead to cut a precise slot in the edge or face of a board to create a biscuit joint. A football-shaped disc made of beech wood, called a biscuit, is glued in the slot where it aligns with the next piece being glued in place.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Hearing protection
- Apron
- Dust mask

Operating Procedures

- Remove loose clothing.
- Always wear eye and ear protection.
- Ensure work piece is tightly secured.
- With the power turned off, test the cut to make sure there is enough space for the tool to work properly.
- Keep the cutters sharp – dull cutters require extra pressure when cutting.
- Hold the tool by the D handle and motor housing, using both hands at all times.
- Check the operation of the guard before using the tool – it should close smoothly over the blade.
- Keep hands away from the blade area when making cuts.
- Never hold a work piece in your hand while cutting.
- Retract the blade fully after a cut.

Specific Hazards

- Cuts and scrapes can come from the exposed blade.
- Eye injuries can result from airborne discharge (sawdust).
- As this is a very high-speed tool, hearing protection should be worn when using the tool.
- Poorly clamped work pieces can kick back from the machine, potentially injuring a bystander.

POWER DRILLS

A drill can be used to bore holes into wood, metal, concrete and a host of other materials and surfaces. Increasingly, carpenters and drywallers use them as screw-guns alike.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Apron
- Face protection where necessary

Operating Procedures

- Proper eye protection is essential.
- Material being drilled should always be clamped or well secured to prevent spinning should the bit bind in the hole.
- Always clamp small pieces when drilling them to prevent them from slipping.
- Always be sure the switch is off before plugging in the tool.
- Make sure the shank of the attachment it tight and square in the chuck and running true before starting the drill.
- For drills with a dual-gearbox, use the fast setting for boring holes; use the slow setting for driving screws.
- Drill a pilot hole in the work so that the bit won't slip or slide when you start drilling.
- Remember that friction builds up in the tip of drill bits and other cutting attachments – avoid contact that could result in a serious burn.
- When drilling into floor, ceilings, and walls, beware of plumbing and wiring.
- While drilling deep holes, especially with a twist bit, withdraw the drill several times with the motor running to clear the cuttings.
- When drilling a through hole, be sure to attach a piece of scrap wood to the exit side of the work piece.
- Never drill through cloth – it will twist around the bit.
- Never support material on your knee while drilling – use a bench or other work surface.
- Never use a bit with a square or tapered tang in an electric drill – the drill's chuck will not hold this type of bit securely.
- Unplug the drill and remove the bit as soon as you are done with the work.

Specific Hazards

- Muscle strain from poor posture/stance/grip during use of tool.
- Electric drills can cause various accidents and injuries, including cuts, gashes, puncture wounds, burns, and eye injuries from flying particles or broken bits.

POWER DRILLS (Continued)

Specific Instructions - Impact or Hammer Drill

- Follow operating procedures for power drills.
- Use the extension handle on the body of the drill to stabilize the attachment.
- Feed the attachment slowly and carefully into the material or the drill may jam and stop suddenly, severely twisting or breaking your arm.

Hammer Drill

HAMMERS

Hammers are striking tools designed to drive and remove nails and other fasteners; they can also be used in conjunction with tools like a nail set. In the case of sledgehammers, the tool can be used to heave large framing members into place, or to assist in demolition.

Personal Protection Equipment (PPE) Requirements

- Eye protection (mandatory at all times)
- Safety gloves (if necessary)

Operating Procedures

- Wear safety glasses
- Make sure the hammer is in good condition so that the handle will not splinter or the head fly off
- Strike the surface squarely
- Never use a claw hammer on hardened metal (chisels, punches)
- Watch the head of the nail, not the hammer
- Look behind and above before swinging the hammer
- Never use a hammer to strike another hammer
- Rest your arm occasionally to avoid tendonitis
- Concentrate on the work being done – inaccurate hammering can cause serious crushing injuries to fingers hit accidentally
- Lightweight **Claw hammers** (6oz. – 12oz.) should only be used for finish carpentry; Medium weight is best for general carpentry (12oz. – 20oz.); Heavy weight (20oz. – 24oz.) is best for framing and demolition
- **Warrington/Tack hammers** (3 ½ oz – 10oz.) should be used for finishing nails and starting brads
- **Mallets** should be used for assembling and disassembling projects, to ensure the surface not be marred or dented, and as a chisel-striking tool
- **Hand sledge** (2lbs. – 4lbs.) should be used with striking tools or to drive stakes during site layout
- **Hammer-tackers** drive staples quickly into materials such as insulation, roofing felt, and building paper

HAMMERS (Continued)

Specific Processes

Claw Hammer: Driving Fasteners Safely

- To start a nail, hold it in one hand between thumb and forefinger and close to the point; grasp the hammer near the head and tap the head of the nail to seat it straight and true
- Watch the head of the nail, not the hammer
- Be aware of your surroundings – take a look around before you begin swinging a hammer to avoid accidentally hitting someone or something
- When nailing together pieces of very hard wood, such as oak or maple, drill a small pilot hole in the first piece – this makes it easier to drive the nail into the wood

Removing Fasteners Safely

- Force the claw of the hammer under the head of the nail and pull on the handle; when the nail is partway out, slip a piece of scrap wood under the hammer head before continuing to draw the nail out (this not only provides mechanical advantage to the lever, it also helps protect the surface of the stock)
- Use a nail remover (i.e. "*cat's paw"*) if possible

Specific Hazards

- Vision damage/loss due to flying debris entering eye
- Crushing injuries
- Misdirected/glancing blows to limbs
- Repetitive strain injury (tendonitis, deep bruising)

HAND PLANES

A plane is a special tool with a blade for smoothing and removing wood as shavings. The plane is nothing more than a chisel held in a block of metal so that it can be controlled to take an even cut. Varieties include: jack plane, block plane, fore plane, and jointer plane.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Apron

Operating Procedures

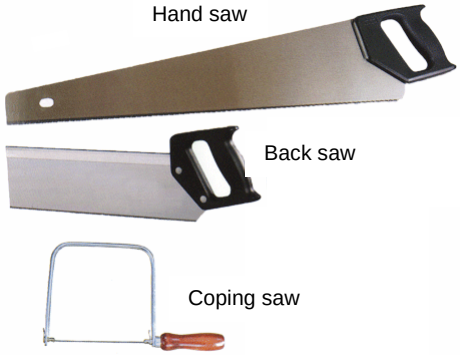
- Always wear safety glasses.
- Use the plane suited to the job and keep the plane iron sharp.
- Sharp tools require less effort and reduce the risk of fatigue, overexertion, and back strain.
- Inspect the surface to be planed to ensure it is free of nails or other debris.
- Clamp the stock firmly on the workbench or in a vise.
- Always place the plane on its side when not in use.
- Never grasp the underside of the plane at or near the cutting edge – you may cut your finger.
- Stand properly balanced on both feet when using a plane.
- Don't try to cut too thick a shaving at one time.
- Raise the plane above the work on the backstroke to prevent the blade from dulling.
- Store the plane with its cutter retracted.

Specific Hazards

- Crush and scrape injuries: when the hand holding the plane strikes the work or objects nearby
- Cutting injuries from the exposed sharp blade

HANDSAWS

A handsaw is a cutting tool that has a thin steel blade with small sharp teeth along the edge. They are used to cut material to different sizes and shapes; they are also used for making the joints that hold wood parts together.



Personal Protection Equipment (PPE) Requirements

- Eye protection
- Apron

Operating Procedures

- Wear safety glasses.
- Keep your thumb and fingers away from the teeth of the blade.
- Select the right saw for the job.
- Ensure all dangling clothing and jewelry is safely secured.
- Never strike the teeth of the blade on a metal surface, such as the edge of a metal vise.
- Make sure nails and screws are removed from old material before sawing.
- Never pile tools on top of each other – saws with bent blades no longer run true and smooth.
- Never twist of strips of waste with the saw blade.
- When starting a cut, draw the blade towards you.
- Keep the saw at a 45-degree angle to the work piece.
- When finishing a cut, support the waste side to prevent splitting work on the underside.
- Raise the work piece enough to prevent the saw blade from striking the floor.
- Fasten the work securely before cutting.
- When cutting long stock, place it over two sawhorses with the cutting line extending just beyond one of the horses - never try to make a cut between the supports.
- Carry the saw with the toe towards the floor.

Specific Instructions and Hazards

1. **Utility drywall saw (wallboard saw)**
   a) Hold the tool firmly to avoid it skipping out of the cut path
   b) Be aware of the pointed, sharp tip on the tool

2. **Backsaw**
   a) Avoid touching the small, very sharp teeth

3. **Rip / Crosscut saw**
   a) Avoid touching the small, sharp teeth.

4. **Hacksaw**
   a) When cutting metal, do not brush debris away with a bare hand as this could lead to metallic slivers entering the body.
   b) Freshly cut metal edges can be sharp – be careful when handling.
   c) Keep the blade taut but not too tight – blades breaking while in use are a major cause of injury.
   d) Make sure the work is held securely in a vise or by other devices such as clamps.

5. **Keyhole / Compass saw**
   a) Avoid the small, very sharp teeth.
   b) Use only in thin stock, as intended.

6. **Coping saw**
   a) Ensure the blade is inserted properly (tooth direction) in the frame for the type of cut being performed.
   b) Use only in thin stock (½" thick or less).
   c) Can be used to cut wood and some plastics.

FILES AND RASPS

Files and rasps are used to form irregularly shaped objects, such as carved figures, models, and parts for projects. Wood files usually have double-cut teeth, and are not as rough as the wood rasp. The rasp is a tool with individual cutting teeth that removes material faster than a file, but also leaves a rougher surface.

Personal Protection Equipment (PPE) Requirements

- Eye protection

Operating Procedures

- Make sure the file has a proper fitting handle.
- Keep files and rasps clean – use a file card.
- Never strike the tool on the edge of the bench to loosen chips.
- Never use a file or rasp as a pry bar, as the metal is highly brittle and will shatter.
- Secure the work firmly in a vise or on a workbench.
- Files cut on the forward stroke.

Specific Hazards

- Scrapes can result from contact with the file or rasp itself, or the material being worked on.
- Puncture injuries can result from files with pointed tips, or from files without handles (pointed tang).
- Damaged wooden handles can lead to splinters.

NAIL SET

A nail set is a small metal punch with a cupped end. The cupped end prevents it from slipping off the head of the nail. The tool is used to sink the heads of casing or finishing nails below the wood surface.

Personal Protection Equipment (PPE) Requirements

- Eye protection

Operating Procedures

- Always wear safety glasses.
- Ensure the striking surface of the tool is not mushroomed; grind and reshape if necessary.
- Keep the tool in line with the direction of the nail.
- Use the correct size and shape for the nail being set.

Specific Hazards

- Puncture wound from slipping head.
- Eye injury from flying debris.
- Crushing injury from glancing blow.

PLIERS

Pliers are a gripping hand tool with two hinged arms and (usually) serrated jaws. They are designed to grip and hold things.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Gloves where necessary

Operating Procedures

- Choose pliers with enough space between the handles to prevent pinching of the palm or fingers.
- Pull on pliers – do not push.
- Don't use pliers as hammers – they might crack or break.
- Don't use cheaters to extend the handles – this can damage or spring the tool.
- Pliers should not be used to tighten nuts or bolts – use a wrench.

Specific Instructions and Hazards

- Muscle strain from poor posture/stance/grip during use of tool.
- Impact injuries from slipped pliers, causing hand to strike foreign material.
- Side cutting pliers may cause injuries when ends of wire are cut and fragments fly off.
- Pliers used for electrical work should be insulated – cushion grips on handles are for comfort only and are not intended to protect against electrical shock.

Locking Wrench Pliers (sometimes called *"vise grips" or "grip-locks"*)

- o Don't use them to replace wrenches since they can damage fittings or fasteners.
- o Don't hammer or use "cheaters" to increase force to tighten jaws or to cut wire or bolts.
- o Severe vibration can cause release of the jaws accidentally – wire or tape them shut as necessary.
- o Never clamp them or attempt to use as a step or climbing device.

Side Cutters

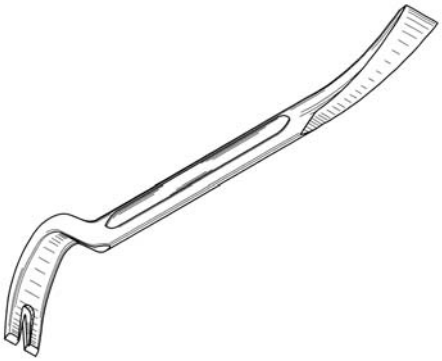
- o Point cutting area away from eyes when working – wire fragments can fly off with considerable force.
- o Cut at right angles to wire – this helps prevent spear-tips from being made on the wire.

Slip-joint / Channel-lock Pliers

- o Keep clean and in good condition – if the pliers' joint accidentally slips during use, serious injury or damage could result.

PRY/RIPPING BARS

A classic prybar consists of a heavy bar with two ends. One end is forked, and the other one is shaped like a wedge. There are a wide variety of ways to use the tool; the wedged end can be worked under or between things to pull them apart, for example, while the forked end can be utilized to pull out nails. In some cases, the wedged end is replaced with a sturdy handle, making the prybar more comfortable to use.



Personal Protection Equipment (PPE) Requirements

- Eye protection
- Safety gloves
- Apron

Operating Procedures

- Loads lifted or levered can cause pinch-points: be sure to keep fingers and toes clear of these areas.
- Try to avoid prying, pulling, wedging or lifting at sharp angles or overhead.
- Wherever possible, keep the bar at right angles to the work.
- Pull with a firm steady pressure giving attention to your balance.

Specific Hazards

- Crushing wound from pinch-points.
- Eye injury from flying debris.
- Impact injury from slipping or loss of balance.

SCREWDRIVERS

Screwdrivers are tools used to insert and remove screws and, in some cases, bolts. They use a twisting force applied to the screw to move it into the material. Screwdrivers come in a variety of shapes and sizes, including the following: Phillips, Robertson, Slotted, and Torx.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Safety gloves

Operating Procedures

- Use the correct size screwdriver bit to match the screw head.
- Never use a screwdriver as a pry bar – it will damage the shaft of the tool and render it useless.
- Always make a pilot hole before driving a screw.
- Never get any part of your body in front of the screwdriver.
- Never hold the work in your hand while using screwdriver – use a vise, or at least a solid surface.
- Keep handles clean to prevent slippage.
- Start with one or two “soft” turns with the fingers of your free hand holding the screw, then remove for remainder of screw (you may also choose to keep free hand on shaft of screwdriver to help keep it seated and straight).
- Pass the screwdriver by holding the blade securely. Receiver accepts the handle.

Specific Hazards

- Puncture wound from slipping off the head.
- Repetitive strain injury (tendonitis).
- When working around electricity, use screwdrivers with a handle insulated with dielectric material (keep in mind that this is only a secondary precaution – ensure electrical power is off before beginning work).

UTILITY KNIFE

A utility knife is a razor-sharp cutting tool with a retractable blade. They are often used to cut vinyl tiles, carpet, and as a layout tool for marking stock.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Gloves where necessary

Operating Procedures

- Advance the blade out of the housing only as far as necessary (snap dull blades off properly, as necessary, discarding safely).
- Use the blade locking mechanism on the knife to prevent it from slipping while in use.
- Keep your hands away from the front of the cutting edge when working.
- Cut away from your body – not toward it.
- Retract the blade fully into the housing before putting the tool away, particularly in a toolbox.

Specific Hazards

- Cutting injuries from the exposed sharp blade.

WOOD CHISELS

A wood chisel is a strong steel, cutting tool with a sharp bevel edge at one end. Chisels are used to shape wood and fit parts.

Personal Protection Equipment (PPE) Requirements

- Eye protection

Operating Procedures

- Clamp the work securely before using a chisel.
- Always use a wood or plastic mallet – never a metal hammer – to strike the handle of the chisel.
- Keep your hands away from the front of the cutting edge when working.
- Chisel away from your body – not toward it.
- Never strike the cutting edge of the tool on metal, such as the edge of a vise, a nail or screw head, or other metal objects.
- Keep the edge of the chisel sharp.
- Never file the edges of a chisel.
- Never use a chisel for prying.
- Chisels not in use or stored in a tool box should have protective blade caps attached.
- Pass the chisel by holding the blade securely. Receiver accepts the handle.

Specific Hazards

- Cutting injuries from the exposed sharp blade, particularly during glancing blows.
- Repetitive strain injury can result from repeatedly striking the head of the chisel with the palm of your hand.

CLAMPS AND VISES

Clamps and vises are used to secure work pieces in place while they are being worked on, and to hold pieces together while gluing.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Apron

Operating Procedures

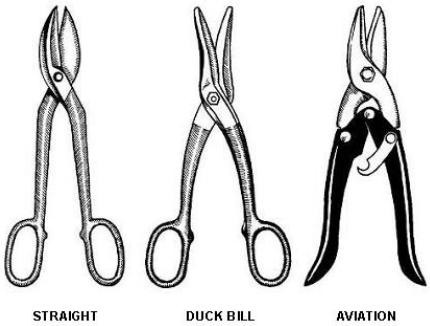
- Use the appropriate clamp for the job, and use it as intended
- Choose a clamp suited to the size of the job
- To stabilize work for certain cutting operations, use more than one clamp
- Mount vise securely
- Keep work close to jaws
- Keep vise cleaned, oiled
- Support extra long work
- Prop very heavy work in vise with wood blocks to prevent it from falling and causing injury.
- Don't open jaws beyond their capacity – the moveable jaw may fall, causing injury or damage.

Specific Hazards

- Clamps create pinch-points: be sure to keep all fingers and clothing free and clear

SNIPS

Tin snips are used for cutting sheet metal, 18 gauge or less. Snips can be used for cutting straight lines or curves.



Personal Protection Equipment (PPE) Requirements

- Eye protection
- Gloves
- Apron

Operating Procedures

- Wear eye protection.
- Keep snips clean and well maintained, including sharpening the blades when necessary.
- Use the right tool for the job – snips are only meant to cut relatively thin, soft material.
- Follow the procedures for making straight, curved and notch cuts.

Specific Hazards

- Muscle strain from poor posture/stance/grip during use of tool
- Impact injuries from slipped pliers, causing hand to strike foreign material
- Snips may cause injuries when ends of material are cut and fragments fly off
- Be careful at cutting edges of material – snips can create razor-sharp conditions, as well as pointed spear-tips

COLD CHISELS

A cold chisel is a strong, tempered steel tool with a blunt bevel edge at one end. Cold chisels are used to cut and shape metal, and to knock free seized nuts.

Personal Protection Equipment (PPE) Requirements

- Eye protection

Operating Procedures

- Use a ball peen hammer or a hand sledge for cold chisels.
- Strike the tool squarely and in the centre.
- Ensure the head of the chisel is not mushroomed – reshape and grind as necessary.
- Keep cutting edges sharp.
- Keep your hands away from the front of the cutting edge when working.
- Chisel away from your body – not toward it.

Specific Hazards

- Cutting injuries from the exposed sharp blade, particularly during glancing blows.
- Cutting injuries from sharp edges of material being cut.
- Crushing injuries resulting from glancing blows to chisel.
- Repetitive strain injury can result from repeatedly striking the head of the chisel with the palm of your hand.

WRENCHES

A wrench is a tool used for turning nuts, bolts, and pipes, consisting of a bar or handle having jaws to fit the nut, bolt, or pipe. Some have fixed jaws, while others are adjustable to fit any number of nut or pipe sizes.

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Gloves where necessary
- Apron where necessary

Operating Procedures

- A wrench is for turning things – do not use a wrench for other tasks.
- The user should always be braced to maintain balance and keep from being injured in case the wrench slips.
- Always inspect a wrench for flaws, damaged parts, or wear that can cause it to slip and damage fasteners.
- Where possible, use penetrating oil to loosen nuts and bolts.
- Always grip the wrench so it will not cause injury if it slips.
- Use the correct type of jaw to avoid slippage (i.e. box wrenches are safer than open-ended wrenches since they are less likely to slip).
- Never overload a wrench by using a pipe extension on the handle or by striking the handle with a hammer (special striking wrenches are available).
- When using a wrench always pull on the wrench – never push.

Specific Instructions and Hazards

- There are hazards with all types of wrenches: the wrench may slip off the work, the work piece may suddenly turn free, the wrench or work piece may break.
- Muscle strain from poor posture/stance/grip during use of tool.
- Impact injuries from slipped wrench, causing hand to strike foreign material.
- Eye injuries from debris flying off of fasteners (particularly when positioned underneath the work piece).

Adjustable Wrench

- Whenever possible, pull on an adjustable wrench – do not push.
- Force should be applied against the fixed, not the adjustable, jaw.

Open-end Wrench / Box Wrench

- Use only the correct sized wrench for the job.
- Keep handles clean and free of grease or oil.

WRENCHES (Continued)

Pipe Wrench

- o Used for tightening or removing pipes, this wrench should never b bolts.
- o Jaws should be kept sharp and clean to prevent slipping.
- o The adjusting nut of the pipe wrench should be inspected frequently for cracks.
- o Face the pipe wrench forward, turn the wrench so that pressure is against the heel jaw.

Allen Wrench (sometimes called a *"Hex Key"*)

- o Use only the correct sized wrench for the job (wide variety available, including sets in both Metric and Imperial rule).

Socket Wrench

- o Use the right socket for the job – be careful when adapting down in size not to over torque a smaller socket and fastener with a larger driver.
- o Make sure the socket fits snugly.
- o Never use "Hand sockets" on a power drive or impact wrench – the metal is not as strong and could break, injuring the operator and damaging the work.

BANDSAW

Personal Protection Equipment (PPE) Requirements

- Eye protection
- Dust masks

Set-Up

- Ensure that workspace is clean and clear.
- Remove jewellery, secure loose clothing and tie back long hair.
- Turn on the dust collection system.
- Before making any adjustments to the machine ensure that it is shut-off and locked out.
- Ensure that all necessary push sticks are available for use when necessary.

Blade

- Ensure that all necessary guards are in place and working properly.
- Check that the correct type and width of blade is being used for the task. Blade width will determine the smallest radius you can safely cut. Check that it is sharp, tracking properly and tensioned correctly. Blades tracking to the centre of the wheel offer the greatest room for safety margins.

Side Blade Guides

- Check that the side blade guides are not set beyond the base of the gullet between the teeth. They should be set to almost touch the blade when resting. There are usually two sets of guide blocks, above and below the table. Ensure that the bearing behind the blade is set just off of the blade when resting. This will ensure that the side guides will not alter the set of the teeth once cutting begins.

Guards

- Set and lock the blade guard 1/4" above the surface of the stock to be cut .
- Unique set-ups and operations like ripping, bevelling, mitre cuts, pattern cutting or use of material other than wood can present a different set of risks. Further research into appropriate set-up and techniques for your specific machine should be done before safely attempting these types of operations.
- Make certain both wheel covers are in place and secure.
- All exposed pulleys and belts should be covered.

Materials

- Inspect materials for foreign objects such as metal or stone.
- Check for loose knots or splintered edges that may catch on the table surface and prevent a smooth feeding operation.

BANDSAW (Continued)

Operating Procedures

- Wear safety glasses.
- Bandsaws can be used for re-sawing boards to reduce thickness. Bandsaws are most commonly used to make curved or straight line cuts in material.
- Clearly mark out on the material the cut-out design in pencil.
- Plan out the order that you will make the cuts. Include making relief cuts in this plan.
- Position your hands so they are on either side of cutting path of the blade. **Do not** push material into the blade with hands or fingers aligned with the blade.
- Use push sticks for smaller pieces of material or whenever safe hand placement is compromised.
- Make relief cuts to reduce the risk of snapping a blade or pulling it off of the wheel.
- Avoid excessive twisting of the blade and backing out of cuts.
- Feed the material into the blade at a rate that does not stress the blade or cause burning on the wood.
- The width of the blade will determine the limits of the radius you may cut. **Do not** attempt to cut a radius too small for the size of blade you are using.
- Once work is complete turn the machine off and wait for the blade to come to a full stop on its own or by using appropriate brake before leaving the machine.
- Remove the waste and leave workspace clean for the next operator.
- If a blade breaks switch the machine off and stand back. Wait for the wheels to come to a full stop before opening the cover panel. Consult with the teacher as to the causes of breakage.

Bandsaw Quiz

Name: _____ Date: _____

Label the following parts on the image

1. On/off switch
2. Blade
3. Upper Guard
4. Rip Fence lock
5. Rip Fence
6. Wheel Cover

Fill in the blanks from the word list provided.

1. Do not place _____ ___ _____in line with cutting path.
2. Adjust _____ _____ so it rests just above work surface.
3. Keep material _____ to the table surface.
4. Before cutting curves make _____ _____.
5. _____ blades are best for tighter radii.
6. Sudden twists of material may cause blades to _____.
7. Do not _____ _____ of cuts while blade is moving.
8. Remove _____ after the blade is fully stopped.
9. Use _____ when cutting small pieces of material.
10. Do not leave the machine until the blade has _____.

▪ upper guard ▪ tight ▪ waste ▪ fingers or thumbs	▪ stopped ▪ break ▪ narrow	▪ relief cuts ▪ back out ▪ push sticks

BELT / DISC SANDER

Personal Protection Equipment (PPE) Requirements

- Safety glasses
- Hearing protection
- Dust mask

Set-Up

- Ensure that the workspace is clean and clear.
- Remove jewellery, secure loose clothing and tie back long hair.
- Turn on the dust collection system whenever sanding.
- Before making adjustments to the machine ensure that it is turned off and locked out.
- Ensure that the guards are in place and functioning effectively
- Check to ensure the belt and or the disc is not loose, torn or worn. Replace if needed.
- Check that belt and disc sander tables are locked and clear of the moving parts.
- Check that belt sander fence is secured and does not touch the belt.

Materials

- Inspect materials for foreign objects.
- **Never** sand metal objects. They may send sparks into the dust collection system.
- Do not sand wet wood or wood with a finish that will clog the belt or disc.

Operating Procedures

- Wear safety glasses.
- Start the machine before introducing material to disc/belt.
- Ensure that the material rests on the table or against the fence at all times.
- Hold the material securely as you gently feed the material to the sanding disc/belt. **Do not** force material into the disc/belt. Allow it to sand material without being forced.
- Sand only on the down side of the disc
- Move the material side to side to avoid burning but do not go beyond edges of the belt or past the downside of the disc rotation. Maintain a secure hold of material at all times.
- Keep your hands and fingers well away from the disc/belt at all times.
- Upon completion shut machine off and wait for it to come to a complete stop.
- Remove the waste and leave workspace clean for the next operator.

Belt/Disc Sander Quiz

Name: _____ Date:_____

Label the following parts on the image

1. On/off switch
2. Disc Table
3. Belt Table
4. Disc Table Lock
5. Belt Table Lock

Fill in the blanks from the word list provided.

1. Ensure both table surfaces are _____before starting machine.
2. Do not sand _____ material on this machine it could be a fire hazard.
3. Keep material tight to the _____ surface.
4. Do not _____ material into the belt or disc.
5. Keep material on the _____ side of the disc rotation.
6. Keep _____ away from belt and disc at all times.
7. Do not sand _____ grain.

▪ table ▪ downward ▪ force	▪ across ▪ metal	▪ clear ▪ fingers

DRILL PRESS

Personal Protection Equipment (PPE) Requirements

- Safety glasses
- Hearing protection
- Dust mask when necessary

Set-up

- Ensure that workspace is clean and clear.
- Remove jewellery, secure loose clothing and tie back long hair.
- Before making any adjustments to the machine ensure that it is turned off and locked out.
- Ensure that all necessary aids (hold downs, clamps) are available for use when necessary.
- Check that a secured fence/guard or vise is in place when needed
- Ascertain that belts are set to provide the speed necessary for the material and bit being used.
- Select the proper size and type of drill bit
- Secure the drill bit in the chuck making certain that it is centred between all three jaws, using the chuck key to tighten.
- Remove the chuck key from the chuck.
- Put the chuck guard in place.
- Adjust and secure the table height.
- Set the depth gauge if needed.
- Use a flat piece of scrap material beneath the wood that is being drilled.

Materials

- Inspect materials for foreign objects.
- Select the correct bit for the material to be drilled.
- All metal work pieces should be secured in a vise.
- Round or cylindrical shaped pieces should be secured with an appropriate jig or vise.

Operating Procedures

- Wear safety glasses.
- Keep well back from all moving parts.
- Set material on the table or in a vise so it is secure and will not move or spin with the turning force of the bit.
- Pull down on the feed lever at a moderate pace that will not force the operation or cause burning.
- Release the feed lever by slowly bringing it back to its starting point.
- Drill bits can become very hot because of friction when drilling. Do not touch after drilling.
- Stop the drilling operation if you see smoke or smouldering at the work piece by retracting the bit slowly.
- Do not reach behind a rotating bit.
- Turn the machine off and wait for the drill bit to come to a full stop.
- Remove the waste with a brush and leave workspace clean for the next operator.

Drill Press Quiz

Name: _____ Date:_____

Label the following parts on the image

1. On/Off switch.
2. Spindle
3. Chuck
4. Chuck Key
5. Handle (raise and lower spindle)
6. Table
7. Table Lock lever and handle
8. Depth stop

Fill in the blanks from the word list provided.

1. Remove _____ from chuck before starting.
2. Secure material with a _____ or _____.
3. Use the appropriate _____ for the material being drilled.
4. Ensure all _____ hair, clothing or jewelry is secured out of way.
5. Ensure the table is _____.
6. Do not _____ bits after they have been drilling it may cause burns.
7. Use _____ bits to avoid burning.
8. When operation is complete slowly return _____ to the start position in a controlled manner.

▪ touch	▪ fence	▪ loose
▪ bit	▪ sharp	▪ locked
▪ key	▪ clamp	▪ handle

JOINTER

Personal Protection Equipment (PPE) Requirements

- Safety glasses
- Hearing protection
- Dust mask

Set-up

- Ensure that workspace is clean and clear.
- Remove jewellery, secure loose clothing and tie back long hair.
- Turn on the dust collection system.
- Before making any adjustments to the machine ensure that it is shut-off and locked out
- Ensure that all necessary aids (push sticks) are available for use when necessary.
- Check that all necessary guards are in place and working properly. Cutters should be guarded on both sides of the fence.
- Adjust the fence location and ascertain the bevel locks are engaged.
- Keep the jointer knives sharp at all times.
- The infeed table should be 1/16" (2mm) lower than the outfeed table. This setting should decrease to 1/32" (1mm) for harder wood, wide boards, or wavy interlocked grain patterns.
- Adjustments to the outfeed table are made only in a few limited situations and should not occur during normal usage.
- The cutter head must be able to spin freely without any interference to the cutters.

Materials

- Inspect materials for foreign objects such as metal or stone.
- Check for loose knots or splintered edges that may catch on the table surface or fence and prevent a smooth feeding operation.
- Inspect the wood to determine grain pattern, and familiarizing yourself with cups, crooks and bows in the stock.
- Do not joint lengths less than 12" (30cm) or thickness below 1/2" (1.3cm).

Operating Procedures (jointing a face and edge)

- Use safety glasses
- Jointers can be used for specialized operations, but the primary use is to true and square one face and one edge of rough lumber. End grain should not be jointed.
- The face of the stock to be placed down on the infeed table should ensure the greatest stability when feeding the material. This is usually the concave face which will allow the material to sit on the two outside ridges.
- The operator should also take into account the grain pattern of the wood to ensure the smoothest cut possible given the rotation of the knives.
- Feed the wood on to the cutter with the grain direction pointing to the operator.
- Push sticks should be used when using the jointer. The exact location of hand positions will be determined by the style of push stick and length of the infeed and outfeed tables.
- Do not place your hands on the wood directly above the cutting knives or on top of wood on the outfeed table.
- The material should be fed at a rate that allows for knives to cut easily, chips to be extracted and wood to not get burned.

JOINTER (Continued)

- Continue to push the wood through using push sticks until the guard snaps closed over the cutters.
- Once the face has been jointed place the completed surface against the fence to joint the edge. Use a push stick to hold the material against the fence (keep this stick above the guard but below the top of the fence.) A second push stick can be used to push forward from the back end of the top edge. Always maintain control of the wood while cutting. Never let go of it.
- Turn the machine off and wait for the cutters to come to a full stop.
- Remove the waste and leave workspace clean for the next operator.

JOINTER QUIZ

Name: _____ Date: _____

Label the following parts on the image

1. On/off switch.
2. Infeed table
3. Fence
4. Fence lock
5. Cutter Guard
6. Infeed table adjustment wheel
7. Outfeed table adjustment wheel
8. Outfeed table

Fill in the blanks from the word list provided.

1. Ensure that the _____ is locked.
2. Ensure that the _____ is working to keep cutters covered.
3. Set the infeed table so that you will remove _____ at a time.
4. Keep hands on _____.
5. Ensure that material is at least _____ long.
6. Push material through until the _____ snaps shut.
7. Do not plane _____ _____, this is a task for experienced woodworkers only.

▪ 1/16" (2mm) ▪ 12" (30cm)	▪ guard ▪ fence	▪ end grain ▪ push-sticks

WOOD LATHE

Personal Protection Equipment (PPE) Requirements

- Safety glasses
- Dust mask

Set-up (Turning between two centre points)

- Ensure that workspace is clean and clear.
- Remove jewellery, secure loose clothing and tie back long hair.
- Before making any adjustments to the machine ensure that it is shut-off and locked out.
- Adjust the tail stock appropriately to account for the length of material. Lock in position.
- Adjust the tool rest to the centre line of stock and about 1/4" (6mm) to ½" (13mm) away from the stock. The location of rest will need adjusting as the work progresses. Turn the lathe off to make any adjustments.
- Ensure that belts are set to provide the speed necessary for the operation being performed and the material being used.
- Adjust the guards before starting the machine.
- Select the appropriate lathe tool for the task. The cutting edge should be sharp and free of any nicks.

Materials

- Inspect the block for foreign objects. Remove any knots.
- Material length may need to be kept oversize for certain profiles and operations.
- The ends of material should be marked for the exact centre with pencil lines.
- Use an awl to pre-punch centre holes on the ends. Saw kerfs can be cut along diagonals with a tenon or back saw.
- Corners of squared stock can be planed to create an octagon shape if a cylinder is to be turned.
- The drive centre should be tapped into the end of stock using a mallet and then mounted in the headstock.
- The tailstock can then be positioned so it centres on the dead end. Lock it to the bed and use hand wheel to feed centre into end of stock. Lock the hand wheel. Add a drop of oil to reduce friction.

Operating Procedures

- Wear safety glasses.
- Inspect material to ensure you have secured it properly. Turn it by hand to ensure that it is not obstructed by any parts of the machine.
- Ensure that the tool rest is located properly and secure.
- The blade of the chisel must always be sitting on the tool rest before it is fed into the stock.
- Hand positioning on the chisel will be determined by the type of operation being performed. Overhand grip on blade for rough gouging and underhand for finer cuts.
- Hold the chisel firmly and keep the elbow of the hand closest to you near your body to ensure greater strength and control.
- Position your feet close enough to the lathe so that your upper body does not have to lean inwards excessively.
- Switch the machine on with the tool rest and chisel well clear of the turning block.

WOOD LATHE (Continued)

- Always place the tool on the rest before starting to cut.
- Slowly lift the handle end while the end of chisel maintains contact on the rest so the cutting edge is gently introduced to the material.
- Move the tool sideways, along the tool rest, while skewing it slightly once it makes contact with the stock. If the handle is raised too much the cut will be too deep.
- You may have to make adjustments to the tool rest as work progresses. Never allow the blade of the chisel to overhang the ends of the rest. Stop before you reach the end.
- Turn the lathe off and wait for the machine to come to a complete stop.
- Upon completion remove the waste and leave workspace clean for the next operator.
- Sanding or polishing on the lathe requires removal of the tool rest.
- Use appropriate blocks for sanding on the lathe.

LATHE QUIZ

Name: _____ Date: _____

Label the following parts on the image

1. On/Off switch
2. Bed
3. Tool Rest
4. Tool Rest Lock
5. Tail Stock
6. Tail Stock Lock Lever
7. Drive Centre
8. Tail Stock Centre

Fill in the blanks from the word list provided.

1. Ensure the chisel you are using is _____.
2. Secure the center of the stock to be turned between the drive and _____ centres.
3. Secure the _____ _____ so that the stock will not hit it when you start.
4. Ensure that the chisel blade remains positioned on _____ _____.
5. The tool rest should be positioned on the center line of the _____.
6. Do not allow chisel to run off of the _____ of the tool rest.
7. Secure or remove _____ sleeves before using this machine.
8. Always maintain a _____ grip on your chisel.

▪ centre ▪ sharp ▪ firm	▪ end ▪ stock ▪ loose	▪ tailstock ▪ tool rest

MITER SAW

Personal Protection Equipment (PPE) Requirements

- Safety glasses
- Hearing protection
- Use dust mask

Set-up

- Read and understand the operators manual before using this machine.
- Ensure that the workspace is clean and clear.
- Use appropriate PPE (glasses, hearing protection, dust mask).
- Remove jewellery, secure loose clothing and tie back long hair.
- Check that the dust collector bag is not full - empty when necessary.
- Unplug machine before making adjustments.
- Check that the guard is in place and working effectively
- Ensure that appropriate rollers or support devices are in place so the operator does not have to use excessive force or strength to maintain control of longer stock.
- Install the blade for the material and procedures being completed (maintain and use sharp blades to avoid burning and using excessive force).
- The bevel and mitre settings must be locked.
- Ensure that the slide lock is set according to the operation you are performing (slide mitre saws only). Do not leave the slide feature unlocked if it is not needed. Ensure that the blade and motor are pushed to the back of the rail (or track) before locking.
- Unique set-ups and operations like compound miter cuts can present a different set of risks and further research into appropriate set-up and techniques for your specific machine should be done before safely attempting this type of work.

Materials

- Inspect materials for foreign objects such as metal or stone.
- Check for loose knots in the wood.
- Orient material so a straight edge is against the fence and a flat face rests on the table for stability.
- Position the material for crosscutting the grain - not rip cutting.
- Lengths of wood below 12" may need to be cut with an auxiliary fence or hold downs.

Operating Procedures for crosscutting (Do not rip wood)

- Position the material with an edge tight against the fence. Do not attempt to cut without the use of the fence.
- Do not stack materials.
- The operator should position themself to the left of the blade assembly, the left hand should secure the material tight against the fence. Keep fingers 6"-8" away from blade. The right hand is positioned on the handle. The operator never crosses hands or arms through the cutting path of the blade.
- Do not shift the material during the cutting operation. The material must remain stationary and secure.
- Consult with instructor about methods for cutting.

MITER SAW (Continued)

- Start the saw when the blade is in the upright position above the materials. The guard should cover the blade in this position.
- Bring the blade down with a consistent motion at a moderate pace.
- When the cut is complete immediately return the motor housing and blade to an upright position, as you release the on/off switch. Ensure that the guard has returned to its original position - fully covering the blade.
- When using the slide feature pull the blade and motor housing forward while upright. Start it then plunge it into the material. Once the blade is fully descended push it towards the fence to the back of the rail then switch off and return it to the upright position. Lock slide feature upon completion.
- Wait for the blade to come to a full stop on its own.
- Remove the waste and leave workspace clean for the next operator.

MITER SAW QUIZ

Name: _____ Date: _____

Label the following parts on the image

1. On/off switch
2. Fence
3. Blade
4. Guard
5. Handle
6. Slide Lock
7. Miter Lock
8. Bevel Lock

Fill in the blanks from the word list provided.

1. Before making cuts the operator should do the following checks:
   a) Secure the _____ and _____ locks;
   b) Release or secure the _____ _____ depending on the width of the material;
   c) Place material _____ against the table and _____;
   d) Ensure that long material is _____;
   e) Ensure that the _____ is in place and working.
2. Do not start the blade while it is _____ the material.
3. Do not _____ stock while the blade is spinning.
4. Do not _____ _____ or arms through the cutting path when holding stock.
5. Use _____ or hold downs to secure small stock.

▪ fence ▪ supported ▪ clamps ▪ touching	▪ cross hands ▪ bevel ▪ mitre ▪ move	▪ tight ▪ guard ▪ slide lock

RADIAL ARM SAW

Personal Protection Equipment (PPE) Requirements

- Wear safety glasses
- Hearing protection

Set-up

- Ensure that the workspace is clean and clear.
- Remove jewellery, secure loose clothing and tie back long hair.
- Turn on the dust collection system.
- Before making alterations to the machine ensure that it is shut-off and locked out.
- Check that the guards are in place and working effectively.
- Test appropriate rollers or support devices are in place so the operator does not have to use excessive force or strength to maintain control of longer stock.
- Use the appropriate blade for the material being cut.
- Ensure that the blade height, bevel and mitre settings are locked in place.
- The blade should be set to a depth slightly below the table surface to complete through cuts. Once the blade depth is set, position the blade and motor housing to the back of the track and check that the blade will not be hitting the wood once it is positioned against the fence. The blade should rest behind the fence, not touching the material.
- Unique set-ups and operations like ripping, bevel or angled cuts can present a different set of risks. Read and understand the operator's manual for complete instructions on these and other operations.

Materials

- Inspect materials for foreign objects such as metal or stone. Check for loose knots in the wood.

Operating Procedures for crosscutting (Do not rip wood using the following guidelines)

- Position the material with an edge tight against the fence.
- Do not attempt to cut without the use of the fence.
- If the wood has a crook (warp) over the length of the edge ensure that the material is tight to the fence nearest the blade.
- Material must sit flat on its face so it is stable on the table surface. Do not stack materials.
- Blade and motor housing should be pushed all the way to the back of the track before starting the saw. The blade should be behind the fence and not touching the material to be cut.
- The operator should position himself just to the left of the blade assembly. The left hand should secure the material tight against the fence while the right hand is positioned on the handle.

RADIAL ARM SAW (Continued)

- Keep fingers 6” – 8” away from the blade at all times.
- Do not shift the material during the cutting operation.
- Pull the blade forward while watching for the front of the blade to emerge along the outside edge. As soon as the wood has been cut through push the handle back so the motor housing rests at the back of the track and shut the machine off.
- Turn the machine off and wait for the blade to come to a full stop on its own.
- Remove the waste and leave workspace clean for the next operator.

Radial Arm Saw Quiz

Name: _____ Date: _____

Label the following parts on the image

1. On/off switch.
2. Fence
3. Blade
4. Guard
5. Handle
6. Blade Depth crank
7. Miter Lock
8. Bevel Lock

Fill in the blanks from the word list provided.

1. Material must be placed tight to the _____ and the _____.
2. _____ the ends of long pieces of material
3. Ensure that miter and bevel _____ are secured before cutting.
4. Blade should not be _____ the stock when it is started.
5. Do not _____ arms or hands through cutting path of blade.
6. Do not _____ material while blade is spinning.
7. Return blade and motor to _____ of the track as soon as material has been cut.
8. Wait for _____ to come to a stop before cleaning up waste.

▪ back ▪ move ▪ blade	▪ fence ▪ locks ▪ table	▪ support ▪ touching ▪ cross

SCROLL SAW

Personal Protection Equipment (PPE) Requirements

- Safety glasses

Set-up

- Ensure that workspace is clean and clear.
- Remove jewellery, secure loose clothing and tie back long hair.
- Use the dust collection system.
- Before making any alterations or adjustments to the machine ensure that it is shut-off and locked out.
- Check that all guards are in place and working properly before starting the machine.
- Use the correct type of blade for the work being completed.
- Make certain that table is secured in the proper position.
- Set the lower guide assembly to rest on top of the material to be cut.
- Adjust the blade tension before beginning.

Materials

- Inspect materials for foreign objects
- Clearly mark out cuts on the surface of the material to be cut

Operating Procedures

- Always keep your fingers and thumbs out of cutting path of blade.
- Keep your hands to the side of blade.
- Feed the material slowly following the marked line with the blade.
- Avoid turning material too quickly. Do not force the material.
- Stop the machine if excessive vibration occurs. Reset the hold down.
- If the blade bends or breaks shut the machine off and wait for it to stop before following blade changing procedures.
- Upon completion, shut the machine off. Wait for it to stop then remove the waste and leave workspace clean for the next operator.

Scroll Saw Quiz

Name: _____ Date: _____

Label the following parts on the image

1. On/off switch.
2. Blade
3. Lower guide assembly
4. Guide assembly lock
5. Table
6. Table Lock

Fill in the blanks from the word list provided.

1. The _____ _____ should be set to rest on top of stock.
2. Keep material _____ to the table surface
3. Ensure that you are using the correct _____ for the material you are cutting.
4. Keep your fingers and thumbs out of the _____ _____.
5. _____ out cuts on material before starting.
6. Remove waste after the _____ has come to a stop.

▪ mark ▪ lower guide assembly	▪ tight ▪ cutting path	▪ blade

TABLE SAW

Personal Protection Equipment (PPE) Requirements

- Safety glasses
- Shop apron
- Roll up long sleeves

Set-up

- Ensure that workspace is clean and clear.
- Remove jewellery, secure loose clothing and tie back long hair
- Turn on the dust collection system.
- Before making any alterations or adjustments to the machine ensure that it is shut-off and locked out
- Make certain appropriate rollers or support devices are in place so the operator does not have to use excessive force to maintain control of longer stock.
- Ensure that all necessary aids (push sticks) are available for use
- Check that all necessary guards are in place and working effectively.
- Test that splitter and anti-kick back pawls are in place for through cutting operations.
- Ascertain that the appropriate blade is being used for the material and procedures being completed
- Ensure that the blade bevel and height settings are locked (set blade to ¼" – ½" (6.35mm – 12.7mm) above material thickness).
- Check to see that the blade and fence are parallel to one another
- Lock the fence in position before starting the cutting operation
- Make sure that others are not in harms way should a kickback occur.
- Ensure that anyone assisting with supporting the stock on the outfeed knows the safe operating procedures (they are to support material only)
- Unique operations and set-ups like bevel ripping or dado cuts can present a different set of risks. Further research into appropriate set-up, additional jigs or fixtures and techniques should be done before safely attempting these types of operations. Read and understand the operator's manual for complete instructions on specialized cuts.

Materials

- Inspect materials for foreign objects such as metal or stone.
- Check for loose knots or splintered edges that may catch on the fence or table surface and prevent a smooth feeding operation.
- One face and one edge of your material must be flat and straight. They must be oriented to the table surface and fence when cutting to ensure the stability of the stock.
- If the wood is slightly cupped keep the concave side down so that the material rides on the two outside ridges to maintain stability.
- Be aware of the properties of the materials you are using. Different species of wood and man made sheet goods do not react the same when being machined. Some woods are less forgiving and have greater tendency to bind together or peel apart as they are cut. The same can be true for some sheet goods like plywood.

TABLE SAW (Continued)

Operating Procedures for Rip Cuts

- Adjust the blade guard on the machine. It should prevent fingers and hands from coming into contact with the blade.
- The rip fence should be used to rip pieces along the length of the material.
- Do not use the fence to make crosscuts.
- Only rip boards that are at least 12" long.
- The operator should position himself slightly to the left of the machine.
- Maintain a stable balanced stance.
- Support and feed the stock with the right hand while the left hand guides the stock against the fence.
- Both hands are used to ensure that the material always remains flat on the table and tight to the fence. The material must not be allowed to lift from table or veer off of the fence.
- As the material is fed towards the blade the left hand applies light pressure to keep the wood against the fence. The hand should remain stationary allowing the stock to slip underneath it and advance forward without dragging the hand and fingers into the path of the blade.
- The right hand supports and feeds the material at a moderate rate that enables the blade to freely cut without bogging down.
- Do not place any part of your hand directly in line with the blade as you feed the stock. Keep all parts of your hand well away from the blade, 6” – 8” (150mm) and outside any guards.
- A push stick must be used to feed the material whenever the rip fence is set below 6” (150mm) and whenever short lengths, below 18" (45 cm), are being cut.
- As the cut nears completion the left hand is removed from the stock so that it never advances beyond the front of the guard.
- The right hand must continue to push the stock through until it clears the outfeed or back end of the blade (material must continually be moved forward slowly).
- Turn the machine off and wait for the blade to come to a full stop on its own.
- Remove the waste and leave workspace clean for the next operator.

Operating Procedures for Crosscutting

- Use an appropriate meter gauge.
- Do not use the rip fence to make crosscuts unless a spacer block is attached.
- Check that the meter gauge slides freely in table groove but without any lateral movement. Ensure that material will not be obstructed in any way.
- Slide the rip fence out of the way so that any offcuts will not be trapped between the rip fence and the blade. If you are trying to use the rip fence to gauge multiple cuts of the same length you must use a spacer block attached to the rip fence near its front.
- Lock the mitre gauge to the selected cutting angle.
- Position material to be cut tight against the table and meter gauge.
- Position hands to hold the material tight to the table and mitre gauge while advancing forward.
- Do not reach over top of the blade.
- Do not position hands directly in line with the cutting path.
- Push the gauge and material through until the cut is complete.
- Do not allow the material to shift during the cutting operation.
- Shut the machine off and wait for the blade to stop.

TABLE SAW (Continued)

Kickbacks

Kickbacks can occur for the following reasons:

- the material is not held securely
- the material wanders away from the mitre head
- the material lifts off of the table
- there is no splitter in place to maintain the saw kerf distance between the stock and off-cut
- the blade and the rip fence are not parallel
- the rip fence is used to crosscut a piece of material when the mitre gauge should have been used
- the mitre gauge and rip fence are used at the same time without an appropriate spacer block

Guards, splitters and anti-kickback pawls do not ensure that kickbacks will be eliminated entirely. The operator must still be following all of the safe operating procedures. Proper hand and body positioning is essential to ensure the additional safety of the operator.

Read and understand the operator's manual for all operations using the table saw.

TABLE SAW QUIZ

Name: _____ Date: _____

Label the following parts on the image

1. Mitre gauge
2. Rip Fence
3. On/off switch
4. Rip Fence lock
5. Guard
6. Splitter
7. Blade height crank
8. Bevel crank

Fill in the blanks from the word list provided.

1. Kickbacks can occur for the following reasons:
   a) the material is not _____ _____;
   b) the material _____ away from the _____;
   c) the material_____ off of the table;
   d) there is no_____ in place to maintain the saw kerf distance between the stock and off-cut;
   e) the blade and the_____ _____ are not parallel;
   f) the rip fence is used to_____ a piece of material when the mitre fence should have been used;
   g) the mitre fence and rip fence are used at the_____ _____.
2. Use _____ to protect your fingers.
3. Rip fence must be _____ before using it.
4. Ensure that area behind the operator is clear to protect everyone from _____.
5. Ensure that the _____ of the blade will enable you to cut through stock (material)

▪ lifts	▪ cross cut	▪ rip fence
▪ kickbacks	▪ held securely	▪ splinter
▪ same time	▪ locked	▪ push sticks
▪ fence	▪ moves	▪ height

THICKNESS PLANER

Personal Protection Equipment (PPE) Requirements

- Wear safety glasses
- Use hearing protection

Set-up

- Ensure that workspace is clean and clear.
- Remove jewellery, secure loose clothing and tie back long hair.
- Turn on the dust collection system.
- Before making any alterations or adjustments to the machine ensure that it is shut-off and locked out.
- Ensure that all necessary push sticks are available for use.
- Check that all guards are in place and working.

Materials

- Inspect materials for foreign objects such as metal or stone.
- Check for loose knots or splintered edges that may catch on the table surface and prevent a smooth feeding operation. Remove loose knots.
- Inspect the wood to determine grain direction so that material can be planed.
- Wood length must be longer than the distance between the feed rollers. A 12" (30mm) minimum is usually acceptable.
- Wood should not be planed less than 1/4" (6mm).

Operating Procedures

- Measure the material thickness at its thickest point and set machine to 1/16" (2mm) less. This may be adjusted to 1/32" (1mm) for harder or wider material to produce a better quality finish.
- Repeat the procedure to slowly reduce the material thickness 1/16" (2mm) per pass.
- Do not feed multiple pieces of varying thickness.
- Stand to the side of the machine as it feeds through. If wood gets jammed or snaps it can be kicked back uncontrollably out of the infeed
- Never look into the infeed opening while machine is running.
- Never place hands beyond edge of infeed table
- Do not place hands or fingers on underside of the wood near the leading edge of the infeed table.
- Support longer boards on both the infeed and outfeed.
- Do not force material. Feed rate is determined by the machine settings.
- If material gets jammed stop the machine. Lower the infeed table when cutters have stopped and inspect for problems or causes.
- Turn the machine off and wait for the cutters to come to a full stop.
- Remove the waste and leave workspace clean for the next operator.

THICKNESS PLANER QUIZ

Name: _____ Date: _____

Label the following parts on the image

1. On/off switch.
2. Infeed table
3. Infeed table adjustment crank
4. Table lock

Fill in the blanks from the word list provided.

1. Set the planer to 1/16" _____ than the thickest part of your stock when starting.
2. Do not send 2 or more pieces of material through that have a _____ thickness
3. If wood gets jammed do not _____ _____, shut the machine off.
4. Do not stand directly _____ planer when material is being fed through.
5. Avoid placing hands near edge of the _____ _____ when feeding stock into the machine, fingers may get pinched between the material and table.
6. If material needs assistance to be fed through use a _____ only, never use your hands.

▪ different ▪ push-stick	▪ in-feed table ▪ look inside	▪ less ▪ behind

ELECTRICAL CLASSROOM SAFETY

General Rules

1. Never work on an electrical circuit that is live. If you are not sure, verify with the teacher and test the circuit with a circuit tester.

2. When using any circuit tester or meter to check for the presence of electrical power test the meter on a known live circuit first to ensure that it is working. (a fault, broken lead or blown fuse could develop in the meter or tester at any time).

3. Keep the shop area floor clean and free of debris especially pieces of conduit and armoured cable which pose an extreme slip hazard if they are stepped on inadvertently.

4. Report any unsafe conditions to the teacher immediately.

5. Report any injuries to the teacher immediately.

6. Know where the safety shut-off buttons are in the classroom and use them immediately if you think a fellow student is in trouble or if you observe an unsafe condition in the shop.

7. Know where the fire extinguishers and fire blankets are located in the classroom. Instruction should be given on their use by the teacher on the first day of class.

Eye Protection

- Wear safety glasses at all times. The ends of wires protruding from electrical boxes are often at eye level and pieces of wire and insulation ejected from pliers and wire strippers can easily cause eye damage.
- Keep the safety glasses or goggles clean and protect them from being scratched or damaged.

Hearing Protection

- Wear hearing protection when necessary. Earmuffs and ear plugs can reduce the noise level by up to 30db.

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

INTRODUCTION

The **W**orkplace **H**azardous **M**aterials **I**nformation **S**ystem (WHMIS for short) is a comprehensive national system for safe management of hazardous chemicals which is legislated by both the federal and provincial jurisdictions. WHMIS is an effort of labour, industry, and government which took several years to develop; it is unique in that it represents a consensus of these three groups.

The WHMIS legislation provides that workers must be informed about the hazards in the workplace and receive appropriate training to enable them to work safely. To accomplish this, WHMIS requires all suppliers (manufacturers, importers, packagers and processors) to label and prepare Material Safety Data Sheets (MSDSs) for products they make, import, package, or process that meet the hazard criteria set out in the Controlled Product Regulations under the federal *Hazardous Products Act.*. The buyers of these controlled products must make sure that these products are correctly labelled and that MSDSs are available. Employers must set up worker education programs that instruct workers about the contents and significance of labels and MSDSs and how to work safely with hazardous materials.

In summary, WHMIS delivers the necessary information by means of:

- cautionary **labels** on containers of controlled products
- the provision of an **MSDS** for each controlled product (Material Safety Data Sheet)
- a worker **education** program

The ultimate goal is to create a safer workplace by providing workers with the knowledge and tools to enable them to work safely.

The Material Safety Data Sheets (MSDSs)

The material safety data sheet or "MSDS" is an important source of information for the worker at the worksite. It is one of the three basic elements of the WHMIS right-to-know-system.

The MSDS includes the following:

- relevant technical information on the substance
- a list of its hazardous ingredients, (*if it's a mixture*)
- chemical hazard data
- control measures such as proper engineering controls and personal protective equipment
- instructions in accident prevention while using the substance, specific handling, storage and disposal procedures
- emergency procedures to follow in the event of an accident

The information provided is expected to be comprehensive and must include what can reasonably be expected to be known about the material and the hazards it may present. MSDS's from different companies may not look the same but they should contain the same basic information.

LOCKOUT AND TAGGING

WHAT IS LOCKOUT AND TAGGING?
Lockout and tagging ensures that hazardous energy sources are under the control of each worker. Serious or fatal accidents can occur when people assume that machinery is turned off or made harmless—*but it isn't*.

Lockout is a procedure that prevents the release of hazardous energy. It often involves workers using a padlock to keep a switch in the "off" position, or to isolate the energy of moving parts. This prevents electric shock, sudden movement of components, chemical combustion, falling counterweights, and other actions that can endanger lives. Lockout is a physical way to ensure that the energy source is de-energized, deactivated, or otherwise inoperable.

Tagging tells others that the device is locked out, who has locked it out, and why. Tagged devices and systems must not be re-energized without the authority of those named on the tag.

INSTALLING LOCKOUT DEVICES
After the circuit has been de-energized and locked out by the person in charge, each worker involved in the lockout must be protected by placing his or her personal lock on the isolating device.
Remember—even though the disconnect is already locked out, you are not protected until you attach your own personal safety lock.
Each worker must retain his or her key while the lock is in place. Only the worker in charge of the lock should have a key.

Remember . . . Merely removing a fuse doesn't constitute lockout. The fuse could be easily replaced. The fuse should be removed and the box locked out.

- The lockout devices attached to one system should not prevent access to the controls and energy-isolating devices of another system.

Locks
Locks should be high-quality pin-type, key-operated, and numbered to identify user.

Multiple locks, lockout bars and scissors
When several workers or trades are working on a machine, you can add additional locks by using a lockout bar or scissors (pictured on right).

Each worker working on the machine can put their own lock on the bar or scissors. This way ALL of the locks have to be removed before the machine can be turned on.

You can add any number of locks by inserting another lockout bar into the last hole of the previous bar or through the holes on the scissors (see right).

LOCKOUT AND TAGGING (Continued)

TAGGING

Section 188 of the Construction Regulation (O. Reg. 213/91) requires each worker involved in a lockout operation to attach a durable tag to his or her personal lock.

The tag must identify:

- the worker's name
- the worker's employer
- the date and time of lockout
- the work area involved
- the reason for the lockout

A tag in itself offers no guarantee that a machine or system is locked out. It simply provides information. Signs must be placed on the system indicating that

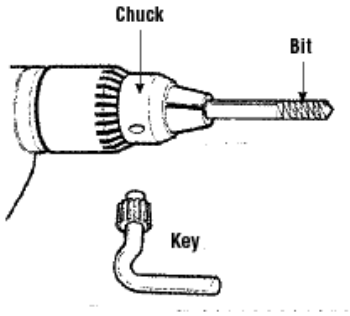
- it must not be energized or operated
- guards, locks, temporary ground cables, chains, tags, and other safeguards must not be tampered with or removed until:
  a) the work is complete, and
  b) each worker has removed his or her personal lock.

Front Back

POWER DRILL AND CORDLESS DRILL

Personal Protection Equipment (PPE) Requirements

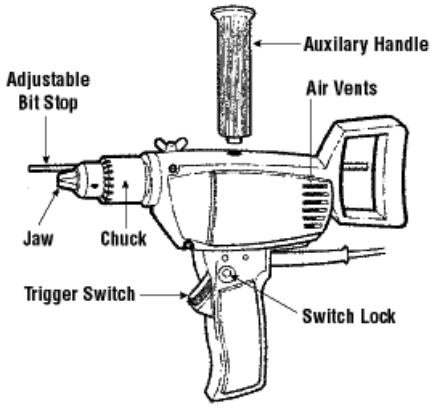
- Safety glasses or goggles



Operating Procedures

Follow manufacturers' instructions when selecting and using a bit or attachment, especially with unfamiliar drills or work.

- Select the bit or attachment suitable for the size of the drill and the work being done. .
- Follow manufacturers' instructions when selecting and using a bit or attachment, especially with unfamiliar drills or work
- Ensure that the bit or attachments are properly seated and tightened in the chuck.
- Use only bits and attachments that turn true (are not bent or twisted).
- Use the auxiliary (second) handle for larger work or continuous operation.
- Wear safety glasses or a face shield. Keep drill air vents clear to maintain adequate ventilation.
- Keep drill bits sharp.
- Keep all cords clear of the cutting area during use. Inspect for damage before each use.
- Disconnect power supply before changing or adjusting bit or attachments.
- Tighten the chuck securely. Remove chuck key before starting drill.
- Secure work piece being drilled to prevent movement.
- Slow the rate of feed just before breaking through the surface.
- Drill a small "pilot" hole before drilling large holes.



Working with small pieces

- Clamp stock so work will not twist or spin.
- Do not drill with one hand while holding the material with the other.

Working with powered hand drills

- Follow the manufacturer's recommended maximum drilling capacities.
- Use a hole saw cutter only with the pilot drill in place.
- High speed steel (HSS) bits may require cooling or lubrication.
- Do not attempt to free a jammed bit by starting and stopping the drill. Unplug the drill and then remove the bit from the work piece.
- Never reach under or around stock being drilled.
- Always keep proper footing and balance.
- Do not raise or lower the drill by its power cord.
- Avoid use in wet or muddy locations. Use a cordless drill instead.
- Use les force to drill into hard material. Reduce drill speed if possible.

POWER DRILL AND CORDLESS DRILL (Continued)

Working with Cordless Drills

It is important to learn to use your cordless drill properly; the following tips will help you do so:

- Read the safety section of your drill's instruction manual
- Avoid wearing loose sleeves or clothing
- Beware of hot drill bits.
- Wear safety goggles. Splintering pieces of wood or other material may be projected out from your work area.
- Look before you drill. Buildings that comply with the National Electric Code should have metal plates covering internal wall wiring, but when drilling into a floor or ceiling, carefully inspect the area for live electrical wires.
- Regularly check your drill and charger for loose, broken or melted parts.
- Securely clamp your project to a table or other stable work area.
- Keep your drill dry.

PLUMBING CLASSROOM PROCEDURES AND SAFETY

This section is primarily introductory material that allows a student to be safe and work comfortably in a plumbing shop

Shop Safety

1. Students MUST work safely and co-operate with the teachers and other students.

2. Safety glasses MUST be worn at all times.

3. Clean up is a group effort. A clean and clutter free work environment is essential to safety to avoid trip, fall and burn hazards.

ACETYLENE-AIR TORCH

Personal Protection Equipment (PPE) Requirements

- Safety glasses or goggles

Description

The acetylene-air torch is the most commonly used torch used for soldering copper pipe. It mixes air in the torch handle with Acetylene gas which when lit creates a very hot blue flame. Acetylene gas is extremely EXPLOSIVE and should be handled with care. It has a unique odour when it leaks from a torch. If you should smell this odour do NOT operate the torch. Do NOT allow anyone in the area to operate the torch. Notify your teacher IMMEDIATELY.

Students are responsible for implementing the following safety procedure EVERY time they wish to use the torch.

If a student has any doubt as to whether the torch is safe to operate they should inform the teacher immediately.

To begin operation:

1. Lift torch handle and hose from the red regulator
2. Examine the grey round valve handle and turn it to the right to ensure that it is closed.
3. There is a small knob on the handle turn it to the left and then right to make sure it is operating and that the gas is shut off
4. Examine the hose to make sure that there are no splits or holes in it.
5. Twist the nuts back and forth where the hose connects to the handle and at the regulator to ensure it is tightly connected.
6. If in doubt as to the tightness of the hose connections spray a soap and water mix on them and watch for bubbles on the connections.
7. Hold the rough brass top of the torch handle in one hand and the tip of the torch in the other and turn the tip to the left until it is removed from the handle.
8. Examine both the top of the handle where the tip was and the bottom of the tip to ensure that nothing is stuck into either end.
9. Replace the tip into the top of the handle and turn to the right until the tip is tight into the handle
10. Turn the Red Regulator knob to the left until it is loose. (but not off)
11. Turn the grey round valve handle to OPEN (left) 1 turn.
12. Turn the Red Regulator knob to the right until the dial on the regulator points to 5.
13. Gas is now turned on as far as the handle.

ACETYLENE-AIR TORCH (Continued)

To light, adjust and shut off:

1. Take a striker in one hand and using your thumb drag the flint end over rough end to create a spark
2. Once you can create a spark with one hand, turn the gas knob on the handle to the left slowly until you hear a small hissing sound of gas escaping from the tip.
3. Place the tip over the striker and light the torch
4. Adjust the flame up until you have a blue flame of about 3 centimetres.
5. Never turn the knob on the handle full open before lighting. It is dangerous to let out too much gas.
6. To shut off the flame turn the knob on the handle to the right. You should hear a popping sound, this is normal.

To close the torch:

1. Turn the grey round valve **to close (right**)
2. Open the small knob on the handle to the left until the gauge reads 0.
3. Close the small knob on the handle to the right.
4. Turn the Red Regulator knob to the left until it turns freely.
5. Hang up the hose and handle over the regulator.

PLUMBING SAFETY TEST

Name: _____ Class: _____

The following statements are either true or false. If it is True place a **T** beside the statement. If it is False then put an **F** beside it.

Each correct answer is worth 1 mark.

1. Make sure the hose on the torch has no splits. _____
2. Turn the red regulator clockwise to 15 pounds before operating the torch. _____
3. Turn out the red regulator knob fully to the left before using the torch. _____
4. Acetylene is the gas used in the torches in the plumbing shop. _____
5. Make sure the handle is loose before using the torch. _____
6. Don't bother shutting off any valves when you are finished using the torch, _____

   someone else is going to use it and this saves time. _____
7. The cut ends of copper pipe are not sharp. _____
8. Turn the red regulator knob clockwise to 5 pounds before operating the torch. _____
9. Open the small knob at the handle fully to the left before lighting. _____
10. Always use a striker to light the torch. _____
11. If in doubt about the tightness of the connections use soap and water to check for gas leaks. _____
12. Always remove and check the torch tip to make sure there is nothing inside it before using. _____
13. Each person must wear safety glasses when any practical work is being done in the shop. _____
14. Report any unsafe tool or condition to your instructor immediately. _____
15. Always carry short lengths of pipe with the end in front of you pointed up, so that other people will see it coming. _____
16. Adjustable pliers are a good tool to use when moving hot copper pipe. _____

PLUMBING SAFETY TEST (Continued)

17. The flux used when soldering copper pipe is safe to touch with your skin. _____

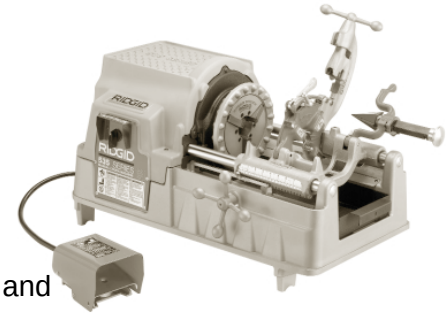
18. Report only major burns or accidents to your instructor. _____

19. Keeping the floor clean and free from pipe and other object is not needed, that is why the school has custodians. _____

20. If you don't remember how to operate any tool ask your instructor. _____

Total Marks 20 **Mark** _____

MANUAL MOTORIZED PIPE THREADER



Personal Protection Equipment (PPE) Requirements

- Safety glasses or goggles
- Shop coat, overalls or apron recommended

Work Area Safety

- Keep your work area clean and well lit. Cluttered benches and dark areas invite accidents.
- Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust. Tools create sparks which may ignite the dust or fumes.
- Keep floors dry and free of slippery materials such as oil. Slippery floors invite accidents.
- Guard or barricade the area when work piece extends beyond machine. A guard or barricade that provides a minimum of three (3) feet clearance around the work piece will reduce the risk of entanglement.

Specific Hazards

Electrical Safety

- Grounded tools must be plugged into an outlet, properly installed and grounded in accordance with all codes and ordinances.
- Never remove the grounding prong or modify the plug in any way.
- Do not use any adapter plugs.
- Check with a qualified electrician if you are in doubt as to whether the outlet is properly grounded.
- If the tool should electrically malfunction or break down, grounding provides a low resistance path to carry electricity away from the user.
- Avoid body contact with grounded surfaces. There is an increased risk of electrical shock if your body is grounded.
- Don’t expose electrical tools to rain or wet conditions.
- Water entering a tool will increase the risk of electrical shock.

Personal Safety

- Stay alert, watch what you are doing and use common sense when operating a power tool.
- Do not wear loose clothing or jewelry. Contain long hair.
- Be sure switch is OFF before plugging in.
- Remove adjusting keys before turning the tool ON.
- Do not overreach. Keep proper footing and balance at all times.
- Always wear eye protection.
- Dust mask, non-skid safety shoes, hard hat, or hearing protection must be used for appropriate conditions.

MANUAL MOTORIZED PIPE THREADER (Continued)

Tool Use and Care

- Do not use with a faulty On/Off switch

Foot Switch Safety

- Using a threading machine without a foot switch increases the risk of serious injury. A foot switch provides better control by letting you shut off the motor by removing your foot.

Machine Safety

- Follow instructions on proper use of this machine. Do not use for other purposes such as drilling holes or turning winches. Modifying this power drive for other applications may increase the risk of serious injury.
- Secure machine to bench or stand. Support long heavy pipe with pipe supports.
- Do not wear gloves or loose clothing when operating machine.
- Do not reach across the machine or pipe.
- Operate machine from side with REV/OFF/FOR switch.
- Do not use this machine if the foot switch is broken or missing.
- Keep hands away from rotating pipe and fittings.
- Stop the machine before wiping pipe threads or screwing on fittings. Allow the machine to come to a complete stop before touching the pipe or machine chucks.
- Do not use this machine to make or break fittings.
- Tighten chuck hand wheel and engage rear centering device on the pipe before turning on the machine.
- Keep covers in place. Do not operate the machine with covers removed
- Lock foot switch when machine is not in use.