

WOODWORKING SAFETY MANUAL AND TEST



Beloit Memorial
Technology Education Department

(Do Not Remove From BMHS Facility)

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Table of Contents

WOOD LAB SAFETY MANUAL	2
INTRODUCTION	2
GENERAL LAB SAFETY.....	3
TABLE SAW.....	6
PLANER.....	11
RADIAL ARM SAW.....	13
MITER SAW.....	15
BAND SAW.....	16
DRILL PRESS	18
HAND-HELD ROUTER.....	20
ROUTER TABLE.....	22
DISC and DISC/BELT (COMBINATION) SANDER.....	23
PORTABLE BELT SANDER	25
HORIZONTAL SLOT MORTISER	26
HOLLOW CHISEL MORTISER.....	27
15" WIDE BELT SANDER.....	29
EDGE SANDER.....	30
PNEUMATIC NAIL GUNS and STAPLERS.....	31
LATHE	32
SHAPER.....	34
HORIZONTAL BORING MACHINE.....	36
SLIDING TABLE SAW.....	37
32mm LINE BORING MACHINE.....	39
GLOSSARY	40
WOOD LAB SAFETY EXAM.....	43

WOOD LAB SAFETY MANUAL

INTRODUCTION

Hand tools and power-driven machine tools have been developed to save time and perform accurate, repeatable work. Hand and power tools consistently perform the same operation hundreds of times if they are properly used, cared for, and understood. In nearly all cases, mistakes and/or injuries are due to operator error, not the machine. **Whether the tools are helpful or harmful depends on you.**

A study made by the National Safety Council on school lab accidents show that more accidents happen Saturday before noon than any other time and day of the week, except days just before or following vacations. Of course, this does not mean you can relax your safety habits during other days. In addition, the most dangerous school lab is the wood lab. In the wood lab, the tools that are involved in most accidents are listed below (the most dangerous in each category is listed first):

HAND TOOLS

1. Chisels
2. Saws
3. Knives
4. Planes
5. Hammers

POWER TOOLS

- | | |
|-------------------|------------------|
| 1. Shaper | 7. Grinder |
| 2. Table Saw | 8. Sander (Disc) |
| 3. Jointer | 9. Band Saw |
| 4. Radial Arm Saw | 10. Jig Saw |
| 5. Wood Lathe | 11. Drill Press |
| 6. Miter Saw | 12. Planer |

GENERAL CAUSES OF ACCIDENTS

- | | |
|--|---|
| 1. Ignorance | 11. Fatigue |
| 2. Carelessness | 12. Using the wrong material |
| 3. Lack of judgment | 13. Absent-mindedness |
| 4. Rushing a job | 14. Working in a disorderly lab |
| 5. Making too heavy a cut | 15. Improper position of feet and body while working on a machine |
| 6. Overconfidence | 16. Improper clothing |
| 7. Talking while working | 17. Using unsafe material (with checks, knots, etc.) |
| 8. Inadequately guarded machinery | 18. Eyestrain |
| 9. Using a dull tool | |
| 10. Using an improperly set or adjusted tool | |

SPECIFIC CAUSES OF ACCIDENTS

1. Startling a person while he or she is working at a machine
2. Crowding or hurrying a person at a machine
3. Failing to stop machinery for adjustments
4. Not replacing a guard after it has been removed
5. Moving or dropping fingers into moving parts of cutters
6. Failing to stop machinery for measurements

7. Students not starting and stopping their own machines
8. Operating machinery without receiving instruction on its proper use
9. Operating machinery while the instructor is out of the room
10. Showing off while operating machinery
11. Using the wrong machine for a given procedure

A NOTE ABOUT THIS MANUAL

1. The term "instructor" in this manual means the class instructor or the instructional aide.
2. The term "special setup" is a machine operation which exposes the operator to greater than average risk; a special setup requires instructor or aide approval prior to operating the machine.

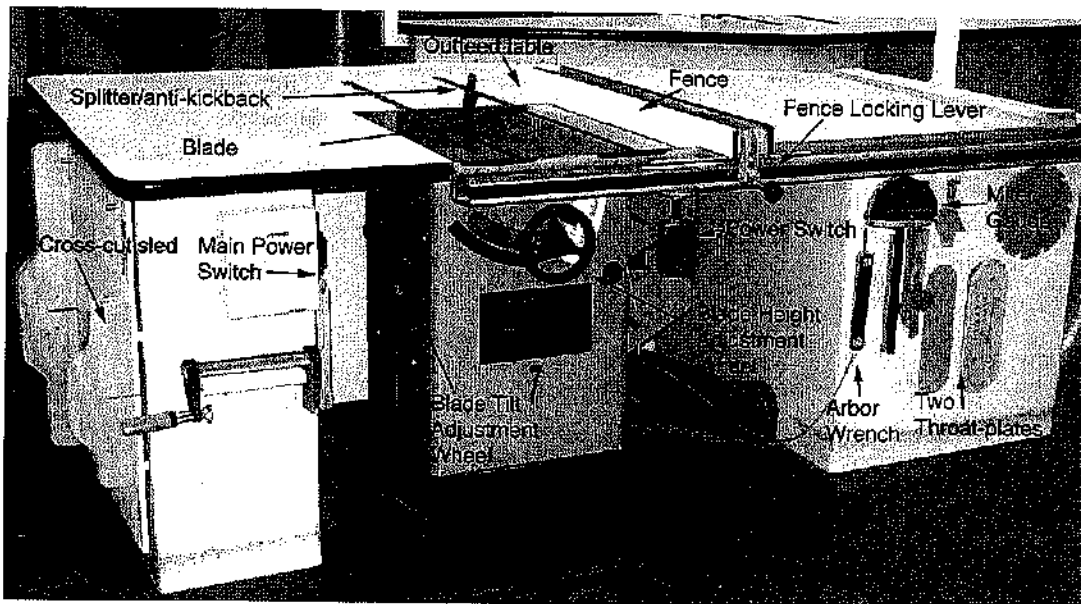
GENERAL LAB SAFETY

1. In any level of the woodworking program, you are under no obligation to use power tools or machinery. Hand tool operations can be substituted for any and/or all machine operations.
2. Wear safety glasses and/or a face shield at all times in the lab to prevent flying particles or corrosive substances from entering your eyes.
3. All work to be done in the lab must have the instructor's approval.
4. The instructor must check all special setups before any machine is turned on.
5. All accidents and injuries, no matter how slight, must be reported to the instructor immediately.
6. If you feel ill or are on any medication that may affect your ability to operate machinery, inform your instructor.
7. With the exception of special, instructor-approved **special setups**, only the operator may start and stop a machine. After the machine is turned off, he or she should control the material and stand by until the machine has stopped running.
8. Wear safe clothing when working in the lab. Fasten or remove loose clothing before you operate any machine. Roll long sleeves above the elbows. Apron fastenings should be made such that they will break if the apron becomes entangled in a machine.
9. Long, loose hair can easily be caught in revolving machinery and ripped out, causing serious scalp laceration. Your hair must be tied back or tightly covered when working with machines.
10. Wearing gloves is forbidden while working with machines within the wood lab. Gloves hinder your dexterity and may get caught in moving machinery.
11. Before operating machinery remove jewelry (bracelets, rings, chains, and beads) and other accessories that, in the judgment of the instructor, may be hazardous.
12. Keep machine guards in proper position at all times, unless the instructor has approved their removal for a **special setup**.
13. Report all breakage or damage to tools or machinery to the instructor immediately.
14. Overloading or forcing any machine is dangerous and is not permitted.

15. Use only material furnished or approved by your instructor.
16. Keep rags away from machines that are in operation.
17. Rags that have absorbed any amount of linseed oil, solvents, or finishing products must be disposed of in an approved covered metal container as a precaution against spontaneous combustion.
18. Hang nothing on fire extinguishers. The area around them should be kept clear so that they may be reached without delay if fire breaks out.
19. If a machine makes an unusual sound, is out of adjustment, or is in need of repair, shut off the power at the machine and report it to your instructor immediately. Only machines in good repair may be operated.
20. Never talk to or distract a student using a machine; likewise, do not allow your attention to be diverted while you are using a machine. Such distractions can cause the operator to make serious mistakes and may lead to injuries.
21. Machines must come to a full stop with the power turned off before cleaning or adjusting.
22. If you see oil, grease, or any other liquid on the floor, wipe it up immediately; you may prevent someone from slipping.
23. Floors, aisles, and passageways should be kept clear of pieces of wood, tools, and materials. Objects on the floor may cause someone to slip or fall.
24. Do not use used materials of any kind in any milling process. They may contain metal or other particles that could cause injury or damage machines.
25. Do not use green or treated lumber in any milling process.
26. Always sweep scraps from your workbench or table with a brush or piece of wood rather than with your hands, as there may be sharp or jagged particles among the scraps.
27. Always carry long objects, such as metal rods and long boards, with the front end high enough to avoid striking someone.
28. Report to your instructor any odor of gas in the room. Gas fumes may make you ill or cause an explosion.
29. All portable electric tools and appliances must be disconnected when not in use, making adjustments, when inserting cutters or bits, or when changing sandpaper.
30. When unplugging an electric tool, pull on the plug instead of the cord.
31. Be sure your hands are dry before touching electrical switches, plugs, or receptacles. If your hands are wet, you may receive a severe shock and serious burns.
32. If it is necessary to use an extension cord, see that it lies flat on the floor.
33. When using air under pressure, make sure the air stream is not directed toward you or any other person.
34. Use the proper tool for the job.
35. It is good safety practice to be courteous and considerate of others.
36. If you have prescription eyeglasses, wear them; eyestrain is a frequent cause of accidents.

37. Notify the instructor if a violation of safety instructions is observed. You may save yourself or someone else from serious injury.
38. If you are in doubt about the use of any tool or machine, or about any lab procedure, ask your instructor for help.
39. Sharp tools are safest; use them whenever possible. Dull tools are dangerous because they are hard to control and require excess pressure by the operator.
40. When entering a lab or class other than your own, request permission to work from all instructors and instructional aides in the wood lab prior to starting work. If given permission to work, fill out the appropriate information on the lab sign-in sheet.
41. CO₂ extinguishers should be used on gasoline fires and most chemical and electrical fires. Use water, not CO₂ extinguishers, on wood or wood product fires.
42. Sharp edges or points of tools should be directed down and/or away from the body.
43. Students must be instructed in the correct and safe use of any machine before they can be use that machine.
44. Do not lift anything in the lab that is too heavy for you; seek help. We will either use more personnel or employ mechanical help such as a lever, dolly, jack, forklift, wheels, or rollers.
45. When lifting, keep your back straight and lift with your legs. Do not strain yourself; injury can occur easily.
46. The following tools are never to be used by students without direct instructor supervision:
 - Portable circular saw
 - 52" wide belt sander

TABLE SAW



Although the table saw is one of the most useful machines in the wood lab, it is also one of the most dangerous. It can be used to accurately rip and crosscut lumber and sheet goods. The table saw can also be used for special operations including cutting dadoes and rabbets and for resawing. With the use of special jigs, joinery like tenons and box joints can be made. In addition, the blade can be tilted for cutting bevels and miters.

The typical table saw uses a 10" blade. Depending on the saw, the blade may tilt to the right or to the left.

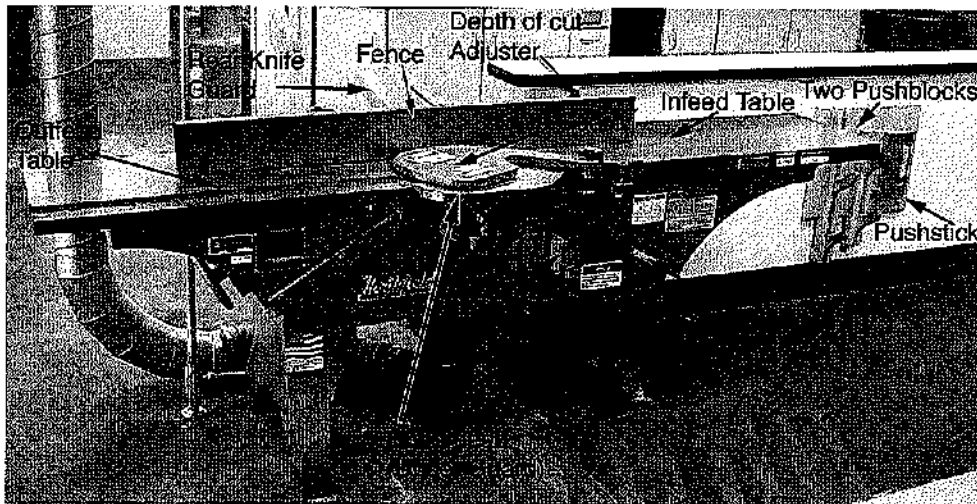
Do not use the table saw until you have been through the WMT table saw safety presentation and are personally checked out in its use by your instructor you must be checked out each semester regardless of whether you have been checked out earlier.

1. The number one cause of injuries on the table saw is **kickback**. Kickback occurs when the operator loses control of the material being cut and it is thrown from the machine with great force.
2. When cutting, the saw blade should project $\frac{1}{4}$ " above the stock or enough to clear the common gullets.
3. The fence is used to guide ripping operations. The miter gauge or sled is used to guide crosscut operations. Always hold the work firmly against the fence, sled, or miter gauge.
4. During a rip cut, once the material has moved away from your left hand, move your left off the table. Do not drag your hand across the table and never reach over the blade.
5. You **must** use a push stick when ripping pieces that are 6" or less in width.
6. Cutting workpieces shorter than 10" in length is a **special setup**; get permission from the instructor or aide prior to cutting.

7. Performing on-edge resawing is a **special setup**. You must get specific instruction and special permission from your instructor.
8. When ripping stock, the piece between the fence and blade must be controlled and pushed past the blade all the way onto the outfeed table. Failure to do so may result in a kickback.
9. Lowering stock directly down over the saw blade is dangerous and is never allowed.
10. Procedures involving raising the blade into the work are **special setups**. Permission and instructions must be obtained from your instructor for doing this type of work.
11. The over-arm saw guard must always be in place over the blade except when the instructor has authorized its removal for **special setups**.
12. The splitter must always be in place behind the blade except when the instructor has authorized its removal for **special setups**.
13. Make adjustments only when the power switch is off and the blade is at a complete stop.
14. Whenever a measurement or other procedure is made where you must have your fingers in close proximity to the blade, make sure the main power switch is in the off position.
15. The main power switch should be left in the off position when you leave the saw.
16. Freehand cutting, ripping, or crosscutting without using the fence, sled, or miter gauge is **ABSOLUTELY FORBIDDEN** in all circumstances.
17. When you are ripping stock, the scrap must fall to the outside (non-bound side) of the blade (not between the blade and fence).
18. Do not reach over the saw blade or pass wood over the saw blade at any time.
19. When helping someone to tail-off (supporting the work hanging off the back of the saw table), your only purpose is to support the stock from below. Only the operator pushes the stock through the saw.
20. Make sure the blade is stopped and completely lowered when clearing scraps from the table.
21. The instructor must inspect all **special setups** and dado blade installations before the power is turned on.
22. Use a **special setup** with V-block or sled when cutting cylindrical stock to help keep it from spinning.
23. Backing the stock away from the blade while the saw is running may throw the piece toward you. If it is necessary to remove the piece, always stop the saw first.
24. Never attempt to turn off the saw in the middle of a cut. If you must stop mid-cut, stop what you are doing without moving your hands and call for someone nearby to turn off the saw.
25. If the fence is used at the same time as the miter gauge, the miter gauge must be between the fence and the blade. This is a **special setup**.
26. When you are crosscutting a number of pieces to the same length, clamp a clearance block to the rip fence well ahead of the saw blade to prevent the cut piece from being pinched between the blade and fence.

27. Stock edges or faces that contact the table, miter gauge or fence, must be straight and flat.
28. Seek assistance and direction from your instructor before milling materials with defects such as splits, warps and knots.
29. Obtain permission from your instructor for all **special setups** using the dado head.

JOINTER



The jointer is primarily used for flattening the face of a board and straightening and squaring the edges of a board. In special circumstances, it may also be used for rabbeting, beveling and tapering. The stock is placed on the infeed table and pushed, with the aid of a pushblock, over the cutterhead and onto the outfeed table. The fence is used to help guide the stock. The length of the cutterhead, which defines the size of a jointer, indicates the widest board that can be surfaced.

1. Ensure that the guard is over the knives at all times while the jointer is being operated.
2. Adjust the depth of cut before turning on the power. For most cuts, the jointer should be set for $1/32''$.
3. The maximum depth of cut is $1/16''$.
4. The minimum length of stock for jointing is 14".
5. Keep all body parts at least 6" from the cutterhead. Never place your hand directly on the piece being jointed within 6" of the cutterhead.
6. Use a pushstick or pushblock when face-jointing flat pieces of stock or for edge-jointing any piece lower than the height of the fence.
7. Never joint the face of stock less than $1/4''$ thick.
8. Push the stock clear of the cutterhead and make sure the guard has returned over the throat and knives before picking up stock.
9. To avoid rocking of the stock during cutting, always place the concave or most stable side of the stock on the table.
10. The outfeed table must be at the same level as the knives and is **NEVER** to be adjusted by a student.
11. **Never joint end grain.** It is a dangerous practice, especially on narrow pieces, and the jointer tends to splinter the work at the end of the cut.

12. Examine stock for loose knots and splits and avoid cutting these if possible.
13. Operations involving “stop cuts” or “drop cuts” require that the stock be held in place by a stop or clamp. The instructor must approve these **special setups**.
14. Never attempt to run a piece of wood across the jointer until the machine is running at full speed.
15. Your instructor must check **special setups** on the jointer for special operations such as rabbeting, beveling, chamfering, or tapering.
16. Use only clean, dry lumber on the jointer.
17. On stock that is severely warped, band saw the stock into shorter and/or narrower pieces before jointing, if possible. This eliminates much of the warp. Then joint the faces as usual.
18. Material must be pushed through the jointer and never pulled.

PLANER

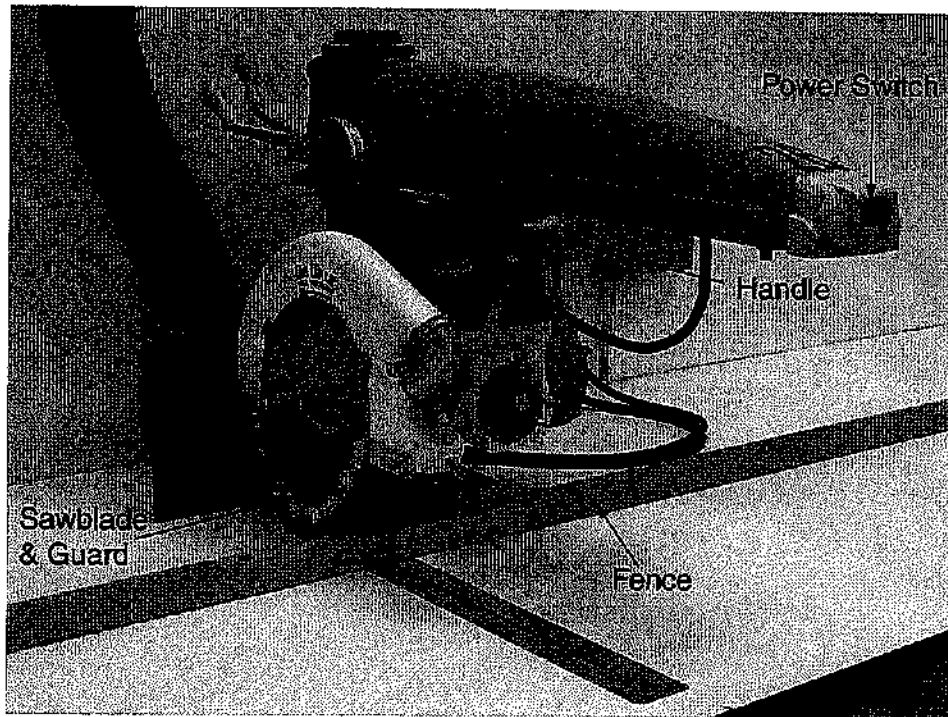


The planer is used to smooth lumber to an even thickness. After flattening one side of a board on the jointer, the board is run through the planer with the flat side down on the table, which supports the board and acts as a reference surface. The cutterhead, located above the workpiece, then smooths the opposite face and makes it parallel to the jointed face. The width of the cutterhead, which defines the size of a planer, indicates the widest board that can be surfaced.

1. Do not remove more than $1/32$ " of wood at one time.
2. Adjust the initial depth of cut to the thickest part of the board.
3. The stock must be longer than the distance between the infeed and outfeed rollers. The minimum length of stock for planing is clearly marked on each planer.
4. Do not plane stock to less than $1/4$ " thick. To plane thinner stock, run it through the planer with a backer board. For this **special setup**, obtain the instructor's permission.
5. Never put your hands into the planer.
6. If a board needs to be realigned on the table after being gripped by the cutterhead, use care to keep your fingers clear of the table and feed rollers.
7. Never change depth of cut after stock has been started through the planer.
8. Do not plane stock with large cracks or loose knots.

9. Always plane wood with the grain, never across or perpendicular to the grain; the planer will shred the wood.
10. Always ensure that the machine has reached full speed before inserting the wood in the machine.
11. Plane pieces of varying thickness in progressive order, starting with the thickest first.
12. Because of the possibility of flying particles, do not look into the planer while the machine is running. Stand in an upright position and to one side while you are operating this machine.
13. The maximum length of stock which can be surfaced or planed is limited only by the location of walls and other equipment surrounding the planer.
14. A planer will produce two flat, parallel faces only when the surface which was put on the table was flat and smooth to begin with. Planing a warped board will only produce a warped board of even thickness.
15. Kickbacks are infrequent but possible on a planer.
16. Only the instructor may adjust the speed of the planer's feed rollers.
17. If the stock gets stuck in the planer, do the following, in this order:
 - a. Gently push the stock into the planer; do not overly force the material.
 - b. If that doesn't work, shift the stock at a slight angle while keeping your fingers clear of the table.
 - c. If that doesn't work, lower the table 1/8 turn of the adjustment wheel and repeat steps a and b until the stock starts feeding again. If the stock still will not proceed through the planer repeat steps a, b, and c until the stock starts feeding again. Do not turn the wheel more than 1/8 turn at a time; the feed rollers could lose contact with the stock and a kickback could occur.
 - d. Note: Do not turn the power off while stock is in the planer; you could damage the cutterhead.

RADIAL ARM SAW

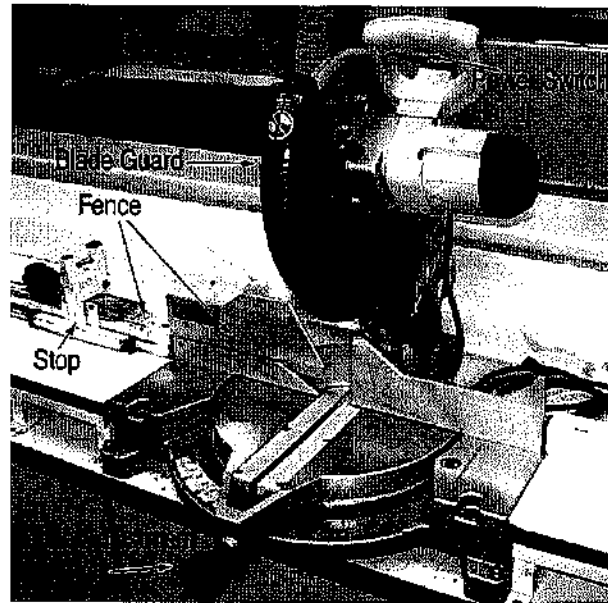


The radial arm saw is used to cut lumber to rough length. It consists of a trunnion assembly, which includes the motor, bracket, and blade, and a cantilevered support arm. The trunnion assembly rolls on bearings along the support arm. The wood remains stationary on the table against a fence and the trunnion assembly is pulled towards the operator. Due to the nature of the machine, it is typically not very accurate, but does an excellent job for rough work. It is possible to raise, lower, and rotate the support arm and to rotate the trunnion assembly for certain operations, but those operations are **forbidden** in the WMT lab.

1. When making a cut on the saw, hold the stock firmly against the fence.
2. Maintain a minimum safe distance of 6" between the line of the blade and your fingers and hands.
3. Never hold the stock being cut with your thumb sticking out along the edge of the board.
4. Make sure there is no gap between the stock and the fence at the cut line. A gap can usually be avoided by turning the board over.
5. Use your upper body to control the speed of the cut by keeping your arm relatively straight and rotating at the waist. Using only your arm makes it difficult to control the saw.
6. Do not force the saw into the material any faster than it can cut with ease. Because of the direction of rotation of the saw blade, it has a tendency to "climb" into the wood. **Control the rate of cut.**

7. When cutting thicker stock, make sure the blade clears the back, upper corner of the stock prior to cutting. A spacer block between the stock and fence may be necessary to ensure this. This is a **special setup**.
8. Because it is hard to hold two or more pieces securely at the same time, cut only one piece at a time.
9. Use the saw for crosscutting only and never for ripping.
10. Do not use the saw for cutting short lengths of stock; your hands could be drawn into the blade.
11. Use extreme care in cutting warped stock since there is a tendency for the kerf to close and pinch the blade in this type of defect. To avoid this difficulty, make a partial cut, back the saw out of the cut, and start again. This process should be repeated as long as a tendency to bind is observed.
12. Let the blade reach full speed before making a cut.
13. Always return the saw to the rear of the support arm after completing a cut. Never remove stock from the table until the saw has been returned.
14. Any unusual noise or vibration should be brought to the immediate attention of your instructor. A noise or vibration could be caused by a blade with the wrong size arbor hole and/or a blade which is out of round.

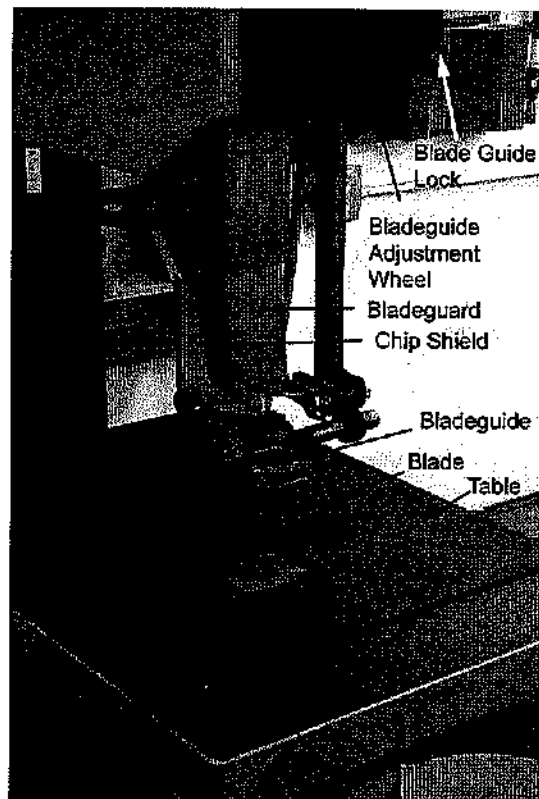
MITER SAW



The miter or chop saw is the best tool in the lab for accurately crosscutting surfaced lumber to length. It is extremely useful for making all cuts from 90° to $\pm 45^\circ$. The miter saw is one of the most dangerous machines in the lab. Use care in its operation.

1. Keep protective guards in place at all times.
2. Remove scraps and other foreign items from the machine before operating the saw.
3. Make sure the piece to be cut is firmly against the table and fence before cutting.
4. Allow the blade to reach full speed before cutting.
5. Do not force the tool into the work.
6. Never hold the piece to be cut in a manner that causes your arms to cross. The majority of all cuts are made on the miter saw with the material held with the left hand on the left side of the saw while the right hand operates the machine.
7. Do not leave the area of the machine until the blade has come to a full and complete stop.
8. Always maintain a 6" margin of safety between all body parts and the blade.
9. Remove chips, scraps and cutoffs only after the blade is at a complete stop.
10. After placing the stock securely on the saw table and aligning the cut, pull the trigger. After the blade comes to full speed, lower the blade into the work at a moderate speed. When the cut is complete release the trigger and allow the blade to come to a complete stop before returning it to the upright position.
11. Use a stick or other hold down device when needed to secure short material without putting your hand in danger.

BAND SAW

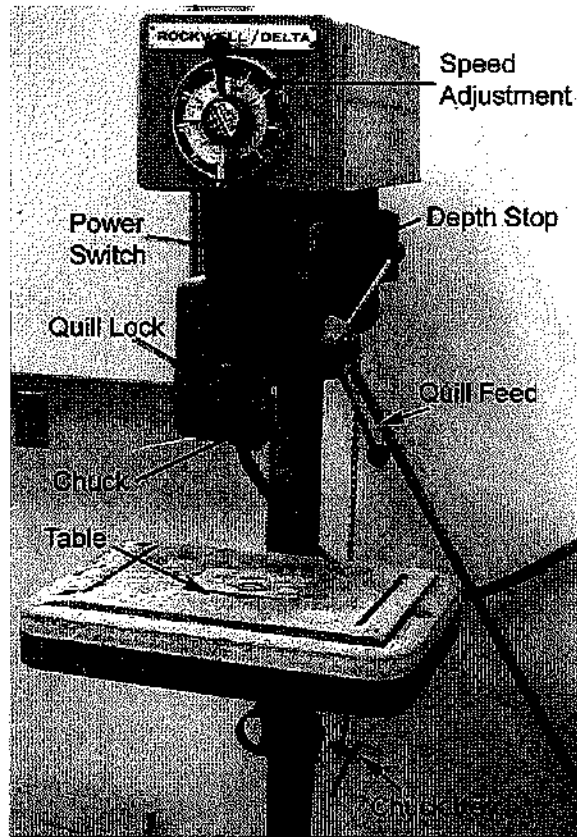


The band saw is almost indispensable for making curved cuts and resawing (cutting wood to make it thinner). The blade is a thin loop of steel, typically $\frac{1}{4}$ to $\frac{1}{2}$ inch wide. The blade runs over wheels above and below a table, allowing wood to be cut where blade is traveling downward through the table. The size of a band saw is determined by the diameter of the wheels, which roughly indicates the largest piece that can fit between the blade and the body of the saw. The band saw is the fastest cutting saw in the woodworking lab. It is a rough cutting and shaping tool not intended for finish cuts.

1. Adjust the upper guide and guard to about $\frac{1}{4}$ " above the stock with the machine at a full stop.
2. Allow the saw to reach full speed before starting to feed your work.
3. Plan cuts carefully; lay out and make relief cuts before cutting long curves and curves of small radii. Turning holes should be made where required. Plan work so that all cuts will be made in the forward direction.
4. If the stock binds or pinches the blade, do not attempt to back the stock out. Shut the power off and remove the stock after the machine stops. Backing up while the machine is running could pull the blade off the wheels.
5. When removing scrap material from the band saw table, always be aware of the blade. Use a piece of scrap stock to remove scrap pieces; do not use your hands.

6. Keep the floor areas surrounding the saw clear of scraps.
7. If the blade breaks, stand clear and shut off the power if possible. Keep others clear until the machine stops completely and notify the instructor.
8. Never make adjustments to the saw while it is running.
9. Do not place your fingers close to the saw blade when cutting stock. Always maintain a 4" margin of safety.
10. If it is necessary to back the saw out of a long cut, turn the power off and wait for the blade to stop. Then seek assistance from the instructor.
11. To stop the band saw make sure the power is off then apply gentle pressure on the brake pedal until the blade stops. Leave the machine only after the blade has stopped moving completely.
12. Your instructor should approve all resawing and other **special setups**.
13. Use a pushstick when resawing.
14. When resawing, the edge of the stock on the table and the face of the stock against the resaw fence must be surfaced.
15. Keep upper and lower doors closed and all guards in place.
16. Use a pushstick or guide for cuts that would place your hands near the saw blade.
17. Cutting cylindrical or irregular stock on the band saw may be done only with a special jig, such as a V-block (**special setup**).
18. Never stand or allow others to stand to the right of the band saw when it is running.
19. If you hear a clicking noise, turn off the saw at once. This indicates a crack or kink in the blade as it passes through the guide.

DRILL PRESS

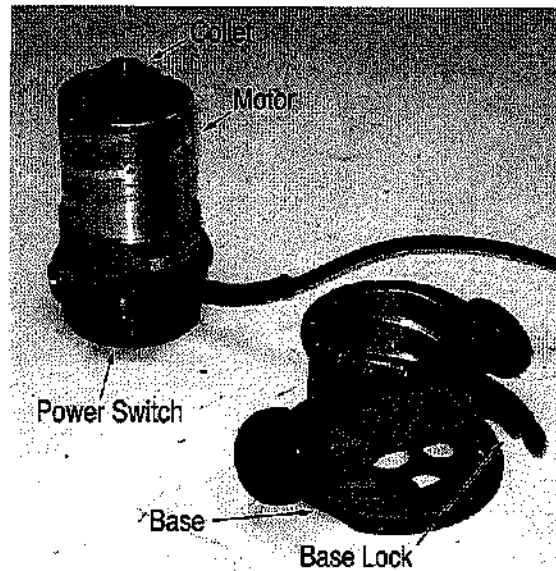


The drill press is an excellent machine for drilling accurate holes and is invaluable when drilling large holes. It consists of a motor/head assembly, chuck, and work table. Any uses other than drilling holes are **special setups** and must be approved by the instructor.

1. The procedure of changing spindle speed varies from drill press to drill press. Check with your instructor prior to making speed adjustments.
2. Be certain that the table and head of the drill press are secure.
3. Select the proper drill bit for the job and avoid dull bits.
4. Insert the drill bit in the chuck properly and tighten it securely before starting the drill press.
5. Remove the chuck key before turning on the power and before leaving the area of the drill press. If the chuck key is not removed it will be thrown out from the chuck at a tremendous speed when the power is turned on.
6. Use clamps or a drill vise whenever necessary to secure small or odd shaped work firmly.
7. Larger bits should be run at slower speeds and smaller bits at higher speeds. This keeps the cutting edge of the bit at a reasonable speed.

8. Use a backer board under the work or be sure the bit is over the center hole in the table when boring completely through your work.
9. Keep hands away from the rotating spindle.
10. Operate the feed lever so that drill cuts at a consistent feed rate into work.
11. Ease up on feed pressure when the bit begins to break through the work.
12. Back the bit out often to clear chips from the hole.
13. When boring to a given depth, use the depth adjustment nut or feature.
14. Stop the drill press before removing your work.
15. If work comes loose and is seized by the drill press, shut off the power immediately if you can do so without endangering yourself. If it is impossible to shut off the power, move away from the machine and move others away. Notify the instructor immediately.

HAND-HELD ROUTER

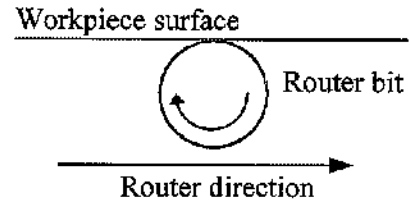


The router is a simple, relatively safe, portable electric tool. It is extremely versatile; its use is limited only by the imagination of the operator. The router consists mainly of two parts; a motor with a collet mounted on one end of the motor shaft and a base which holds the motor. A bit or cutter is mounted in the collet and protrudes below the surface of the base to do the cutting. The depth of the cut can be adjusted by moving the motor up or down inside the base and locking it at the desired depth setting. Routers run at speeds up to about 22,000 rpm.

There are two basic types of routers, fixed-base and plunge. With a fixed base router, the motor is adjusted in the base for a given depth of cut and locked in place. With a plunge router, the motor can be slid up and down within the base while the motor is running.

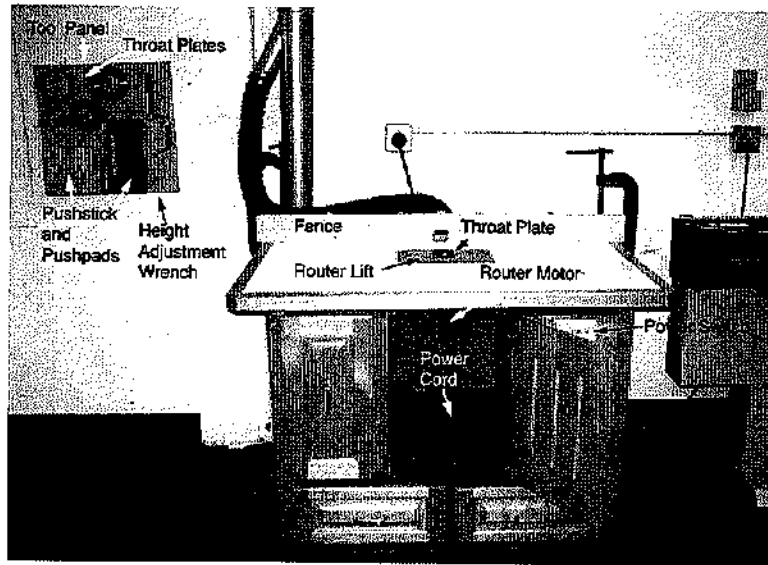
1. Use only bits that are specially designed for operation in high speed routers.
2. Always unplug the router before changing bits or making adjustments other than the depth of cut.
3. Do not bottom out the shank of the router bit in the collet. When possible, insert the bit to its maximum depth, and then withdraw it about 1/8" before tightening the collet.
4. Make sure the bit is firmly secured in the collet before starting work. A loose bit will work its way out of the collet, damaging your work and/or injuring you.
5. Make sure the router motor is tight in the router base before power is turned on.
6. When starting the router, make sure the bit is not in contact with anything.
7. Hold the router firmly when turning on the power to withstand the starting torque of the router motor.
8. Keep hands and loose clothing away from revolving bits and cutters.

9. Operate the router in the proper direction. If only one side of the bit is being used, move the work against cutter rotation. If the bit is cutting on both sides, feed the work so that the bit pushes the work towards the fence (when applicable).



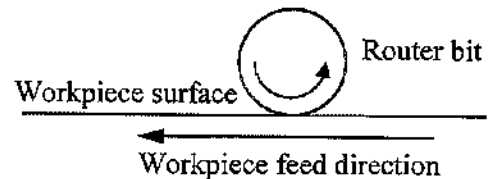
10. Use slower speeds for larger bits.
11. Do not overload or bog down the speed of the motor.
12. Make several light cuts where large amounts of material are to be removed.
13. Always make sure the bit is sharp; if unsure, check with the instructor.
14. Always secure or clamp the work so that it cannot move during routing.
15. When using multi-piece router bits, ensure all nuts and bearings are tightened properly.
16. Large panel-cutting bits should not be used in a hand-held router.
17. Due to the physics of routing, dados and rabbets in solid wood are best achieved using a table saw. Dados and rabbets in manufactured material such as plywood, particle board, and MDF are better achieved using a router.

ROUTER TABLE



One way to increase a router's usefulness is to mount the base to the underside of a table. The bit then protrudes up through the table and the piece being routed is moved past the bit. This configuration makes for a very stable and controllable routing process and is the desired configuration whenever possible. Using the router table is not possible, however, for large workpieces or for those that cannot be moved to the router table. The procedures for using a router at the router table are similar to those for a hand-held router, with the following additional information.

1. Move the workpiece in the proper direction. If only one side of the bit is being used, move the work against cutter rotation. If the bit is cutting on both sides, feed the work so that the bit pushes the work towards the fence (when applicable).
2. Use slower router speeds for longer bits. This is especially important at the router table, since large bits are more likely to be used here.
3. On the Bench Dog router lifts: Do not change router bits without first removing the throat plate. When tightening the throat plate attach screws, use only light finger pressure. Do not over-tighten one throat plate screw before tightening the other; the tightness of the first screw will prevent the throat plate from being flush with the table when you tighten the second screw.
4. Use the throat plate that leaves the smallest opening around the router bit.
5. When routing small or narrow pieces, use a backer board and/or a pushstick to ensure proper support, along with a fence with a small or no opening.



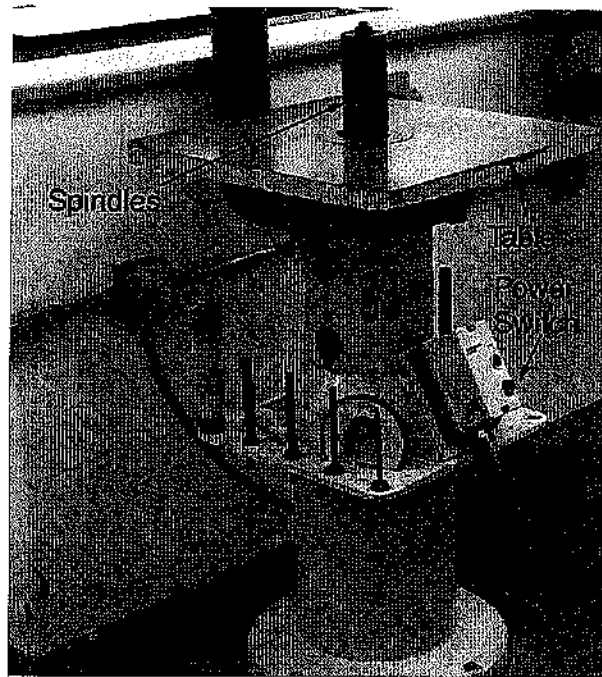
DISC and DISC/BELT (COMBINATION) SANDER



The disc sander consists of a reference table and a circular plate mounted to a motor shaft. A cloth or paper-backed abrasive disc is cemented to the plate. The diameter of the disc indicates the size of the machine, commonly 12". The combination sander includes a vertical belt sander as part of the machine.

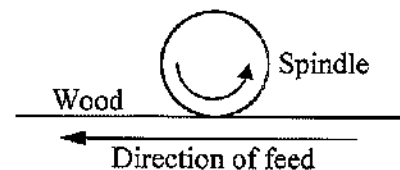
1. Hold the work securely.
2. On the disc sander, always sand on the downward-traveling side of the disc.
3. Do not sand stock that puts your fingers within 2" of the abrasive.
4. Apply moderate pressure to the stock against the abrasive and keep it moving. Excessive pressure can overheat and damage the abrasive.
5. Keep the stock moving to avoid overheating the abrasive material.
6. Be sure the work is held firmly against the table.
7. Use the disc/belt sanders only for sanding straight edges or outside (convex) curves .
8. Do not use the sanders for joinery, squaring stock, or other similar applications.
9. On the disc sander, make sure the disc is secured properly. Notify the instructor if the disc is loose or worn.
10. On the belt sander, make sure the belt is tracking properly. Notify the instructor if the belt is loose or worn.

OSCILLATING SPINDLE SANDER

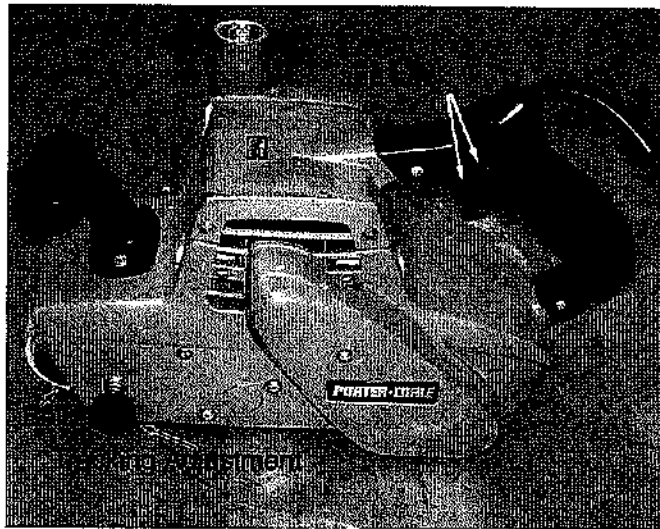


The spindle sander is used to sand inside (concave) curves. The spindle rotates while simultaneously oscillating up and down. This helps keep the abrasive from loading up and overheating, which would happen if the spindle did not move up and down. Various spindle sizes can be used on the machine to accommodate different work radii.

1. Always use the largest spindle possible for the radius being sanded. Using a smaller spindle makes it more difficult to get a smooth curve, takes longer, and results in excessive abrasive wear.
2. Always feed against or into the direction of the spindle rotation.
3. Avoid excessive pressure on the spindle. Too much pressure generates heat and will quickly damage the abrasive.
4. Use the throat plate that leaves the smallest opening around the spindle.
5. Hand-tighten the spindles only. Do not use wrenches to tighten spindles; this can result in the spindle becoming stuck in the collet.
6. Every component of the spindle sander has a home on the tool rack. Do not leave spindles, throat plates, or wrenches lying around; return them to their proper location in the tool rack.
7. Notify the instructor if the spindle abrasives are excessively worn.



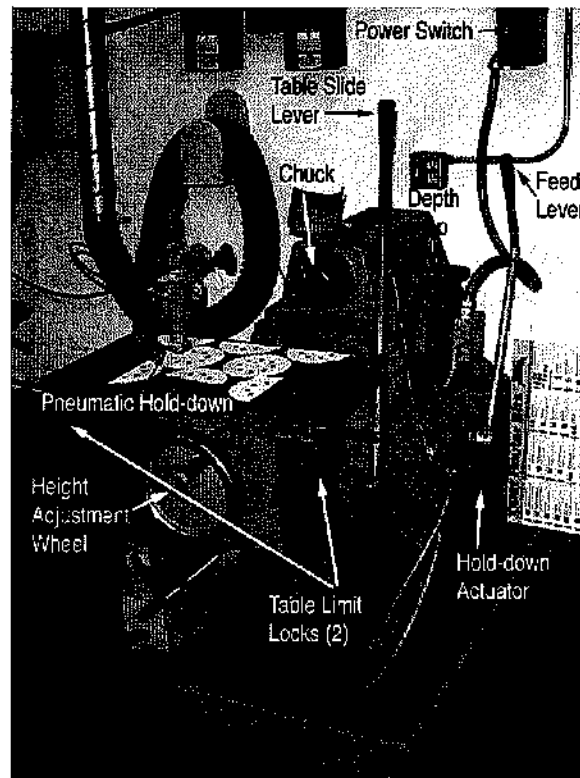
PORTABLE BELT SANDER



The belt sander features a continuous abrasive belt which runs over rollers at each end of a platen. An adjustment is provided for tracking the belt. When used properly, the belt sander excels at removing high spots and flattening surfaces. The size of the sander refers to the width and length of the belt; for example, a 3 x 24 belt sander has a 3" wide belt, 24" long.

1. Avoid excessive downward pressure on the belt sander. The weight of the machine should be the only pressure necessary.
2. Check to see that the belt is in good condition and that the proper grit paper is installed. 80- or 100-grit papers are good choices for general use.
3. Be sure the belt is tracking properly prior to use. The belt tracking can be adjusted only while the machine is running.
4. Allow the sander to reach full speed before placing it on the piece to be sanded.
5. Lift the sander off the work before stopping the motor and wait until the belt is completely stopped before placing the sander on the bench.
6. Do not use the belt sander to sand stock smaller than the platen.
7. Use the belt sander in a consistent pattern and always keep it moving.
8. Belts should always be installed with the arrow pointing in the direction of motor rotation.
9. The belt sander should be used at full speed at all times.
10. Always hold the piece to be sanded securely with a clamp or vise.
11. Before plugging in the machine, make sure the trigger lock is not engaged. Lay the machine on its side when inserting the plug.
12. Always use two hands when operating or carrying the machine.

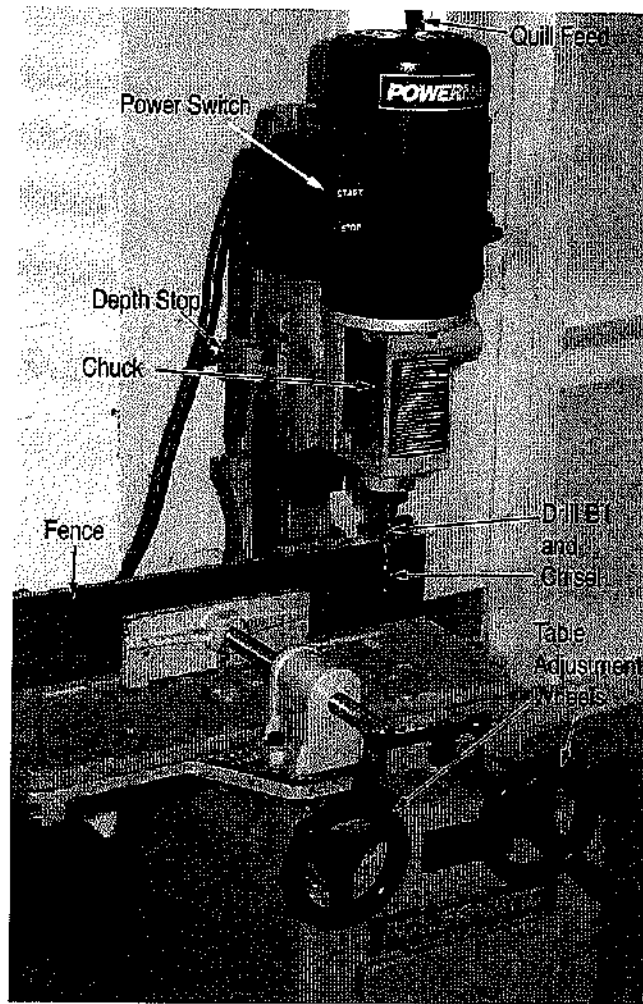
HORIZONTAL SLOT MORTISER



The slot mortiser is used for making slots or mortises. It is made up of a horizontally mounted motor/chuck assembly and an adjustable table. The table can be moved vertically and horizontally and the motor can be moved in and out relative to the base, making the mortiser very versatile for machining mortises.

1. The space between the pneumatic hold-down and the stock must not exceed $\frac{1}{4}$ " prior to the pneumatics being actuated. This will help avoid placing your fingers under the hold-down when it is operated.
2. Do not bottom out the shank of the bit in the chuck. When possible, insert the bit to its maximum depth, and then withdraw it about $\frac{1}{8}$ " before tightening the chuck.
3. Ensure the chuck is tightened and the chuck key is removed before turning on the machine.
4. Never leave the chuck key in the machine when you leave. If left in the chuck it can be thrown out from the chuck at a tremendous speed when the power is turned on.
5. Take light cuts, no more than $\frac{1}{8}$ " at a time.
6. Move the table at a reasonable speed when cutting; do not overfeed. Excessive speed will result in chattering, excessive wear on the cutter, and a poor cut. Listen for unusual noises and feel for excess vibration.

HOLLOW CHISEL MORTISER



The hollow chisel mortiser is uniquely capable of making a square hole. It does so by forcing a hollow, four-sided chisel into the wood, and removing the encircled waste with a special drill bit. Due to the forces involved, a lot of heat is generated. Setup of this machine is critical; improper positioning of the chisel and bit can ruin the tool or the workpiece.

1. You must be checked out on this machine before using it. Check with the instructor or aide for detailed instructions prior to using the hollow chisel mortiser.
2. Ensure the chisel and drill bit are sharp prior to installation.
3. The bit should be positioned about .020" below the chisel. This is approximately the thickness of a non-flexible 6" scale, or a dime. The spacing can be accomplished by installing the chisel with a .020" spacer between the chisel shoulder and the upper bushing. Then, install the drill bit with the bit tight against the mouth of the chisel; tighten the chuck. Remove the .020" spacer, slide the chisel up tight against the bushing, and

tighten with the appropriate wrench. Ensure the chisel is square to the fence when it is tightened.

4. When the machine is turned on, some squeaking is normal. It is caused by the bit rubbing against the chisel. If the noise is excessive, check your setup.
5. If using the depth stop or other stops, make sure lock bolts are securely tightened.
6. Ensure the work is securely clamped in place.
7. Always use a backer board to prevent damage to the bit and minimize tearout on through mortises.
8. Do not cut more than about 1/2" deep at a time. Deeper cuts may result in the chisel getting stuck in the workpiece. If a deeper cut is desired, make a 1/2" cut, move the work piece over and make an overlapping cut of greater depth. Continue this back-and-forth process until the desired depth is achieved.
9. Harder woods will require shallower cuts and greater care in drilling.
10. Do not apply excessive force. If excessive force is required, check your setup and/or have the instructor check it.

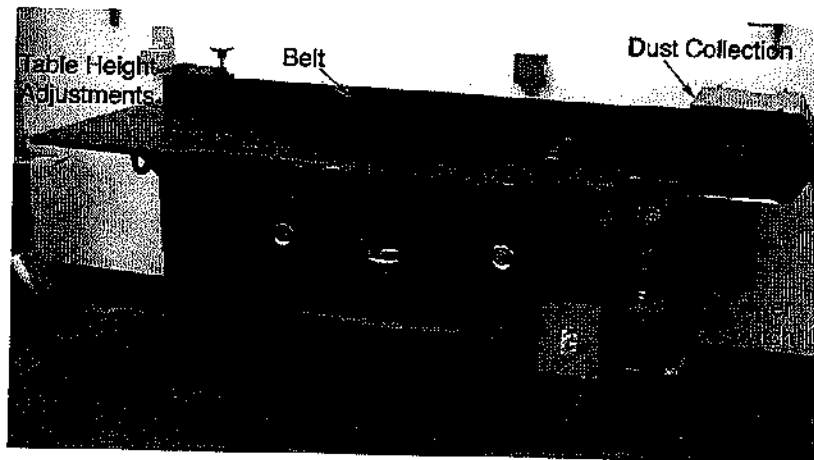
15" WIDE BELT SANDER



Wide belt sanders excel at flattening or smoothing lumber. A planer can be used for the same purpose, but planers can cause tearout on difficult grain. A wide belt sander will never cause tearout. Special precautions must be taken with the wide belt sander, however, as the machine is not as robust as a planer.

1. You must be checked out on this machine before using it. Check with the instructor or aide for detailed instructions prior to using the sander.
2. The sander is for finish smoothing only; it should not be used for removing more than about 1/8" of material. If you must remove more than that, use the planer first.
3. Follow the setup instructions on the machine every time. If anything is out of adjustment, ask the instructor or aide for assistance.
4. If the tracking is out of adjustment, the belt will not oscillate. It will move to one side of the machine and hit a limit switch, stopping the machine. If this happens, ask the instructor or aide for assistance in adjusting the tracking mechanism.
5. Always start with the coarsest grit available. Attempting to dimension lumber with finer grits will overwork and ruin the abrasive.
6. The depth of cut should be 1/16 of a turn of the table height adjuster at a time.
7. Always leave the machine with the coarsest grit installed.

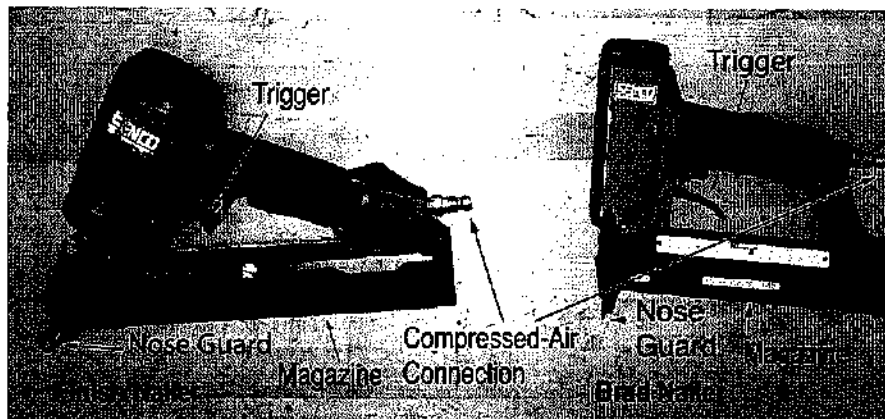
EDGE SANDER



The edge sander is basically a large belt sander laid on its side. It is extremely useful for sanding long edges like face frames and frame-and-panel doors. Care must be taken to use it correctly, as abuse can ruin the belt, destroy your work, and injure you. Like the disc sander, it is a relatively safe machine, but can result in painfully skinned fingers if the operator is not careful.

1. The edge sander is used for sanding edge grain only, **never** face or end grain.
2. Make adjustments only when the sander is at a complete stop.
3. Keep fingers away from the abrasive surface of the sander. Touching the moving abrasive will cause injury.
4. Maintain a 4" margin of safety at all times.
5. Move material against the direction of belt travel.
6. Avoid excessive pressure on the belt. Too much pressure generates heat and will quickly damage the belt or cause a kickback.
7. When sanding thin edges, lift the front end to sand the work at a diagonal. This will distribute the heat load across the belt instead of concentrating it along one small strip.
8. Hold the work being sanded with your hands close to the belt, but no closer than 4". Holding the work too far back gives you less control and can result in the leading edge digging into the belt, causing a kickback.
9. If the belt is loose, notify the instructor. A loose belt will allow a wave to develop at the leading edge of the part, resulting in deformation of the part and increased likelihood of tearing the belt.
10. Do not sand pieces shorter than 10" long without the permission of the instructor.
11. When possible, make a pencil mark on the edge to be sanded, and then sand to, or parallel to, the mark. This helps you avoid sanding too much on one or the other end.

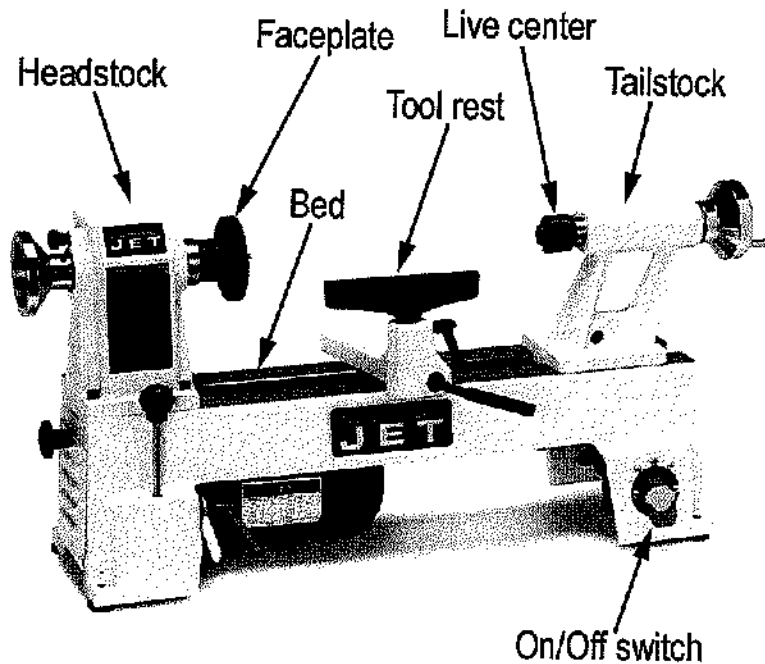
PNEUMATIC NAIL GUNS and STAPLERS



Pneumatic nail guns and staplers are compressed-air-operated devices used to drive nails or staples quickly and efficiently. They also increase accuracy over using a hammer, since the gun does not require pounding on the workpiece. Nail guns and staplers are made in a variety of sizes. In the Cerritos wood lab, finish nailers, brad nailers, and several varieties of staplers are available. Each shoots a specific diameter of nail or width of staple in a range of lengths. Operating a nail gun or stapler requires the user to press the gun against the workpiece, thereby depressing the nose guard. The gun is then actuated by pulling the trigger.

1. Safety glasses must be worn when operating a nail gun or stapler.
2. Always point the nail gun or stapler away from any person or body parts.
3. Except when ready to actuate the nail gun or stapler, keep your finger off the trigger.
4. Always disconnect the air supply when loading or unloading the magazine, or when making adjustments.
5. Ensure the nose guard is working properly. If there is any question, report the problem to the instructor.
6. When operating the nail gun or stapler, make sure your hand or other body parts are not in front of or to the side of the fastener's intended path. Nails especially have been known to hit hard objects, like knots or difficult grain, and shoot out the side of a workpiece.
7. Never drive a fastener close to an edge; the edge is likely to break off and the fastener may go flying.
8. Do not attempt to angle a nail or staple into the work surface more than about 10°; more than that may cause the fastener to ricochet off the work.
9. Pull the trigger lightly. A heavy pull may result in the gun driving two nails.

LATHE

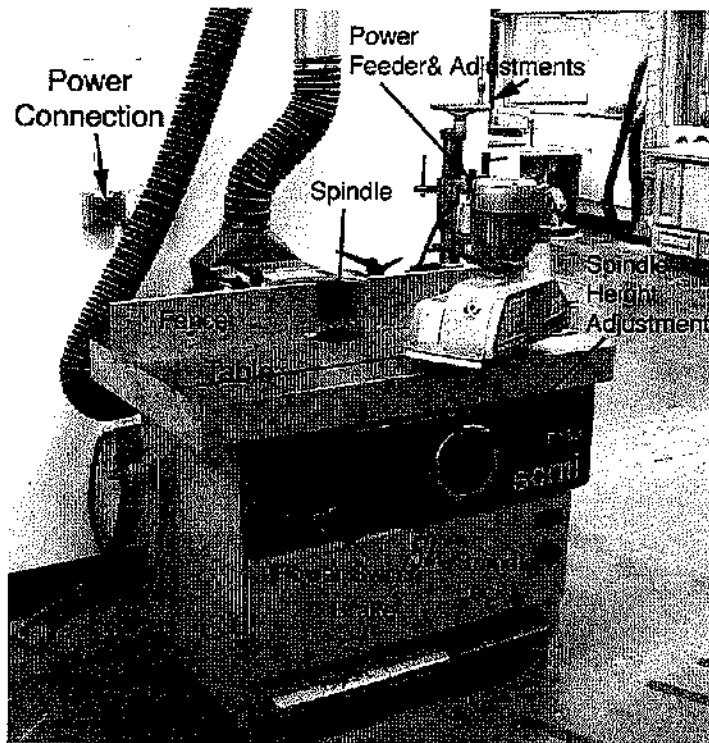


The lathe is used to make round or cylindrical shapes. Its primary components are the bed, headstock, tailstock, and tool rest. The work is rotated using a motor in the headstock; various tools are used at the tool rest to shape the work. The tailstock is used to support longer work at the opposite end of the bed. The lathe can be used to make a variety of turned objects, including table or chair legs, spindles, goblets, and bowls.

1. Always wear a face shield and eye protection when operating the lathe.
2. Remove or fasten any loose clothing and roll sleeves above your elbows. Tie long hair up and back.
3. Be sure belt covers are in place and closed.
4. Keep the floor where you are standing clear of chips to provide good footing.
5. Make sure the stock is free from checks, loose knots, or other defects.
6. Make sure the stock is correctly mounted on the lathe.
7. For faceplate turning, carefully select the screws used to secure the work. The screws must be properly sized for the design; they must not contact the cutting tools while you are working. Use a screw in every hole provided in the faceplate.
8. Make sure all screws are tight and check them occasionally.
9. Clamp the tool rest holder and tool rest firmly.
10. Make adjustments to the tool rest only when the lathe is at a complete stop.

11. Keep the tool rest as close as reasonably possible to the stock by frequently stopping the lathe and adjusting the tool rest.
12. Adjust the tool rest height so the cutting edge of the tool is at or just below the center of the work piece.
13. Before turning on the lathe, rotate the stock at least one full revolution by hand to make sure it clears the tool rest and all parts of the lathe.
14. Always hold the turning tool firmly against the tool rest.
15. Remove the tool rest when sanding, polishing, or finishing the workpiece.
16. Use a tailstock with a bearing center (live center) whenever possible.
17. Adjust the tailstock center so that the point is firmly embedded in the stock without impeding free rotation.
18. Run the lathe at slow speed when beginning any turning operation. When the stock is balanced and does not vibrate the speed may be increased.
19. If the lathe vibrates, it is running too fast or the stock is not properly secured. Stop the lathe and correct the problem.
20. The speed selector on a variable speed lathe must be operated only while the lathe is turning. A variable speed lathe does not have a belt which is moved between different sized pulleys to change the speed; it typically has a knob or handle on the front that can be rotated.
21. Stand to the side when starting the lathe.
22. Keep your hands away from the stock while it is rotating.
23. Keep your tools sharp since dull tools are harder to control and leave a rough surface on the work.
24. Stop the lathe to make measurements with calipers.
25. When polishing use a small rag folded in a pad, not wrapped around your finger.
26. Sand and polish only on the underside of the work.
27. A dust mask is recommended when sanding, especially with exotic or spalted woods.
28. Cut faceplate stock round on the band saw before mounting on the faceplate.
29. Allow glued stock or mounting blocks to cure at least 24 hours before using.
30. On faceplate turnings keep an accurate check on cutting depth to avoid striking the mounting screws.

SHAPER



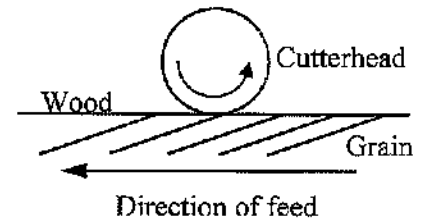
THIS IS A SPECIAL SETUP MACHINE; instructor approval is required for all operations.

The shaper is designed to quickly and efficiently produce moldings and other shapes. It is like a large, high-powered, table-mounted router. The spindle speed can be varied from 2000 to 10,000 rpm and is reversible. Cutter heads can be stacked to produce a variety of shapes.

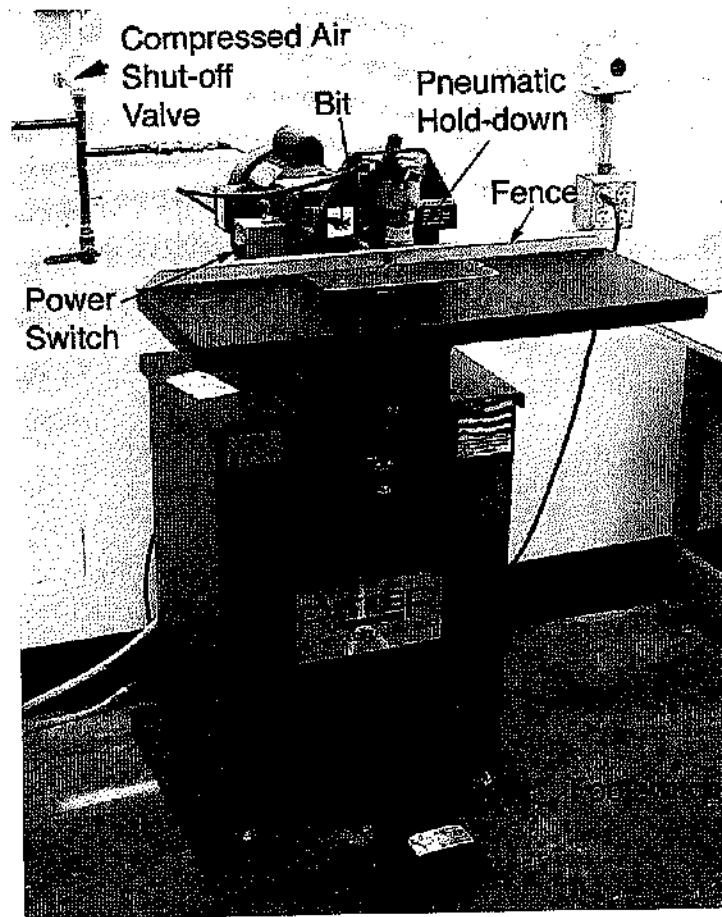
The shaper can, if all safety procedures are not carefully followed, become the most dangerous machine in the lab. Proper setup and use is essential. Always remember that a shaper is only as safe as its operator!

1. Do not turn on the shaper without direct permission from your instructor. Never run the shaper unless your instructor is present and/or has specifically authorized you to proceed.
2. Whenever making any adjustments, unplug the shaper.
3. Before starting the shaper be sure to check the following:
 - a. No foreign matter on the table
 - b. No spindle damage
 - c. No spindle nut damage
 - d. Spindle nut tight and double-nutted
 - e. Cutters sharp
 - f. Cutter(s) tight under the nut
 - g. Cutter carbide is in correctly
 - h. Spindle rotation correct

- i. Spindle turns freely with cutters in position and tightened. Manually turn the spindle with cutters and fence in position to ensure proper clearance alignment before plugging the shaper in.
 - j. Split fences are parallel or in plane
 - k. All adjustment locking mechanisms are tight
 - l. All guards are in position.
4. As you feed material into the cutter, stand towards the front of the machine; not on the side (where a kickback is most likely to occur).
5. Keep your working area clutter-free and clean at all times. Good housekeeping is essential for safety.
6. Use only stock that is sound and free of knots, splits, warps, and other defects.
7. Make a trial cut on scrap stock after setup approval from the instructor
8. Do not run stock shorter than 12" through the shaper without an approved hold-down jig.
9. Never back stock out when using the shaper.
10. Never engage the shaper's spindle lock when operating the machine.
11. Verify the spindle speed selection with your instructor.
12. When doing spindle or rub collar spindle work, always use a starting pin or an extended template jig.
13. Use a holding device or jig when doing rub collar or spindle shaping.
14. All setups, jigs and guards must be double-checked, first by the student and then by the instructor.
15. Do not leave the shaper until it is completely stopped.
16. Use ring guards, hold-down devices, featherboards and other guards whenever possible.
17. Always feed work into (or against) the rotation of the cutterhead.
18. To avoid tearout, rotation of the cutter should be consistent with the direction of the grain whenever possible.
19. Whenever possible, position cutters under the stock and not on top.
20. Whenever possible use a power feeder for safer and smoother operation.
21. Keep the area clear of all people other than the operator and the instructor when using the shaper.
22. Never run stock between the fence and the cutter(s).



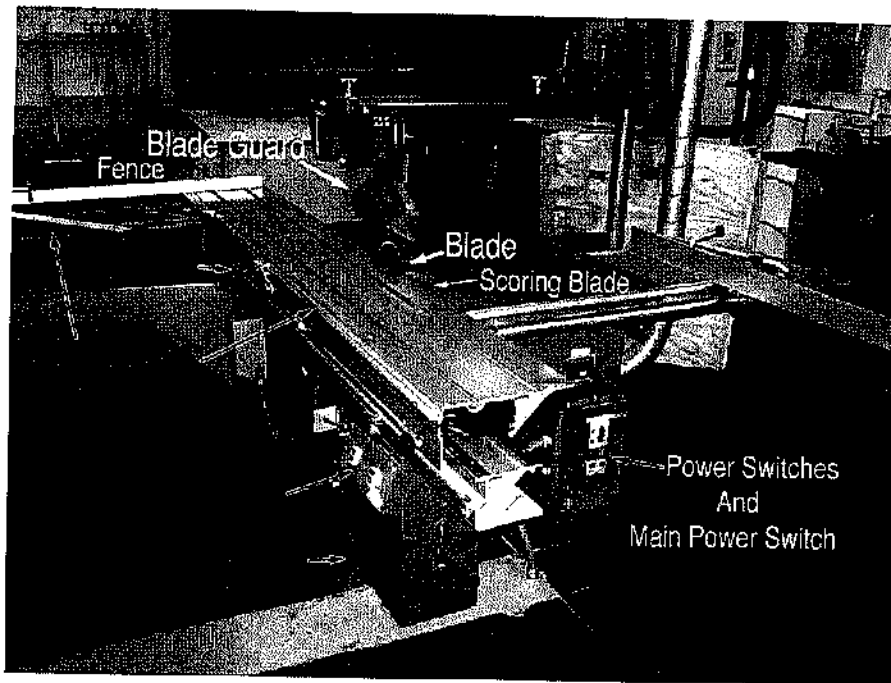
HORIZONTAL BORING MACHINE



The horizontal boring machine is used to drill holes for dowel joints. It is easier to use than the drill press since the work is typically held flat on its largest side and clamped with an integral cam or pneumatic ram.

1. Never use your finger to brush away chips and dust from the reference line. Use a brush or simply blow it off.
2. Keep your fingers clear of the hold-down device. Failure to do so can result in **crushing** or pinching. This is how most accidents on this machine occur.
3. Make sure your fingers are clear of the bit before operating the foot lever.
4. On the manual feed machine, feed the bit at a reasonable speed.
5. Make sure the bit is sharp. If it is dull, notify the instructor.
6. Rushing to complete many dowel holes can make you over-confident and injury-prone.

SLIDING TABLE SAW

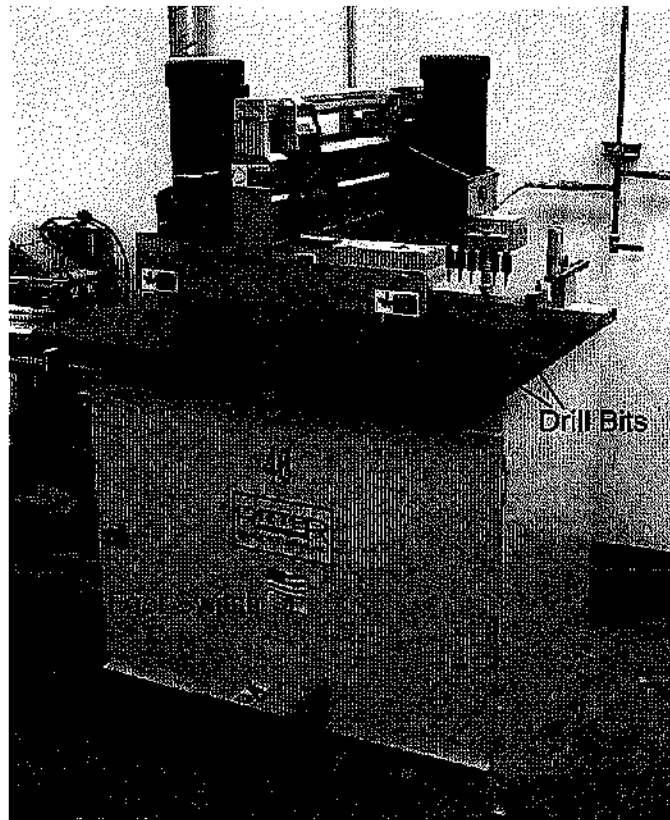


The sliding table saw is different from a typical table saw in that the portion of the table to the left of the blade slides back and forth. This sliding portion includes a crosscut fence and support structure for holding large panels, allowing sheet goods and other large pieces to be ripped or crosscut easily. The saw incorporates a scoring blade in front of the main blade to eliminate tearout or chipping on the underside of the cut. This machine is not used to rip solid lumber!

1. Two people are required to operate the saw, one to control the panel being cut and one to support the offcut.
2. The minimum safe distance from the blade to your hands is 6".
3. For crosscutting, the minimum width is 4". The material to the left of the blade (the part you are holding), should be at least 24" long. The maximum length is limited by the obstructions around the saw. Ensure the stock will clear any obstructions prior to cutting long stock.
4. For ripping, the length should be 90-97". The material to the left of the blade (the part you are holding), should be at least 18" wide. Material longer than 97" or shorter than 90" must be cut on a standard table saw.
5. Make sure the sliding table is all the way back and locked before operating the saw.
6. When crosscutting with the rip fence as a length guide, make sure the back end of the rip fence lines up with the back edge of the fence support casting. If the fence is farther back, the material being cut may get trapped between the blade and fence and cause a kickback.
7. For $\frac{3}{4}$ " stock, raise the main blade about $1\frac{1}{2}$ ". Lower the guard over the blade.

8. The scoring blade, when necessary, should be up about 3/32". Do not use the scoring blade for solid lumber.
9. Two people are required to load the workpiece and adjust the support arm. The larger portion of the piece should be on the sliding table side.
10. Adjust and lock the butt stop so that it comfortably wedges the body between the stop and the part, with the workpiece against the front fence.
11. The helper may assist with supporting the sheet and catching the outfall only *after* the cut is made and the piece leaves the blade. Remove small pieces only with a stick.
12. After the cut, the helper, at the direction of the operator, may shut off the motor(s).

32mm LINE BORING MACHINE



THIS IS A SPECIAL SETUP MACHINE; instructor approval is required for all operations.

The line boring machine is used to drill multiple holes simultaneously for European 32mm frameless cabinetry. It accurately drills two rows of 5mm diameter holes on 32mm centers, which is a standard specification for frameless cabinets.

1. Two people are required to operate the line boring machine. The second person supports the material and assists in the setup.
2. Make all possible adjustments with the power disconnected.
3. Keep hands and fingers clear of the drills.
4. Put both hands flat on the table and push the material against the fence before operating the machine.
5. The operator must communicate with the helper by stating "Clear" before operating the machine.

GLOSSARY

Note that the following terms are defined in the context of the woodworking lab and may be different than definitions found elsewhere.

Backer board	a piece of wood or sheet good placed on the back side of a workpiece in order to provide support of minimize tearout
Bevel	an angled edge or end, where the complete surface of the edge or end is angled (different from a chamfer)
Chamfer	an angled surface on the edge or end of a board that spans from the edge or end to the face (different from a bevel)
Chuck	a device (usually on a drill or drill press) used to clamp a bit in place, capable of gripping a large range of bit or shank sizes and often utilizing a key to operate
Collet	a device (usually on a router) that clamps a bit in place, sized for a specific bit or shank diameter, e.g. ¼" or ½" and utilizing wrenches to operate
Crosscut	to cut across the grain
Cutterhead	a cylindrical block with knives or cutters positioned around its perimeter
Dado	a groove running across the grain
Dado head	a set of blades stacked side-by-side for use on the table saw, used for making dados or grooves
Edge	the smaller long-grain pair of surfaces on a board that exhibit long grain
End	the pair of surfaces of a board that exhibits end grain
End grain	the cut fibers at the end of a board, which look like the open ends of soda straws
Face	the larger pair of long-grain surfaces of a board
Fence	a beam or board used to guide a workpiece past a blade or bit
Green	a term used to describe lumber that has not been dried
Joint	to flatten and smooth the face or edge of a board using the jointer (see the Jointer section in this manual)

Long grain	the wood fibers that are cut along the length of fibers (as seen on face and edge grain)
Lumber	a solid wood board
Grain	the cylindrical fibers (like soda straws) which make up lumber, oriented along the vertical axis of a tree
Kerf	the slot created by a blade or bit
Kickback	a dangerous situation in which a workpiece is forcibly ejected from a machine, often at tremendous speed
Margin of Safety	the minimum distance the operator's hands, fingers, or other body parts should be from the cutter, blade, or bit
MDF	sheet goods made of fine particles glued together to make a smooth-faced, stable product
Melamine	particle board with a thin layer of plastic on one or both faces, typically used for cabinet construction
Mortise	a hole or slot with at least two flat sides into which another part is inserted (typically a tenon)
Offcut	the part of a piece being cut that is on the far side of a blade and is therefore not typically held or controlled by the operator
Particle board	sheet goods made from medium-sized particles glued together to make a moderately smooth-faced, stable product (coarser than MDF)
Plane	to flatten and smooth the face or edge of a board using the planer (see the planer section in this manual)
Plane	a hand tool used to smooth and flatten a surface
Platen	a flat reference surface, typically the surface on which a belt-sander belt runs
Pushstick	a safety device used in an upright orientation to guide a workpiece past a cutter, blade, or bit, thereby keeping the operator's hands at a safe distance
Pushblock	a safety device with a broad base and handle used to guide a workpiece past a cutter, blade, or bit, thereby keeping the operator's hands at a safe distance
Rabbet	a stepped edge on the side of a board

Resaw	to cut a piece of wood in order to make it thinner
Rough	a term used to describe lumber that has not been surfaced (smoothed) on its faces or edges
Rip	to cut with the grain
Sheet good	man-made materials, like plywood, melamine, or MDF
Sled	a carrier consisting of a base and fence for controlling a workpiece during a cutting operation
Special setup	a machine operation that exposes the operator to greater than average risk; a special setup requires instructor or aide approval prior to operating the machine
Stock	the piece being worked
Tearout	torn or damaged fibers, typically caused by a blade or bit exiting the workpiece
Track	on a belt sander, to adjust the belt to run true on the machine and not off to one side
Trigger lock	the button on some hand-held power tools that locks the trigger in the ON position
V-block	a block with a V-shaped channel along its length
Warp	a lumber defect describing stock that is not flat; the four types of warp are cup, bow, crook, and twist

WOOD LAB SAFETY EXAM

GENERAL LAB SAFETY. Multiple Choice

1. Eye protection must be used to:
 - a. improve your vision.
 - b. prevent eyestrain.
 - c. prevent flying particles, sawdust, foreign objects or corrosive substances from entering your eyes.
 - d. magnify small objects.
2. Floors, aisles, and passageways must be kept clear of wood, tools, material, oil or grease spots, and other objects:
 - a. because they may cause someone to slip or trip and fall.
 - b. unless you are in a hurry.
 - c. because they are unsightly.
 - d. because they cause more work for the custodians.
3. Rags wet with linseed oil, solvents, or finishing products must always be:
 - a. folded neatly and placed on a shelf.
 - b. discarded in an approved metal waste container with a lid.
 - c. wadded up and thrown in the trash.
 - d. left on the floor.
4. Loose clothing, jewelry and long hair must be securely fastened or removed:
 - a. before operating any machine.
 - b. before the end of class.
 - c. only when you are assisting the instructor.
 - d. only when it will not affect your fashion look.
5. Carry long objects:
 - a. like a spear.
 - b. with the back end high.
 - c. with the front end high.
 - d. with one hand.
6. You must **not** talk to, or distract the attention of, a person operating a machine because:
 - a. conversation slows down the flow of work.
 - b. it is not polite.
 - c. the distracted operator or others may be injured.
 - d. it is too noisy for conversation in the lab.

7. All accidents and injuries, no matter how slight, must be:
 - a. ignored.
 - b. reported to health services immediately.
 - c. reported to the instructor immediately.
 - d. None of the above.
8. Wearing gloves when operating machinery is:
 - a. considered a safe practice on a cold day.
 - b. safe, provided the gloves are not made of leather.
 - c. permissible if the machine is dirty.
 - d. not a safe practice because the gloves may get caught in moving parts and pull your hand into the machine.
9. All **special setups**, including removal of any safety equipment, must be:
 - a. checked by another student.
 - b. approved by the instructor or instructional aide.
 - c. need not be approved if you know what you are doing.
 - d. done quickly while no one is watching.
10. When sweeping scraps from a machine or workbench:
 - a. use your hands to show how tough you are.
 - b. use a piece of wood or a brush since there may be sharp or jagged particles among the scraps.
 - c. use compressed air.
 - d. leave the scraps to show how hard you are working.
11. When lifting a heavy object you should:
 - a. get help.
 - b. keep your back straight and lift with your legs.
 - c. use a lever, dolly, jack, forklift, wheels, or rollers.
 - d. do one or more of the above, depending on the situation.
12. When you enter a lab or class session other than your own,
 - a. you may start working immediately.
 - b. you must get permission to work from every instructor and instructional aide prior to working.
 - c. you must report to the instructor and aide in the room in which you are working.
 - d. you can't work; this is not allowed.
13. The following are causes of accidents in the wood lab:
 - a. Rushing or hurrying
 - b. Overconfidence
 - c. Fatigue
 - d. Ignorance
 - e. All of the above

14. Sharp edge tools are
 - a. a pipe dream.
 - b. scary.
 - c. more dangerous than dull edge tools.
 - d. safer to use than dull edge tools.
15. Compressed air may be used to dust yourself off under the following circumstances:
 - a. never.
 - b. on Mondays and Wednesdays only.
 - c. if no one is looking.
 - d. if you're wearing pants.

TABLE SAW. Multiple Choice

16. All students must be checked out on the table saw:
 - a. at the beginning of each semester.
 - b. only if you are in the Intro to Woodworking class.
 - c. only if you haven't used it before.
 - d. every time you use it.
17. The splitter must be in place on the saw except:
 - a. when you are cutting large stock.
 - b. when ripping stock between 2" and 5" wide.
 - c. when the instructor has authorized its removal for **special setups**.
 - d. for short pieces which tend to be caught under the guard.
18. Adjustments are to be made while:
 - a. the saw is shut off and the blade is coasting.
 - b. the saw is running, providing you have the instructor's permission.
 - c. the blade is lowered below the table.
 - d. the blade is at a complete stop and the main power switch is off.
19. A pushstick must be used when you are:
 - a. ripping narrow (less than 6" wide) pieces.
 - b. adjusting the saw.
 - c. turning on the saw.
 - d. crosscutting with a sled.
20. The shortest piece you may rip cut without special permission is:
 - a. 6".
 - b. 8".
 - c. 10".
 - d. 12".

21. Freehand cutting without the aid of the fence or crosscut guide is:
- permitted when stock is too large for the table.
 - okay if permission is received from the instructor.
 - never permitted because of the danger.
 - permitted if the operator has help.
22. You must **never** back the wood away from the blade:
- without first rolling up your sleeves.
 - while the saw is running, due to the danger of a kickback.
 - without giving a signal.
 - except when sawdust or scraps are on the table.
23. If you are in the middle of a cut and the workpiece gets stuck:
- back the piece away from the blade and then fix the problem.
 - reach down and turn off the saw, then back the piece out.
 - force it.
 - call for someone nearby to turn off the saw.
24. Reaching over the saw blade or passing wood over the saw blade when it is running:
- speeds up the operation.
 - is dangerous and forbidden.
 - shows you are handy with machines.
 - lets you feed wood into the saw faster.
25. When "tailing off" the helper must remember to:
- pick up scraps off the floor as the operator starts the cut.
 - hold the stock and pull it gently away from the saw once the operator starts the cut.
 - support the stock from underneath, but not grasp it.
 - pull the stock faster if the operator is too slow.
26. When ripping stock, you should push the piece that is against the fence clear of the saw blade and onto the outfeed table. Failure to do so may result in:
- damage to the blade.
 - pinching the board.
 - a kickback.
 - None of the above.
27. At the end of a rip cut, your left hand should be:
- on your head.
 - holding on to the offcut.
 - resting on the table.
 - off the table.

JOINTER. True or False

- 28. Wood less than $\frac{1}{4}$ " thickness must not be jointed on its face.
- 29. End grain may not be jointed on the jointer.
- 30. A pushstick is necessary when edge jointing stock lower than the height of the fence.
- 31. The depth of cut should be $\frac{1}{32}$ " for most jointer cuts.
- 32. The maximum depth of cut is $\frac{1}{16}$ ".
- 33. Operations involving rabbeting, beveling, chamfering, tapering, "stop cuts" or "drop cuts" need not be approved by the instructor.
- 34. The concave or most stable side of the stock should be toward the table.
- 35. You must push the stock past the knives so the guard can close and cover the knives before picking up the stock.

PLANER. True or False

- 36. It is okay to remove $\frac{1}{4}$ " of stock on each pass.
- 37. The length of the stock must be longer than the distance between the in-feed and out-feed rollers.
- 38. After the in-feed rollers grip the stock, it is safe to look directly into the planer.
- 39. The thickness setting should be set for the thickest part of the board.
- 40. Wood may not be safely planed across the grain.
- 41. It is not possible to get a kickback on the planer.
- 42. The maximum amount of material to be removed in one pass is $\frac{1}{32}$ ".
- 43. It is okay to start feeding stock as the planer comes up to speed.

RADIAL ARM SAW. Multiple Choice

- 44. When crosscutting on the radial arm saw, the operator should:
 - a. control the rate at which the blade passes through the stock.
 - b. let the blade feed itself through the stock at its own rate.
 - c. pull the blade through the stock as quickly as possible.
 - d. talk to a fellow student.
- 45. When crosscutting on the radial arm saw the blade should be returned:
 - a. after the stock has been cleared away.
 - b. slowly, but without moving the stock that has been cut.
 - c. as quickly as possible.
 - d. by letting go of the handle so the auto return can pull the saw back.
- 46. When crosscutting on the radial arm saw the stock should:
 - a. be firmly held against the fence.
 - b. be in contact with the fence at the point of cut.
 - c. not be allowed to pinch the blade.
 - d. All of the above.

47. If a thick piece of lumber, when against the fence, touches the blade of the saw,
- it can't be cut on this saw.
 - turn the stock over.
 - this is a special setup; use a spacer block between the fence and the stock and check with the instructor prior to making the cut.
 - ignore it.

MITER SAW. Multiple Choice

48. The margin of safety for the miter saw is:
- 2 inches.
 - 3 inches.
 - 4 inches.
 - 6 inches.
49. The miter saw is used for:
- cutting rough lumber to final length.
 - cutting surfaced lumber to final length.
 - cutting rough lumber to rough length.
 - ripping lumber to width.
50. After completing the cut,
- jump for joy.
 - raise the blade slowly without disturbing the workpiece.
 - raise the blade quickly and allow it to stop.
 - allow the blade to stop before raising it.
51. When using a stop to cut a workpiece to a set length,
- it doesn't matter how the workpiece is positioned relative to the stop.
 - the offcut must be held in place by the operator
 - the piece between the stop and blade must be held in place by the operator.
 - stops are for wimps; never use them.

BAND SAW. Multiple Choice

52. Adjust the upper guide and guard:
- when the power is shut off but the saw is coasting.
 - within $\frac{3}{4}$ " of the stock while cutting if the blade is not tracking properly.
 - to the exact thickness of the stock before the power is turned on.
 - to about $\frac{1}{4}$ " above the stock when the machine is at a full stop.

53. Cuts made on the band saw should be planned so that:
- small curves can be cut by twisting the blade.
 - relief cuts are used to minimize back-out on long cuts and small radii.
 - the final cut is made while the saw is coasting to a stop.
 - All of the above.
54. Stock with a round or otherwise irregular base:
- may be cut provided that the operator has adjusted the tilting table.
 - requires a special band saw.
 - may be cut only with a **special setup** cutting jig such as a v-block.
 - should be cut fast while the instructor is not looking.
55. If it becomes necessary to back out of a long cut, you should:
- yell for help.
 - turn off the motor. Bring the blade to a complete stop and then back the stock out carefully.
 - try to turn the stock on the blade.
 - rapidly back the stock out.
56. When you are finished using the band saw you should:
- turn it off and walk away; the blade will stop eventually on its own.
 - turn it off and step on the brake with all your weight to stop the saw.
 - turn it off and gently apply the brake until the blade is stopped.
 - take a short break.
57. Should the band saw blade break while the machine is in motion:
- run for your life.
 - shut off the power if possible, keeping yourself and others clear. Notify your instructor.
 - back your stock away from the blade immediately to avoid damage to the stock.
 - continue cutting until the blade comes to a stop.

DRILL PRESS. Multiple Choice

58. Small work should be held on the drill press:
- in your hands.
 - in a vise or firmly clamped.
 - by an assistant.
 - never; it should be cut with a hand-held drill.
59. When operating the drill press you should:
- keep your head away from your work, so an eye shield is not necessary.
 - always use eye protection.
 - wear an eye shield only if aluminum is being drilled.
 - All of the above.

- 60. Remove the chuck key from the chuck to prevent:
 - a. the chuck from being damaged.
 - b. breaking the chuck key.
 - c. the chuck key from being thrown out at a tremendous speed.
 - d. the chuck from becoming unbalanced.
- 61. If a drill bit catches in your work causing the work to revolve:
 - a. exert more feed pressure.
 - b. stop the machine immediately if possible without endangering yourself. Otherwise, move away from the machine.
 - c. grab the work piece with your hand.
 - d. decrease feed pressure.
- 62. Large bits should be run at:
 - a. Higher speeds.
 - b. Lower speeds.
 - c. It doesn't matter.
 - d. None of the above.

HAND-HELD ROUTER. True or False

- 63. The router should be unplugged when installing or changing bits.
- 64. The bit should be bottomed out in the collet.
- 65. The router should be moved in a direction such that the cut is made against the cutter rotation.
- 66. It is a good idea to make several light cuts rather than one heavy cut.
- 67. When using a hand-held router, the workpiece should be clamped or otherwise held in place.

ROUTER TABLE. Multiple Choice

- 68. The workpiece should be moved in a direction:
 - a. that is oriented closest to due north.
 - b. away from the operator.
 - c. such that the cut is made against the cutter rotation.
 - d. such that the cut is made with the cutter rotation.
- 69. The throat plate attachment screws should be tightened:
 - a. as tightly as the router collet.
 - b. with finger pressure only.
 - c. evenly, to avoid bending the throat plate or other parts.
 - d. both b and c.

70. When routing small or narrow pieces,
- use a push stick.
 - use a backer board.
 - use a fence with a small or no opening.
 - any or all of the above, depending on the circumstances.

DISC and COMBINATION SANDER. Multiple Choice

71. When using the disk sander, you should hold your work against the:
- rim.
 - center.
 - upward motion side.
 - downward motion side.
72. You should feed stock into the abrasive material of the sander:
- as fast as possible.
 - with light to moderate pressure.
 - with heavy pressure.
 - only with your right hand.

OSCILLATING SPINDLE SANDER. True or False

73. Use the biggest spindle possible for the radius being sanded.
74. Feed stock in the same direction as the spindle rotation.
75. Secure spindles tightly with wrenches.

PORTABLE BELT SANDER. True or False

76. The operator must apply downward pressure to the belt sander when sanding.
77. It is not necessary to check the tracking before using the sander.
78. The trigger should be locked and the sander should be on its side before plugging the unit in.
79. Always use two hands to control the belt sander.
80. The direction of the arrow on the belt is of no consequence.

HORIZONTAL SLOT MORTISER. True or False

81. Cutting depth should be limited to 1/8" per pass.
82. The space between the pneumatic hold down and the stock should be no more than 1/4" prior to actuation.
83. The table should be moved as fast as possible.

HOLLOW CHISEL MORTISER. Multiple Choice

84. The drill bit should be positioned:
- a. in no particular location.
 - b. tight against the chisel.
 - c. about the thickness of a dime below the chisel.
 - d. about 1/8" below the chisel.
85. The maximum depth of cut in a single plunge is:
- a. 1/8".
 - b. 1/4".
 - c. 1/2".
 - d. 1".
86. If excessive force is required to make a cut:
- a. check your setup.
 - b. quit and go home.
 - c. force the tool by pushing harder.
 - d. use your other hand.

15" WIDE BELT SANDER. Multiple Choice

87. The wide belt sander is used for:
- a. removing large amounts of material.
 - b. fixing your mistakes.
 - c. finish smoothing only.
 - d. sanding melamine.
88. If the sander is turned on and the belt moves to one side and stops:
- a. it is working correctly.
 - b. turn it off and walk away.
 - c. reposition the belt and try again.
 - d. ask the aide for assistance.
89. The maximum depth of cut should be:
- a. 1/16 turn of the height adjuster.
 - b. 1/8 turn of the height adjuster.
 - c. 1/4 turn of the height adjuster.
 - d. 1/2 turn of the height adjuster.

EDGE SANDER. True or False

90. Sanding pieces shorter than 10" requires instructor permission.
91. It is not possible to get a kickback on the edge sander.

- 92. The table height may be adjusted with the machine running.
- 93. Touching the moving abrasive belt will not cause injury.

PNEUMATIC NAIL GUNS and STAPLERS. Multiple Choice

- 94. When using a nail gun or stapler:
 - a. safety glasses are optional.
 - b. safety glasses must always be worn.
 - c. close your eyes tight and hold on for your life.
 - d. safety glasses should be dark sunglasses to look cool.
- 95. When using a nail gun or stapler, your free hand should be:
 - a. holding the workpiece wherever it gives you the most control.
 - b. holding air hose to keep it out of the path of the fastener.
 - c. holding the workpiece such that the fastener can't deflect and hit your hand.
 - d. behind your back.
- 96. Driving a fastener close to an edge:
 - a. is not a problem.
 - b. is okay if no one is looking.
 - c. is okay if the fastener is angled toward the workpiece.
 - d. is not permitted; the edge might break and the fastener fly free.

LATHE. Multiple Choice

- 97. While operating the lathe the operator should:
 - a. wear eye protection (safety glasses).
 - b. wear a face shield.
 - c. fasten any loose clothing.
 - d. All of the above.
- 98. When adjusting the tool rest, you should:
 - a. stop the lathe.
 - b. make sure it is firmly clamped to the tool rest holder and to the lathe bed.
 - c. turn the stock by hand at least one full rotation to check clearances.
 - d. All of the above.
- 99. When cutting on the lathe you should:
 - a. hold the tool above the tool rest to show your strength.
 - b. hold the tool firmly against the tool rest, which is placed close to the stock.
 - c. place the tool rest 2" away from the stock.
 - d. talk to your classmate.

100. When using the tailstock center it should be:
- barely touching the stock.
 - embedded in the stock firmly but allowing the stock to rotate freely.
 - forced in until the wood starts to split.
 - None of the above.
101. When the lathe vibrates:
- it may be running too fast.
 - the stock may be loose.
 - you must stop the lathe and correct the problem.
 - All of the above.
102. When sanding or polishing **do not**:
- wrap the rag or sandpaper around your fingers.
 - remove the tool rest.
 - work on the underside of the stock.
 - wear a dust mask.
103. Work mounted on the lathe should be initially turned at slow speed until it is well balanced; if this is not done, the:
- wood will take on a poor finish.
 - tools will dull quickly.
 - stock may vibrate and fly off the lathe.
 - None of the above.
104. Dull lathe tools are dangerous to use because they:
- are hard to control.
 - stick to the tool rest.
 - create static electricity, which causes sparks.
 - All of the above.

SHAPER. True or False

105. The shaper may never be operated without the direct permission and supervision of the instructor.
106. Adjustments may be made with power off but the machine plugged in.
107. It is okay to run stock with splits, knots, or warps.
108. It is not necessary to make a trial cut.
109. Never run stock between the fence and the cutter.
110. Never step on the spindle lock when the shaper is running.
111. The operator should double check all setups, guards and jigs and then seek the instructor's permission before operating this machine.

HORIZONTAL BORING MACHINE. True or False

- 112. Use your index finger to clear dust and chips away from the reference line.
- 113. Make sure hands are clear of the cam lever, air ram or other hold down.
- 114. Double check the position of your hands before engaging the foot feed.

SLIDING TABLE SAW. True or False

- 115. It is safe for one person to operate the sliding table saw.
- 116. The scoring blade should protrude $\frac{3}{4}$ " when in use.
- 117. The sliding table should be all the way back and locked before operating the saw.

32mm LINE BORING MACHINE. True or False

- 118. A person may operate this machine without assistance.
- 119. Make sure hands are clear of drills before operating the machine.

WOOD LAB SAFETY EXAM ANSWER SHEET

Name _____

1.	_____	31.	_____	61.	_____	91.	_____
2.	_____	32.	_____	62.	_____	92.	_____
3.	_____	33.	_____	63.	_____	93.	_____
4.	_____	34.	_____	64.	_____	94.	_____
5.	_____	35.	_____	65.	_____	95.	_____
6.	_____	36.	_____	66.	_____	96.	_____
7.	_____	37.	_____	67.	_____	97.	_____
8.	_____	38.	_____	68.	_____	98.	_____
9.	_____	39.	_____	69.	_____	99.	_____
10.	_____	40.	_____	70.	_____	100.	_____
11.	_____	41.	_____	71.	_____	101.	_____
12.	_____	42.	_____	72.	_____	102.	_____
13.	_____	43.	_____	73.	_____	103.	_____
14.	_____	44.	_____	74.	_____	104.	_____
15.	_____	45.	_____	75.	_____	105.	_____
16.	_____	46.	_____	76.	_____	106.	_____
17.	_____	47.	_____	77.	_____	107.	_____
18.	_____	48.	_____	78.	_____	108.	_____
19.	_____	49.	_____	79.	_____	109.	_____
20.	_____	50.	_____	80.	_____	110.	_____
21.	_____	51.	_____	81.	_____	111.	_____
22.	_____	52.	_____	82.	_____	112.	_____
23.	_____	53.	_____	83.	_____	113.	_____
24.	_____	54.	_____	84.	_____	114.	_____
25.	_____	55.	_____	85.	_____	115.	_____
26.	_____	56.	_____	86.	_____	116.	_____
27.	_____	57.	_____	87.	_____	117.	_____
28.	_____	58.	_____	88.	_____	118.	_____
29.	_____	59.	_____	89.	_____	119.	_____
30.	_____	60.	_____	90.	_____		

I have read and fully understand the Woodworking Safety Manual.

Signed: _____

Date: _____