Unit 1 – Hand Tools

3.1.0 Hammers

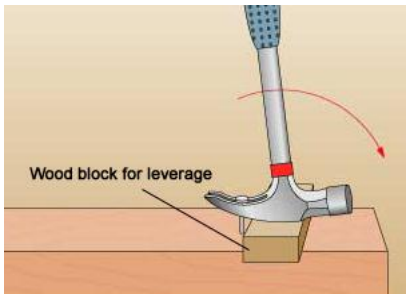
As you can see, there are various sizes, shapes and weights of hammers, each designed for a specific task. The most used tool in this class will be the claw hammer (pictured below).

The claw hammer typically has a head made of steel and a handle made of wood. The handles are also sometimes made of steel or fiberglass. The head and face are used to drive nails while the claw is used for pulling nails out of wood. Some claw hammers have a broad, smooth face which makes it easier to strike the nail squarely but will leave a mark on the wood as you drive the nail flush. Other claw hammers have a rounded face that can eliminates the damage to the wood surface but require a more experienced worker to drive the nail.

3.1.1 Driving a Nail

It usually works best to slightly tap a nail to get it started while holding the nail with your left hand (if right-handed) and holding the hammer with your right hand forward on the handle. Once the nail is started, move your right hand back on the handle and strike the nail squarely by using a full stroke. You should use not just your wrist but your entire arm with force applied from the shoulder. This position would be reversed if you are left-handed. Never strike objects with the cheek or side of the hammer.

3.1.2 Pulling a Nail



The claw portion of the hammer is slid under the nail head, and the handle is lifted up perpendicular to the surface by pulling from your biceps. Be careful, you can break the wooden handle or the hammer can slip and the force of your pull can throw the hammer back towards you. Always pay attention to your work and do not become distracted. If the nail is longer, sometimes it helps to use a second piece of wood to get the hammer positioned higher as in this illustration. This will give you added leverage.

Other times, the nail head may be flush with the surface and you cannot get the claw to engage the nail. A special tool called a cat's paw can be driven into the wood to start the nail pulling. Once you get enough nail exposed, then it is pulled with a claw hammer. It takes practice to do a minimum amount of damage to the wood.

3.1.3 Hammer Safety

- Make sure you are focused on your work and are not distracted
- The handle of the hammer should be solid and not split
- The head of the hammer should be tightly affixed to the handle
- Make sure the hammer is clean

Do not strike hammers together or damage the head of your hammer by pounding metal or concrete. Hand tools will last longer if they are only used for their intended purpose.

3.1.4 Pliers

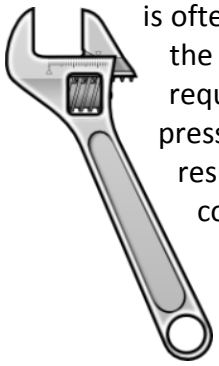
Pliers are shaped like scissors and are a type of adjustable wrench. The jaws usually have teeth to help grip, and the jaws can be adjusted to grip various widths. The most common use is to hold metal or wire objects during assembly. Pliers are one of the most commonly used tools. They allow you to grip objects tightly. Notice there are two or three width settings available allowing you to grip larger objects. Squeeze the handles together to tighten your grip.

Needle-nose pliers allow you to reach into tight places and handle smaller objects. They come in many sizes and are also used to bend metal.

Vise-Grips are locking pliers that can hold objects very tightly. A knob on the handle controls the width and tension in the jaws. Although you still squeeze the handles to tighten, a lever is supplied to remove the pliers.

A channellock is most useful to grab round objects and is often used in plumbing projects. Its advantage is that it has a wider variety of jaw width settings. Channellocks come in various lengths and you get more mechanical advantage to hold objects as you use larger sizes. Remember the upper jaw always goes on top of the object to be held, and you need to turn in the direction that causes the object held to turn "into" the channellocks.

The Crescent wrench or adjustable end wrench has one fixed and one moveable jaw. This allows the wrench to fit a variety of bolt sizes. This wrench is used to tighten nuts and bolts and is often used in pairs, one on the bolt and the other on the nut. The proper use of this type of wrench requires you to remember to always put the pressure on the fixed jaw. Failure to do so often results in the wrench slipping and rounding the corners of the nut or bolt.



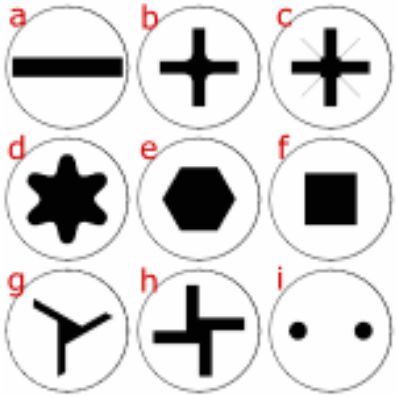
3.1.5 Wrench Safety

Safety rules apply to wrenches as well. Whenever the joint becomes loose, the pliers will slip. If you are applying high force (torque), the wrench can fly out of your grip and cause injury. Inspect the wrench to ensure that it is safe to use; a wrench that breaks when you are applying maximum force can be dangerous. If the jaws are loose, often there is a way to retighten the joint. If there is not, it needs to be discarded.

3.1.6 Screwdrivers

Screwdrivers are used to tighten (insert) or loosen (remove) screws. They are named by the type of screw and need to match the type of screw for safe, efficient operation. Screwdrivers which are too large, too small or of the wrong type will only destroy the screw head making it difficult to tighten or loosen in the future.

Slotted or flat screwdrivers (a) are the most common but are being replaced by designs that "strip" less easily as we begin to use power drivers more often. A Phillip's head screwdriver is probably the second most common (b, c) as it allows for more torque before damaging the head. Torx© are star shaped (d) and uses often in the automotive, appliance and computer industry as they are often inserted by robotic assembly. Hex screws and drivers (e) allow you to use either a screwdriver or a hex wrench. Robertson© are square drive (f) and allow for high torque uses such as a power screwdriver or combination drill/driver. These screws are made to be inserted flush or beneath the surface of the wood. The other three types are used in secure situations where you do not want them removed by just anyone. Pig nose (g & h) or snake eye (i) screws are often used in public facilities to prevent vandalism.



Using a screwdriver Each screwdriver has 3 parts: The handle, the shank and the blade. They come in a wide variety of sizes. To safely use a screwdriver, you need to choose one of the right size and type of blade. Always position the shank perpendicular to the work. Clockwise tightens a screw and counter clockwise loosens (right is tight, left is loose or "righty tightly, lefty loosey"). The screw also has both a shank and a head. Notice the wide

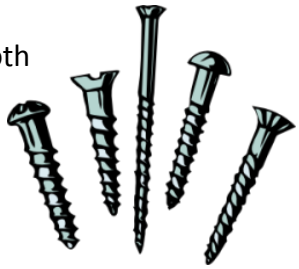
variety. Some are meant to be sunk into the wood and others tighten flush with the wood or metal surface. Choose the right screw for the job, taking into factor the material, the length and diameter of the screw and the amount of force needed to hold the two pieces (or more) of material together.

3.1.7 Screwdriver Safety

Many accidents happen when the screwdriver blade slips out of the screw's slot. Keep your nonworking hand out of the way. Keep the screwdriver blade clean, and do not force the screw. Excessive force often damages the screw, making the work more difficult.

3.1.8 Screws

In woodworking, screws are often used as they hold better than smooth nails and can be removed and reused. Self-tapping screws have a sharp point. Often in woodworking, it is best to drill a starter hole; this helps prevent the wood from splitting and ruining your work.



3.1.9 Bit and Brace

This hand drill is often used in fine woodworking to drill larger holes. Inspect the brace; notice both the top and middle handles need to turn freely. The top handle allows you to apply downward pressure while the middle handle allows you to turn the drill with your other hand. The amount of pressure to apply takes practice. Too much pressure causes wood to chip, creating an irregular hole.

A wide variety of bits can be used, from those creating a very small hole to those which use a bit that drills holes 1" to 2" or even larger. The front of the drill holds a Jacobsen chuck which holds the bit using a key. Other chucks can be hand tightened. In the brace pictured, there is also a mechanism to change the direction in which power is applied and the other which is free turning in a racketing fashion. This is helpful when the bit becomes stuck in the wood.

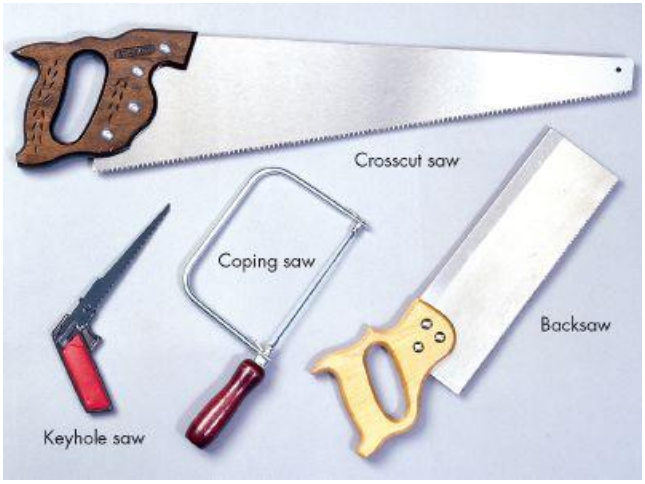
3.1.10 Drill Bits

Drill bits come in many sizes and diameters. The bits that are used in a brace usually are larger and have a squared end to hold tighter in the brace. Notice the top is often sharpened to a point to make starting easier. The bit must be held perpendicular to the wood to get a straight, sharp drilled hole. Another type of bit can bore a larger hole.

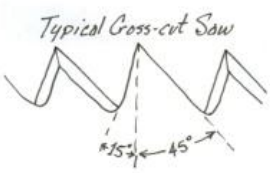
A Forstner bit has a larger flat surface, a sharpened cutting point and a central point to start the hole.

Spade bits are for drilling holes of larger diameters (usually in softer woods). The bits come in a wide variety. Those for wood usually have a tighter spiral pattern than those for metal or concrete.

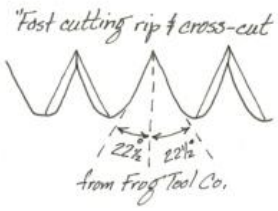
3.1.11 Crosscut and Ripsaws.



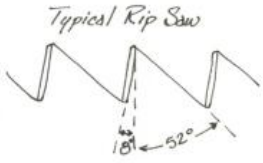
Using the right saw for the job makes cutting easy. The main differences between types of saws are the shape, number, and pitch of the teeth. The difference in shape allows saws to be used in a wide variety of jobs around the jobsite. With wood, these differences make it possible to cut across or with the grain of wood or along curved lines. Other saws cut through metal, plastic, or wallboard. We are going to concentrate on two handsaws, one for cutting across the grain and the other for ripping with the grain. The handsaw's blade is made of tempered steel so it will stay sharp and will not bend or buckle. Handsaws are classified mainly by the number, shape, size, slant, and direction of the teeth. Saw teeth are set or angled alternately in opposite directions to make a cut slightly wider than the thickness of the saw blade itself. Two common types of handsaws are the crosscut saw and the ripsaw. The ripsaw has 5 to 9 tpi (teeth per inch). The ripsaw, designed to cut with the grain (parallel to the wood fibers), meets less resistance than a saw cutting across the grain.



The crosscut saw, which has 8 to 14 tpi, is designed to cut across the grain (perpendicular to the wood fibers) of wood. Blade lengths range from 20 to 28 inches. For most general uses, 24 to 26 inches is a good length.



Generally, the fewer points, or teeth per inch, the coarser and faster the cut. The more teeth per inch, the slower and smoother the cut. A ripsaw will have fewer teeth and is intended to cut with the grain. A crosscut saw, as the name implies, is meant to cut across the grain and will have more teeth per inch.



3.1.12 Other Common Saws

Backsaw – This saw is used to cut miter joints, tenons and cut small pieces of trim wood. This saw will have 11 to 14 tpi and is often used with a wooden jig to cut angles.

Keyhole saw – This saw cuts small holes in wood, or a special version cuts drywall for vents or switch boxes. The blade will have 7 or 8 tpi.

Coping saw – This saw has a narrow, flexible 6-3/4-inch blade attached to a U-shaped frame. Holders at each end of the frame can be rotated so you can cut at angles. Standard blades range from 10 to 20 tpi. The coping saw is used for making irregular-shaped moldings fit together cleanly.

Hacksaw – The hacksaw has more of a pistol grip and is used to cut metal such as pipe, bolts or nails. The blade is fine with 32 tpi. The blade is pulled tight with a wing nut and is designed to cut on the push rather than the pull stroke.

3.1.13 How to Use a Crosscut Saw

The crosscut saw cuts across the grain of wood. Because it has 8 to 14 tpi, it will cut slowly but smoothly. Follow these steps to use a crosscut saw properly:

Step 1 Mark the cut to be made with a square or other measuring tool.

Step 2 Make sure the piece to be cut is well supported (on a sawhorse, jack, or other support). Support the scrap end as well as the main part of the wood to keep it from splitting as the cut nears the edge. With short pieces of wood, you can support the scrap end of the piece with your free hand. With longer pieces, you will need additional support.

Step 3 Place the saw teeth on the edge of the wood farthest from you, just at the outside edge of the mark.

Step 4 Start the cut with the part of the blade closest to the handle end of the saw, because you will pull the first stroke toward your body.

Step 5 Use the thumb of the hand that is not sawing to guide the saw so it stays vertical to the work.

Step 6 Place the saw at about a 45-degree angle to the wood, then pull the saw to make a small groove.

Step 7 Start sawing slowly, increasing the length of the stroke as the cut deepens.

Step 8 Continue to saw with the blade at a 45-degree angle to the wood.

3.1.14 How to Use a Ripsaw

The ripsaw cuts along the grain of wood. Because it has fewer points (5 to 9 tpi) than the crosscut saw, it will make a coarser, but faster, cut. To use a ripsaw properly, mark and start a ripping cut the same way you would start cutting with a crosscut saw (*Figure 42*). Once you have started the cut, saw with the blade at a steeper angle to the wood, about 60 degrees.

3.1.15 Safety and Maintenance

You must maintain your saws for them to work properly. Also, it is very important to focus on your work when you are sawing—saws can be dangerous if used incorrectly or if you are not paying attention. Here are the guidelines for working with handsaws:

- Clean your saw blade with a fine emery cloth and apply a coat of light machine oil if it starts to rust. Rust will ruin the saw blade.
- Always lay a saw down gently.
- Have your saw sharpened by an experienced sharpener.
- Brace yourself when sawing so you are not thrown off balance on the last stroke.
- Do not let saw teeth come in contact with stone, concrete, or metal.

Assessment – Hand Tools

When holding a saw, in relationship to the wood:
a. The ripsaw is held at a higher angle
b. The ripsaw is held at a flatter angle
c. The crosscut saw is held at a steeper angle.
d. The crosscut saw is held at a higher angle.

A coping saw would be the best choice for:
a. A curved cutout in a plywood trim board.
b. Cutting a piece of plywood in half lengthwise
c. Cutting a piece of plywood in half crosswise
d. Cutting a copper pipe to length

True or False:
____The article implies that sharpening a saw is an easy task for a beginner.
____A drywall saw can also cut through metal pipe quickly.
____Both the crosscut and ripsaw use a pulling motion for the initial cut.

If your job is to divide a sheet of plywood into two halves the long direction, the best choice from above would be:

a. Backsaw
b. Drywall saw
c. Ripsaw
d. Crosscut saw

Cutting copper pipe to length is best done with:

a. Backsaw
b. Hacksaw
c. Drywall saw
d. Ripsaw

The primary difference between a crosscut saw (across the grain) and a ripsaw (with the grain) is:

a. the length of the blade
b. the handle shape
c. the number of teeth per inch
d. the softness of the wood