Lesson 2: Tools and Safety in the Wood Working shop

Introduction

In **Woodworking,** tools are the craftsman's greatest allies. However, improper use of negligence can result in accidents and poor-quality work. To ensure both efficiency and safety, it is essential to understand the common woodworking tools, workshop safety practices, and the importance of proper maintenance and storage.

Hand tools and Power tools

Introduction:

Hand tools are non-powered instruments used for construction. Unlike power tools, they are not driven by electrical, fuel, or pneumatic (air) power. They are driven by muscle and controlled by the hand. Proper use of these tools will help prevent accidents.

Hand Tools

A. Hand tool preparation

1. Make sure tool handles are not split and are tightly fastened. Many injuries occur when the handles of tools come off (hammer head flies off, file tang punctures, saw handle separates).

2. To prevent slipping, make sure your hands are dry and not oily when using tools.

3. Put tools back in their proper place. Do not leave hand tools in the work area or sticking out from workbenches. Otherwise, students may be injured by brushing against the teeth or sharp edges.

B. Hand tool selection

1. Use the proper size screwdriver to fit the screw. Improperly sized tools slip out of the screw and may puncture you or your material.

2. Only use a tool for what it is made for. Wrenches are not for hammering, chisels are not for prying, screwdrivers are not for chiseling, files are not for hitting or prying, and so on.

C. Hand tool use

1. Most accidents with hand tools will be to the non-dominant hand (the hand not holding the tool), so be aware of hand positioning.

    - Screwdrivers: Never hold the work in the palm of your hand while using a screwdriver. As a result of doing so, you may slip off and inflict a puncture wound. If the work is unstable, secure it in a vise, clamp, or workbench.

    - Chisels: Keep your hands clear of the blade. The wood should be secure enough for you not to have to hold it. Use a clamp or vice if necessary. Chisels require two hands to use safely (even if one hand is striking with a mallet).

    - Chisels: Chisel strokes should always go away from the body. Place your dominant hand on the handle. With the other hand, guide/stabilize the blade. Hold the tool firmly to prevent slipping.

    - Hand saws: Start a hand saw cut with the dominant hand on the saw handle and position the saw blade against the thumb onto the mark. Steadily draw the blade backwards. When the teeth bite, push the saw downward (or upstroke, depending on the blade) to complete the first cut. Then, release pressure, pull backward, and push downward again for the next cut. Continue this process until the wood is completely cut.

    - Hand planers: Work is to be securely fastened in a clamp or vice before planning. Always plane away from you and never put your non-dominant hand on the work being planned.

2. When pounding or cutting, be sure that the chips fly away from you and others.

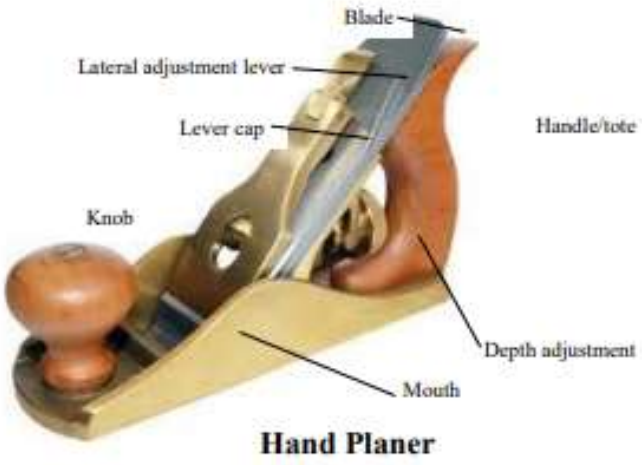
3. Never throw tools to or at other students.

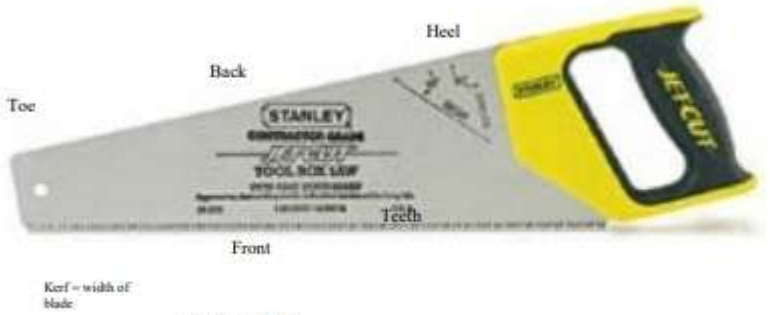
4. Never hammer on a vise or vise jaws.

5. When handling sharp tools, always point the sharp end down. Do not carry sharp tools in your pocket, do not let sharp tools hang off the workbench, and when handing a sharp tool to someone else, always give them the handle first. When cutting with a sharp tool, cut away from your body.

6. When using clamps or vises, make sure they are tight before starting work on a project.

refining wood fibers into a pulp. This pulp is then combined with adhesives and compressed under high pressure. These are often used as backing materials for cabinets, which provide stability and support.





Hand Saw

Power Tools

As stated in the last chapter, "whether a tool is safe or not will depend upon you." If you learn the general safety guidelines for using power equipment, you will be well on your way to a safe and enjoyable woodworking experience.

Here are some keys to remember:

A. Always wear eye protection

B. You must be certified on a tool before operating it.

C. Never operate equipment while the teacher is out of the shop area.

D. Make sure equipment safety guards are on and working correctly before using any machine.

E. Avoid wearing loose clothing and tie back long hair while using equipment.

F. Keep rags away from equipment.

G. Use a brush to clean ships or shavings off of equipment. Never use your hand.

H. Never adjust equipment while it is running.

I. Turn the machine off when you are done and never walk away from it while it is running. Always wait for a blade, bit, cutter, or sander to come to a complete stop before leaving. Never leave it running or unattended. Machines are quieter than you think, and others may not know it is running. Blades are often felt before they are heard.

J. Do not force wood through the machines as this could result in kick back.

K. Hold wood firmly when running it through equipment.

L. Check all wood for knots, splits, nails, etc. to make it safe to cut. Inspect for and remove all nails from lumber before cutting. Try to do layout cuts between knots.

M. Position yourself properly when using equipment. Maintain a well-balanced solid stance. Know the flow zone and stand away from it. Never walk in the fly zone of another user.

N. Keep area clear to prevent injury.

O. Don't talk to anyone and keep your mind on your work while using equipment.

P. Always make certain the power switch is in the off position before plugging in a machine. Often times you will have to lean over the machine to plug it in. If it suddenly comes on, you risk being injured. Other times material may be touching the blade and it will be sent flying when you plug it in.

Q. Always unplug a machine when you are changing a blade or cutter.

R. Make certain all adjustments and changes to blades, bits, and cutters are tightened properly before turning on a machine. After new cutters are installed, turn on the machine briefly, turn it off, and check the cutter again.

S. Always allow a tool to reach full operating speed before starting your cut. Feed the wood or cutter carefully and only as fast as the machine can cut easily. Learn to listen for "bog down" (the sound of a slowing blade), and smell for "wood burn" (the smell produced when you are moving too slow or the cutter is dull).

T. If a tool is not performing properly (or even sounds odd), it may be out of adjustment. Shut it off, unplug it, and tell the teacher immediately.

U. BE IN CONTROL, REMAIN IN CONTROL: Turn on and turn off your own machine. You, as the user, must remain in control and aware at all times.

The Ten Commandments of Machine Safety

1. **PAY ATTENTION:** Not paying attention is the number one cause of accidents. Think. Think. Think. Keep your mind on your work. Give your work your undivided attention. Do not look around, talk to others, or use a machine without rehearsing the cut in your mind first.

2. **KEEP MACHINE GUARDS IN PLACE** at all times. Guards are there to protect you. If a guard has been removed tell the teacher so that he/she may put it back on before you begin.

3. **DO NOT OVER REACH:** Never reach across or over a moving blade.

4. **KNOW THE FLY ZONE:** Know where the wood is going to go, kick back, or fly if you lose control of it, and do not stand in that area. For example: A drill press will spin the wood clockwise, so the long side of the material should be to the left. A table saw will throw the wood backward, so stand to the side.

5. **PROPER TOOL USE**: Only use a tool for what it is made for. Understand grain direction, rip-cuts, crosscuts, blade direction, and proper blade installation. Turn off a tool when you are finished and wait for it to come to a complete stop before leaving. Blades are often felt before they are heard.

6. **PROPER WOOD SIZE:** Many accidents occur simply because a person attempts to cut a piece of wood that is too small or too big. Smaller pieces of lumber are easily grabbed by the blade and the hand holding the wood quickly follows. Because lumber that is too large must be forced into the blade, the extra force required can cause slipping, thrusting, or sudden release. Body parts then lunge forward into the blade. Oversized lumber is under control of the blade, not your hands.

7. **SPECIAL SET-UP APPROVAL**: A special cut requires guards to be removed, and if not done correctly will cause serious injury. Always inform the teacher of any special set-up you are thinking on attempting.

8. **PROPER HAND PLACEMENT:** Always hold the wood firmly. Never cross your arms. Do not push wood hard towards the blade. Do not force wood. You may slip and fall into the blade.

9. **KEEP FINGERS CLEAR**: Keep your fingers clear of blades, rotating parts, pinch points, and electrical plugs by maintaining a clearance of 2 to 4 inches. To assure your safety and the safety of others, only cut wood that is a minimum of 12” long and 3” wide (the 12/3 rule). You must inform the instructor before cutting any piece smaller than the 12/3 rule.

10. **KEEP WORK AGAINST THE FENCE AND ON THE TABLE:** Wood should be firmly against the fence and the table before cutting. The blades and cutters are designed to drive/throw/press the wood against the fence and table. In other words, if you don’t have wood there, the blade will put it there for you, along with your hand.

And two safety tid-bits

1. SHARP TOOLS ARE SAFER THAN DULL TOOLS: Use sharp tools! Dull tools require excess pressure to push, thus increasing the risk of slipping into a blade. Dull tools are also hard to control. Sharp tools do what they're designed to do.

2. USE YOUR SENSES: Woodworking requires all of the senses: seeing, smelling, hearing, feeling, and even tasting (believe me you can taste burning wood). Improve your craft: engage your senses. Ensure your safety: engage your senses.

Safety Certification

Introduction:

Though the greatest cause of accidents in the woodshop can be summed up as happening because someone was “not paying attention,” or “didn’t have their mind on their work,” there are many factors that lead to injury. Here are a few :

1 **Ignorance**
2 **Rushing a job**
3 **Talking while working**
4 **Fatigue**
5 **Absent-mindedness**
6 **Using unsafe material**
7 **Carelessness**
8 **Overconfidence**
9 **Using a dull tool**
10 **Using wrong material**
11 **Improper clothing**
12 **Eyestrain**
13 **Lack of judgment**
14 **Making too heavy a cut**
15 **Using an improperly set or adjusted tool**
16 **Improper body positioning**
17 **A disorderly or messy woodshop**
18 **Inadequately guarded machinery**

So, with your mind on your work, let’s begin…

Whether tools are harmful or safe depends on you.

It is important that you fully understand how to properly operate each piece of machinery before using it. That means certification. Before using any equipment in the woodshop, you must be certified by the instructor. Each machine comes with its own set of warnings. Failure to use caution may result in serious injury, even death. Be safe and get certified!

When you fail to practice safety, you put yourself and others in danger. Remember, the greatest virtue you have is patience, and your most valued skill is the ability to stay focused. Don’t get hurt, and don’t hurt others by:

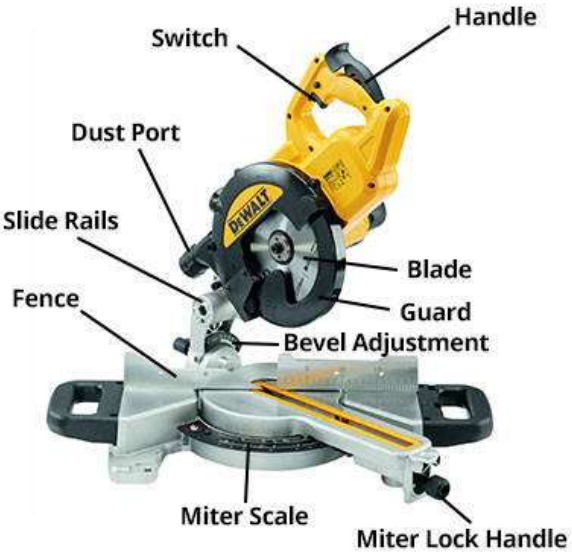
Talking while working
Causing loud, sudden noises unrelated to the woodshop (yelling, sneezing obnoxiously, slamming, etc.)
Cutting while someone is in your fly zone
Leaving behind a mess
Leaving unused wood laying around Leaving tools out
Not replacing dull or overused equipment
Leaving stuff on the floor that can trip people up (cords, boards, tools, etc.)
Not clamping work appropriately
Swinging tools wildly
Using tools in an unsafe manner
Getting too comfortable with a machine
Being a know-it-all about a machine
Holding wood for a person while they are cutting it on a machine
Crowding someone on a machine
Hurrying someone while they are on a machine
Distracting people by drawing unnecessary attention to yourself
Using a tool you have not be certified to use
Ignoring, forgetting, or otherwise not thinking about the safety requirements of the machinery
Taking advice from someone other than the instructor

In order to be safe, you must know the dangers that come with each piece of equipment. You should know exactly what a machine is used for and what it is not used for. You should know the warnings that come with the tool. And, you should know the major cause of accidents that occur while using the machine. The following pages are an overview of the commonly used tools in the VOCS woodshop and the tips to keep in mind while using them. You will need to know this information in order to be certified.

1 Woodworking Manufacturing Technologies Department, Cerritos College; Woodworking Safety Manual and Test (Norwalk, CA, 2008). p. 2

Miter Saw

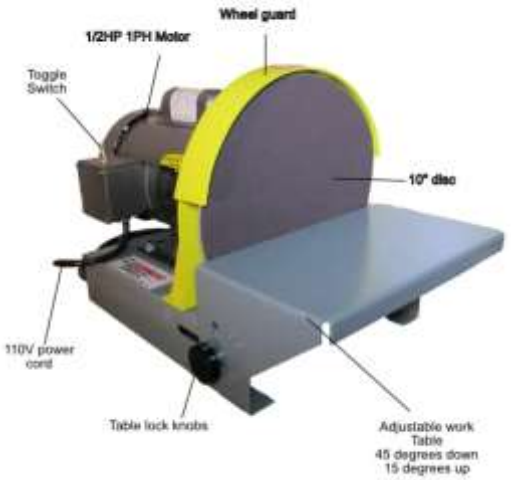
Purpose: A miter saw, also known as a chop saw, is used to make an accurate crosscut in a workpiece.
Warning: Most accidents occur with this tool.
Major cause of accidents: Not paying attention, cutting too small of a piece, rip cutting, and working too fast.



Operating and safety instructions:

• Always wear eye protection. Ear protection, though not mandatory, is recommended.
• Be sure blade is sharp, runs freely and is free of vibration.
• Allow the motor to come up to full speed before starting cut. Make sure blade is not contacting work piece before switch is turned on. Engage power switch with miter saw in fully raised position. The motor has a high torque and it will jump in your hand. Never lock the switch in the ON position.
• Keep motor air slots clean and free of chips.
• Always make sure rotating table is tight before cutting, even if the table is positioned in one of the positive stops.
• Be sure blade and flanges are clean and that the arbor screw is tightened security.
• Always keep the blade guard in place and operating properly.
• After completing a cut, keep the handle down, then release the power switch and wait for coasting blade to stop before returning saw to raised position.
• Do not remove jammed or cut off pieces until blade has stopped.
• Never cut ferrous metals or masonry with wood cutting blades.
• Always clamp your work. Never re-cut small pieces. Follow the 12/3 rule (12” long and 3” wide). If it can’t be clamped, it is too small.
• Danger zone: Never have your hand on the miter saw rotating table. Know and follow this boundary.
• Make certain the workpiece is firmly pressed against the fence and the table at the same time. If it is not, the blade will grab it and drive it until it hits something, often times taking your hand with it.
• Provide adequate support to the sides of the saw table for long work pieces.
• Clean it before leaving it. Never leave a machine or the area around it dirty or cluttered with scraps.
• All adjustments shall be made to the miter saw prior to starting
• Never cross your hands when operating the miter saw.

Disc/Belt Combination Sander



Purpose: Also known as the combo sander or table sander, this machine is used for the fine sanding or removal of material on both the face and edge surfaces of a workpiece.

Warning: Both the disc and the belt move at the same time.

Major cause of accidents: Not paying attention, slipping into the sander, losing control of workpiece, removal of stop

Operating and safety instructions:

• Always wear eye protection.

• Make sure the sanding belt is tracking correctly in order for it not to run off the pulleys.

• Make sure the sanding belt or disc is not torn or loose, such pieces cause malfunctions and loss of workpiece control, not to mention the damage in can cause to your wood.

• When sanding with the belt sander, hold the workpiece firmly on the top edges and support it against the backstop. Never let it go. It will fly.

• When sanding on the disc, always hold the workpiece firmly on the table. Never let it go. It will fly off.

• When sanding on the disc, always sand on the downward stroke of the disc. Sanding on the upward side can cause the workpiece to lift up off the table and cause an injury.

• Make certain the table and backstop are properly set. Always maintain a minimum clearance of 1/16" or less between the table or backstop and the sanding belt or disc.

• Turn on the machine briefly to make certain it is tracking correctly. Make certain the table and backstop are properly set.

• Never wear gloves or hold the work with a rag when sanding. Such items can result in loss of control.

• Sand with the grain of the wood: Face and edge grain with the belt. End grain sanded on the disc. Not following this rule will cause damage to your wood, scratch marks sometimes not seen until you stain.

• Do not sand pieces of material that are too small to be safely supported and controlled.

• Avoid awkward hand positions where a sudden slip could cause a hand to move into the sanding belt or disc. Never cross your hands.

• When sanding a large workpiece provide additional support at table height or use a hand sander instead.

• Whenever possible, attach a vacuum to the sander and run it while sanding is in process. When sanding for long periods of time, you should wear a dust mask or air respirator

• Always remove scrap pieces and other objects from the sander before turning the machine ON

• Never layout, assemble, or set up work on the table while the sander is operating (moving).

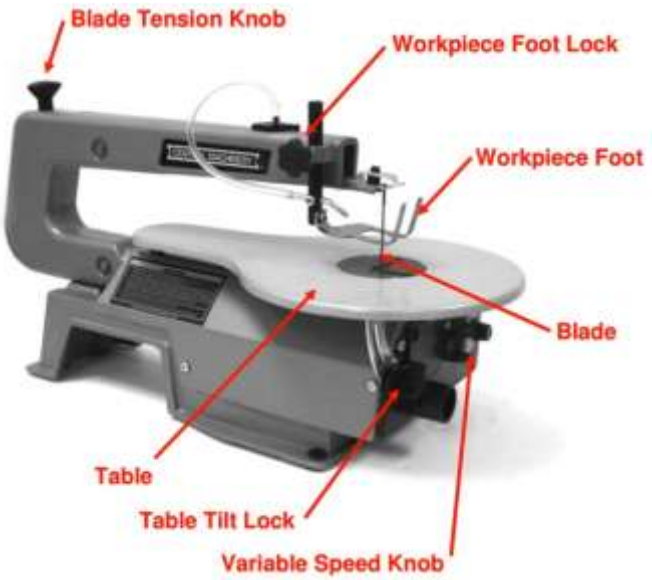
• Always turn the machine OFF and disconnect the cord from the power source before installing or removing accessories.
• Never leave a machine with the power left ON or before the machine has come to a complete stop.
• When sanding on the belt sander, you should start the sander first, then make careful contact with the workpiece to the moving belt or disc.

Scroll Saw

Purpose: A scroll saw is for cutting intricate curves.

Warning: Your fingers a close to this blade.

Major cause of accidents: Not paying attention, safety guard is removed, fingers slip into the blade.



Operating and safety instructions:

• Always wear eye protection.

• Before turning on power:

o make sure the instructor has checked your set up.
o make sure everyone is a safe distance away before you start, outside yellow lines.
o be sure teeth are pointing down and that the blade is sharp. Blades that are dull or that have missing teeth can require excessive force in feeding which may damage the blade.

• Firmly support stock against downward thrust of the saw. Do not lift wood from the table while cutting.

• If the blade breaks during operation, immediately shut off power, stand clear of the saw and notify instructor.

• Clean it before leaving it. Never leave a machine or the area around it dirty or cluttered with scraps.

• To make an internal cut, first drill an appropriate size hole to insert the blade into, set the blade, and then begin cutting.

• Maintain a 2” margin of safety. When possible, push by moving only your fingers, not your hands.

• Do not remove the safety guard/pressure foot.

• Do not clear scraps from the table until the saw comes to a complete stop.

• The pressure foot is designed to hold the workpiece securely down on the table. If you hear knocking as a result of your wood slapping up and down, your pressure foot is not set correctly.

• All adjustments to the scroll saw shall be made prior to starting.

• When cutting with the scroll saw, your hands should hold the workpiece firmly.

• If a small piece of wood gets caught in the throat against the saw blade, you should turn off the machine and clear it.

- When backing out of a long cut, you should turn off the machine to avoid breaking the blade
- To help keep a blade from binding when cutting an arc, use a series of cuts vertical to the arc, called "relief cuts."

Virtues of Woodworking

Introduction:

Virtues are a quality of your personality and character that benefits yourself and others. A virtuous person is said to be someone whose behavior is highly respected. For your safety and the safety of others, we in the Valley Oaks woodworking department expect students to be virtuous woodworkers. Below is a list of virtues we expect students to practice in their lives.

Patience: Patient people do not rush or hurry needlessly and carelessly. This virtue is perhaps the most beneficial for the safety of the woodworker. When you are impatient, mistakes happen, sometimes painful ones. Don't let this happen to you. Be patient!

Diligence: Diligence is the ability to stay focused, work hard, and be attentive. When you come to the VOCS woodshop, you come to work. Be self-motivated and take initiative, don't just stand around. If you don't know how to do something, ask.

Creativity: Being creative means you use the resources provided to come up with your own ideas, plans, and special touch. Look for ways to add that little extra to your work. Creativity is always accepted. In fact, in woodworking we like to think that we never make mistakes; we just create opportunities to be creative.

Cooperation: Working well with others is a valuable asset. Don't rush others. Be kind, gentle, and considerate of the time, beliefs, and abilities of others.

Sobriety: Being sober simply means that you think clearly. Come to class with a clear head. Use common sense when working in the shop. Take time to clear your head and consider what you are doing.

Critical thinking: While in the woodshop, you will be expected to think for yourself. The woodshop is designed to build self-confidence. If you rely on others for answers, you'll never develop the confidence necessary in life. Be creative and think through solutions before asking others.

Honesty: It is expected that students be honest in everything they do. They do not copy other people's work, cheat on tests, or turn in projects they did not do. Do not let others do cuts for you. If you are scared, be honest and inform the instructor so that appropriate steps can be taken to help you. Moreover, if you break something, tell the teacher. The bottom line is to take responsibility for yourself and own up to your mistakes.

Respect: Students are to respect the instructor, each other, and the property of VOCS. Treat people better than you want to be treated, and treat property better than you treat your own property. The woodshop is a privilege not a right, so be respectful in all you do.

S.A.W
Skills and Assembly in Woodworking

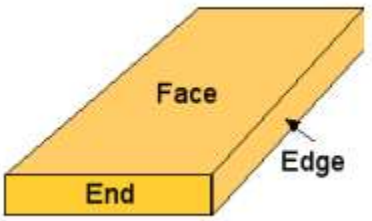
Woodworking Terminology

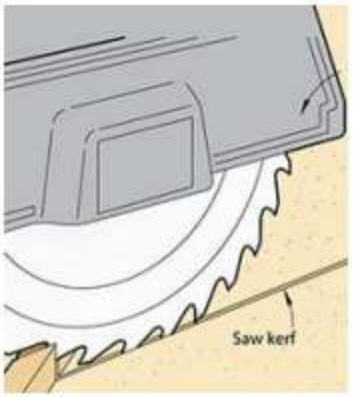
Introduction:

Believe it or not, a part of safety is terminology. It is important that you understand the terms being used in the woodshop so that you don't get confused and do something wrong. As is always the case, "Ask if you are ever unsure about what has been said." Study the words and phrases below for your safety and the safety of others. Confusion only gets people hurt.

Woodworking Terminology

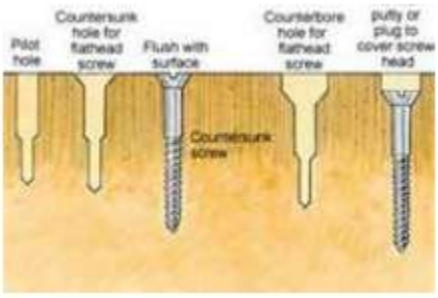
1. Board Face: The widest part of the board where wood grain lines run end to end.
2. Board Edge: The side of the board where wood grain lines run endto-end.
3. Board End: The end of the board where the grain fibers end.
4. Fence: The part of woodworking machinery perpendicular from the table surface.
5. Grain: Formed from the growth rings of a tree as a result of the fibers in wood that carry water from the roots through the trunk. The part of lumber lines/patterns that alternate between darker and lighter colors.
6. Grit: Abrasive material, such as sand, used for removing wood. When sand is glued to paper it is called "sandpaper." Grit refers to the degree of roughness. Grit may be coarse (very rough) to fine (smooth), and is defined by the size and amount of sand granules in a square inch.
7. Kerf: The width of the cut left behind from a blade, typically 1/8". The amount of wood the blade removes when cutting.
8. Warp: The distortion of lumber from its original shape. Generally speaking, it is a twisting or bending in the lumber away from straight.
9. Clamp: A device used to hold lumber tightly to a work surface or to other boards for gluing





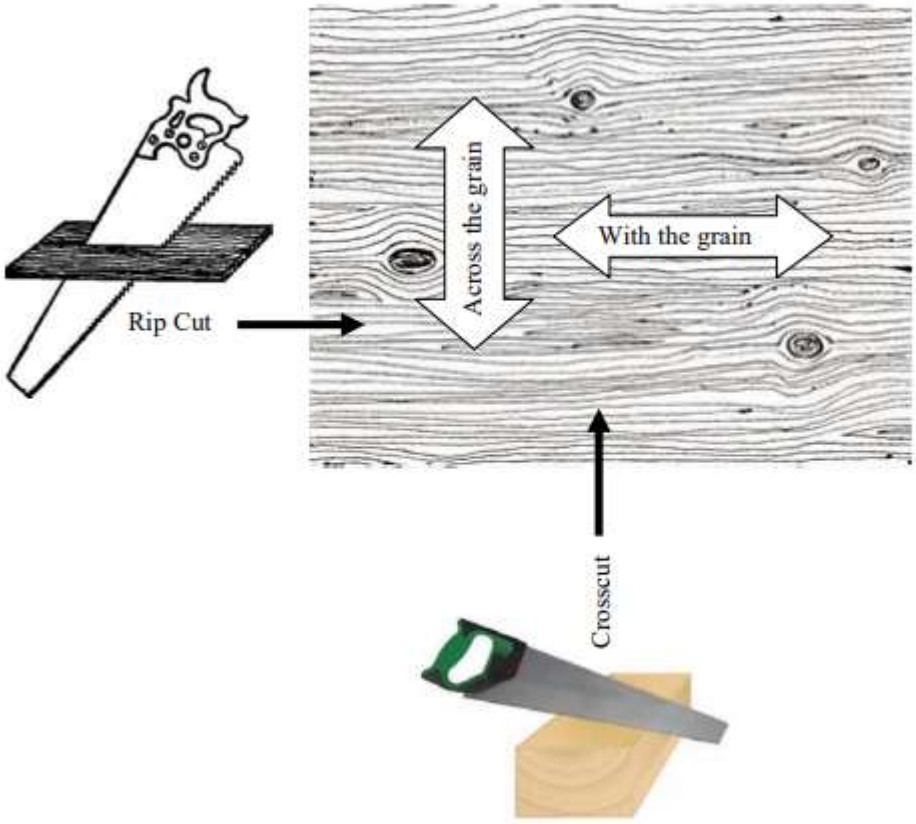
10. Countersink: The process of drilling a larger hole over the top of a smaller hole, called a pilot hole, so that the head of a screw recesses into the wood when it is screwed in.
11. Kick-back: When a piece of lumber is forced or thrown backwards by the blade in the direction of the machine operator.

12. With the grain/across the grain: With the grain means parallel to the grain lines. Across the grain means perpendicular to the grain lines.



13. Rip Cut: Cutting with the grain of a piece of lumber, parallel to the grain lines.

14. Cross Cut: Cutting across the grain of a piece of lumber, perpendicular to the grain lines.



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