How To Use a Circular Saw

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Introduction Thanks for volunteering to help at a construction site. Your efforts will make a difference not only to one particular family in need of decent, affordable housing but also the whole neighborhood.

In this Construction Volunteer How-To article we discuss the power tool called a circular saw. Circular saws are used extensively during the early phases of construction, and they are used fairly often thereafter. They are powerful tools that can be dangerous, but with the proper training many novice volunteers can learn to use them safely and accurately and efficiently.

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Circular saw described TOP

A circular saw is basically a motor that turns a rigid, circular blade with sharp teeth on the perimeter. The teeth cut into whatever you push the spinning blade into, usually wood. The blade is usually 7-1/4 inches in diameter and can make a cut as deep as just about 2-1/2 inches deep. Unlike a table saw and a miter saw, which can perform the same functions, a circular saw, sometimes just called a "circ saw," is portable.

Typical use for a circular saw. Probably the most common use for a circ saw on construction sites is cutting a 2 by 4 or 2 by 6 to length. You need to cut a piece that's 14-1/2 inches long from a piece that's maybe 20 inches long, so you make a mark on the wood at 14-1/2 inches and set your saw in position so it will cut there. You pull the trigger, the saw blade revs up to full speed, and you push it through the wood till the cut is finished.

We'll discuss a lot more details about this type of cut and others in later sections, but first let's discuss the two types of circ saw.

Sidewinder v. worm-drive. Circular saws come in two main styles, called sidewinder and worm-drive.

The principal difference between a worm-drive saw and a sidewinder is the orientation of the motor's shaft relative to the blade. In *sidewinders*, as the name suggests, the motor is located directly to one side or the other of the blade, and the shaft of that motor connects directly to the arbor of the blade, i.e., the shaft spins in the same direction as the blade.

In a *worm-drive saw* (sometimes called an *inline saw)* the shaft of the motor is parallel to (or in line with) the blade, and the torque is delivered through a worm gear that diverts it 90 degrees.

Left-handed sidewinder

You might encounter both types on job sites. Although they are operated the same, here are some differences you might want to know about.

- Worm-drive saws are more powerful. Although they tend to spin at only around 4,300 revolutions per minute while not under load whereas sidewinders spin at about 5,800 rpms, worm-drive saws deliver more *torque* (spinning power, not spinning speed).

  Worm-drive circular saws are therefore better than sidewinders for making rip cuts through thick wood, because they can maintain sufficient torque for a longer time. They are better than sidewinders at cutting through wet or hard wood. Inline saws are less likely than sidewinders to be slowed by a knot in the wood (knots, which are where branches were cut off, are always harder than the surrounding wood). Worm-drive saws are more capable of being steered, because they can chew through wood harder without exhibiting kickback.

- Inline saws are more expensive than sidewinders but are also more durable. They are designed for tough, daily use by professionals. Unlike with sidewinders, there is no "light-duty, homeowner's" version of a worm-drive circ saw.

Right-handed worm-drive

- Worm-drive saws are heavier than sidewinders, often by a lot. A typical sidewinder weighs just over ten pounds, whereas a worm-drive weighs more than fifteen. The more you use a worm-drive saw the better you learn how to heft its weight about from place to place with minimal effort. Because sidewinders are lighter, they are preferred by most novice volunteers.

- Inline saws jerk sideways a bit right when they rev up, because of how that big motor is situated; you'll get used to anticipating this as you use the saw more. Sidewinders do not do this.

- Also, with respect to sidewinders, on some the motor is situated on the left side of the blade and on others it's on the right side. If you're right-handed you'll want one – assuming you have a choice – with the motor on the right side. The reason is that it's important to be able to see the spot where the blade and the wood are in contact, and if you're using a "left-handed" sidewinder you have to crane your head over to the right side of the saw to see that spot.

Safety TOP

Circular saws for some novice volunteers are too loud and too powerful and too frightening to be used safely. If you don't want to use a circular saw, no site supervisor will make you do so. If you do want to learn to use one to help us build a house, you must start with the safety rules.

- Circular saws can't tell the difference between wood and flesh. Whenever you're in charge of a saw you must make sure you don't cut into anything you shouldn't, such as yourself or someone else. If you're the one holding the saw, you're the one in charge of it, and you need to keep in mind that injuries from being cut by the spinning blade of a circular saw are rarely trivial.

- Circular saws are loud, so feel free to use ear protection such as foam earplugs or earmuffs if you're working or working near one. If you're a nearby bystander, either walk away from the noise or at least put your fingers in your ears while the saw is running.

- Circular saws can throw sawdust and chips all over the place. If they're getting thrown into your face, feel free to wear safety glasses or other eye protection.

- Circular saws aren't as good as other tools for cutting limbs and roots. A chain saw, a reciprocating saw, and an axe are all usually better. But if all you have is a circular saw, understand that this can be an especially dangerous activity because of the risk of kickback, discussed next.

Kickback TOP

The subject of what's called kickback is an important part of these safety rules. If you follow the rules you are less likely to experience kickbacks, which are inefficient at best and really dangerous at worst.

Kickback occurs when the entire saw unexpectedly tries to move *backwards* because something has tried to stop the blade from turning. You don't ever want the saw to move backwards.

To understand this undesirable phenomenon of physics, keep in mind that the momentum of the motor, a big AC motor that does not spin down instantly, wants to keep turning even if the blade it's firmly attached to is suddenly slowed. Since the blade is being slowed down, the only way for that inertia to express itself is by the entire saw's trying to move backwards. If this happens, you must try to resist it by the use of your muscles till it stops.

In many circumstances kickback is mild and therefore easily controlled. As you're pushing forward you feel that the saw is trying to resist you a little bit. By pushing a little harder you can force it to keep going through the material.

At the other end of the kickback scale is a situation in which the blade comes instantly to a stop while you're pushing hard, while you're teetering on a ladder, and while you're sawing overhead to boot, and while you're not expecting it. In these circumstances even the best carpenters would be hard put to recover gracefully, but the point is that the best carpenters never allow this situation to arise. So you shouldn't either.

The most important point here is that you must try to foresee when the blade will bind too much and make sure that doesn't happen. Here's a common example that might seem like a good idea till you understand it.

You have an 8-foot length of 2 by 4 lumber you want to cut down to 5 feet. You place the lumber on saw horses that are spaced 6 or 7 feet apart. You line up the saw with your mark on the wood at the 5-foot point, and you start cutting. Can you foresee what can happen as the cut progresses across that distance of 3-1/2 inches?

At first the cut proceeds just fine, because there's so much wood ahead of your cut line that the board remains straight. But as you remove more wood the remaining wood shrinks to the point where it can't keep the board straight. The weight of the saw plus any downward pressure you're applying tend to push the left end of the right side down, and the same with the left side. Near the end of the cut the wood gives way and the new ends push violently into the *sides* of the blade, causing it to want to go backwards, which as you now know is always bad.

Needless to say, this is not the right way to cut a stick (or a sheet) of wood. It pretty much guarantees kickback.

Instead, **always have one end of the material hanging over air.** For the cut in this example, hang the 3-foot end of the piece out over space, with nothing under it, and lay the 5-foot end on anything that will support it. When you make the cut this way, the 3-foot scrap part will fall *away* from the blade and 5-foot keeper part will not move at all.

For cutting really long sticks, such as sawing a 16-foot piece in half, you should get help if you need it. The helper, the holder, must make sure the half being held doesn't press on the side of the blade.

Regardless of the circumstances, you never want the teeth of the blade touching the material when you pull the trigger. Always keep the blade at least a tiny distance away, then pull the trigger and let the saw come up to speed and settle down, and only then start sawing.

Sometimes you need to let go of the trigger and let the saw spin down, then do something, then pull the trigger again and keep sawing. In this situation, always make sure to nudge the saw backwards just a bit before you pull the trigger, so the blade isn't touching wood when the saw starts up.

Needless to say, any time the saw kicks back violently you must instantly let go of the trigger, but at the same time you must still strenuously fight its backward travel till its inertia is spent. Do not ever let a circular saw control you; you must always control it, and you can but not if you don't think ahead and try hard.

Care and handling TOP

Circular saws perform tough work, but they are by no means indestructible (or inexpensive). Please avoid dropping them or otherwise treating them too roughly. Here are a few more tips.

- Make sure you won't ruin the blade by cutting through anything metallic such as nails or screws. Look on both sides of the wood.

- Cord failure, which is always preventable, is a common reason circular saws and other power tools either stop working or work only intermittently or, worse yet, present a risk of electrocution. Please treat the cords with care. Don't yank on them, and don't even pull hard.

- Anytime the blade slows down such that the motor stops, you must immediately let go of the trigger. If you smell or otherwise detect that the motor is overheating, stop using the saw and let it cool down for a few minutes. If it still isn't OK, report the problem to a site supervisor.

- Generally, if you think a tool is broken and you aren't sure you can fix it, let the site supervisor know. We need to know not only so we can get it fixed but also so we can decide whether to take it out of service.

How to make a typical cut [TOP]

As noted, the most common use for a circular saw is a simple crosscut that reduces the length of a 2 by 4 or 2 by 6 piece of lumber.

> A *crosscut* is a cut that runs across the grain, i.e., perpendicular to its length. For a 2 by 4 that cut will be 3-1/2 inches long, and for a 2 by 6 it will be 5-1/2 inches long.
>
> A *rip cut* is one that is parallel to the length of the stick of lumber, and these are rarely needed. When they are needed, a better tool than a circular saw is a table saw.

Here are the steps for making a typical crosscut, let's say to reduce the length of an 8-foot board to 92-5/8 inches (a standard stud length).

(1) Make a crow's-foot mark at 92-5/8 inches from whichever end of the board you decide is handier for you.

(2) Using a Speed Square or some other square, draw a pencil line at that crow's-foot across the board, perpendicular to its length. This will be your *cut line.*

(3) Making sure you won't create a situation where the wood will bind the blade (see "Kickback" above), place the saw on the face of the wood so that the sole plate is flat on it. The *sole plate* (sometimes called the *foot)* is the big, flat rectangle of aluminum or other metal below which the blade protrudes.

(4) Maneuver the saw left or right till the blade is lined up with the cut line you marked.

(5) Making sure the blade isn't quite touching wood yet, pull the trigger.

(6) Push the saw towards the wood till it bites in, then keep pushing straight ahead till the cut is made.

Controls [TOP]

In a given year on various volunteer job sites you might find more than a dozen models of circ saw, and on a given day on a given job site there might be nearly half a dozen. Although each model of saw is different from every other and has to be learned in its own right, here are the controls on a circular saw you should know about.

Trigger [TOP]

Unlike some power tools, a circular saw has only two speeds – on or off. If you don't pull the trigger till it clicks, nothing happens. When you do pull the trigger far enough, it clicks and the saw tries to spin, and it will always try to spin as fast as it can till you let go of the trigger. When you do let go of the trigger, keep in mind that the saw's motor does not stop instantly.

Depth of cut [TOP]

It is desirable to make sure the depth of your cut is no more than it needs to be. For example, if you're cutting through 7/16-inch OSB, set the blade depth just a tiny bit deeper than that, to maybe 8/16ths or 9/16ths. The main reason is that if you do cut into something you didn't mean to, whether it's wood or flesh, the damage will be less severe. This also reduces the likelihood of kickback in case you run into something you didn't expect.

The depth of cut on a circular saw is changed by changing the angle of the sole plate, which is hinged either at the heel end or, more commonly, the toe end. As the sole plate rises closer to the center of the blade, the cut deepens. Typical saws with 7-1/4-inch blades can make a cut with a maximum depth of around 2-1/2 inches.

You loosen a wing nut or, more commonly, a lever, which frees the sole plate to move on its hinge. Set the sole plate so the amount of blade you want exposed is correct, then tighten it up. Make sure to tighten tight enough lest the sole plate creep up (which deepens the cut) as you put downward pressure on it during the cut. Also, sometimes the adjustment you set will change as you go to tighten the lever, so if you think it might have done that, check it.

You may measure the blade depth with a ruler, but a much batter way is to set the sole plate on a piece of the material to be cut so that you can observe the blade relative to the bottom of the material, then rotate the body of the saw till it looks right and lock it in.

Sometimes the depth of cut must be set quite precisely, such as when you're cutting through just one of two pieces that are *laminated* (fastened face-to-face). In these cases, the best solution is to make test cuts in scrap material till you've got it adjusted just right.

Remember to check the depth of cut that's set on a saw you didn't use last. It's wasteful of your time (and a little embarrassing) to make a nice, long, straight cut only to discover you sawed only partway through the wood.

Angle of cut TOP

Almost every cut made with a circular saw on a job site is performed with the blade set at 90 degrees to the sole plate, but on most saws you can change that angle, sometimes as far as 45 degrees. Making such cuts, especially at as steep an angle as 45 degrees, is not nearly so easy as making a 90-degree cut. Skip down to here to learn why.

You change the angle of the cut the same way you change the depth of cut, which is that you locate and loosen the appropriate lever or nut, swivel the sole plate to where you want it relative to the blade, and tighten it up.

Note that saws will swivel this way in only one direction – either right or left from level depending on on which side the motor is located. This means that which way your saw swivels determines the starting and ending points of your cut.

Some saws feature a protractor gauge and a little pointer showing the angle you've chosen in degrees; you should not trust these gauges unless the saw is brand-new, and probably not even then. To make sure your blade is set to 90 degrees to the sole plate, unplug the saw, rotate the blade guard out of the way, and use a square. A Speed Square will also check for a 45-degree angle.

Blade guard TOP

The saw will be equipped with a *blade guard.* When not in use, all but the front of the blade below the sole plate is covered by that guard. Typically, as you push the saw into the wood, the guard simply moves out of the way as needed and you don't have to think about it. When you've finished the cut a spring pulls the blade guard back into its original position.

This is a useful feature, because of the fact circular saws take a few seconds to spin down. As long as that blade guard is performing its function, it means that the instant you're finished with the cut you may safely set the saw down, even though the blade is still spinning.

On some cuts you must rotate the blade guard out of the way before you can start to saw. You'll find a tab somewhere on the saw that allows you to move and hold the guard out of the way with one hand while using the trigger and otherwise operating the saw with the other. Sometimes, after you've gotten the cut started, you can let go of that tab and allow the guard to spring back to where it should be.

You should check any saw you're unfamiliar with to make sure the blade guard springs into place correctly. If it does not then you've got a significant safety problem on your hands, and no one should use the tool till you've checked with a site supervisor.

Shaft-lock TOP

The shaft-lock control, if your saw has one, makes it easier to change the blade. See here below for more information.

Details TOP

The many details below are not in any particular order, so you should read through all of them.

Cuts are from the front bottom up TOP

It is useful to understand that the blade always cuts from the bottom up. Said another way, if you look at the blade from the left side of the saw, it will be turning clockwise; looked at from the right side it is turning counter-clockwise. The blade depicted in the image at right is set up to cut from left to right.

If the blade spun the other direction it would all the time be trying to lift the sole plate off the top of the wood. As it is, the blade digs in from below the sole plate and the wood, tending to keep them firmly together as you want.

This blade spins counterclockwise as it moves right.

How fast to cut TOP

It is not obvious to most novices how fast to push the saw through the wood. The answer depends on several factors, but the most important one is that you never want to push so fast that you wander off the line or endanger anyone. After that, exactly how fast depends on the thickness and hardness of the wood, the amount of torque your saw has, and your own skills. The best way to learn is to keep trying, paying attention, and re-trying. This will help develop your skills. Also, don't hesitate to study the practices of a sawyer you know to be experienced.

Generally, if you're scorching the wood, you're going too slowly. When you pause too long in one place with the blade spinning, the wood there heats up so much from the friction that is begins to burn. You can tell because the wood has turned dark from charring. It smells great, but otherwise it is generally a bad idea to scorch the wood this way. Sometimes it is unavoidable, but do try to avoid it when you can. Another obvious drawback to pushing too slowly is that you're wasting your time and the time of anyone who's waiting for that piece. Duh.

On the other hand, you don't want to push so fast that the blade slashes violently into the wood rather than sawing it smoothly. The best way to decide at any given moment how hard to push the saw eventually depends on how many times you've tried to learn how to do it better next time. Listen to the saw.

How to steer a circ saw TOP

Circular saws are designed to cut in a straight line. Once you get fully started you pretty much have to stay on that line, which means you want to get started right. The reason is that the blade, unlike the blade of, say, a jigsaw, is both large and perfectly rigid. But under certain circumstances it's possible very gradually to steer the saw right or left a little to get back on line, and that's a skill you might want to learn.

This procedure increases the risk of kickback, so be careful.

The technique is to raise the heel of the saw as much as necessary, swivel the saw on its toe, and then plunge back in at the new preferred angle, whether right or left of the original *kerf* (the missing slice left by a saw cut). Circular saws don't like to do this, but if you're slow and careful you can talk them into it. The thicker and harder is the wood you're trying to steer through, and the deeper you are into it, the more difficult it will be.

Sheet goods TOP

Above we differentiated between crosscuts and rip cuts, saying that rip cuts into stick lumber as thick as a 2 by 4 are rarely performed with a circular saw. A crosscut of a 2 by 4 is only 3-1/2 inches long.

But circular saws are used frequently to make long cuts, sometimes over 8 feet long. Those cuts are often made into *OSB* (oriented strand board) and floor decking, typically in sheets that are 4 feet by 8 feet. Because these sheet goods are much thinner than stud-type lumber, a circ saw can be and almost always is used to make these long cuts.

OSB, once called Blandex, is typically only 7/16 of an inch thick, so you can cut it pretty easily. It's used principally for sheathing the exterior walls and the roof. You might also be called on to saw floor decking, which is about twice as thick but still easily cut, if a bit more slowly, with a circ saw.

How to set up a saw table TOP

If you can foresee it will be worth the effort, set up what's called a *saw table,* which is just a pair of sawhorses with a piece of OSB or other sheet material laid across them. If you're going to be using a table saw (which is heavy) on that saw table, lay some stick lumber across the horses first for better support.

Take the time to set up the saw table pretty close to level, ideally on smooth, level ground, with plenty of room on the left and right sides. If you set one up inside the house, make sure it won't be in the way or be prepared to move it.

Particularly when you're using a saw table to make a long cut, make sure to position your material so you won't be cutting through any parts of the table itself.

Sometimes you need to immobilize a piece you're cutting and you can't find a helper or it would be too dangerous for a helper. This is when you need to figure out a way to tack down the piece to the saw table. Use nails long enough to reach through the wood into the table, but don't drive them all the way in so you can pull them out later easier, or use a drill to sink screws.

Finish the cut TOP

A common mistake novices make is failing to finish the cut. Whether you're pushing through 1 inch or 96, make it a point to push the saw *all the way through and well past* the top of the wood, because the *bottom* of the cut is always about half an inch behind. This is because the blade is round and the center of it is always located above the sole plate. You want to cut through the entire piece, not just the top of it. Only then should you stop pushing and finally let go of the trigger. If you make the rookie mistake of stopping too soon, the result can be some serious kickback. Also, because the blade is slowing down before the cut is finished, the teeth just whap into the wood and end up tearing away at and wrecking not one but two corners.

The blade has width TOP

Cutting wood with a circular saw, or any saw, is not the same as cutting paper with scissors. If you start with a piece of paper that's 9-1/2 inches long and cut it in half with a scissors and put the pieces back together, they will still add up to 9-1/2 inches, just as you would expect. But if you cut a 9-1/2-inch piece of wood in half with a circ saw and put the pieces back together, they will add up to less than 9-1/2 inches. That's because, unlike the scissors through paper, the saw blade *removed* material. That sawdust you saw flying around is the

material you removed, and if you could reassemble it it would be the width of the teeth of the blade, which is typically 1/8th of an inch.

Although many cuts made with a circular saw during rough framing may be off either way by an eighth of an inch, and a few cases even a quarter of an inch, you might as well get in the habit of being more accurate than that during any phase of construction. Assuming the cut line is marked correctly, you need to know which is the scrap side and which is the keeper side. The rule is to **place all of the width of the blade on the scrap side** of the cut line. That way the 1/8th of an inch of sawdust you remove will not be sawn from the keeper side, which would make it too short.

How to test-kiss TOP

Often it's difficult to see, as you're starting the cut, whether your left-right alignment of the saw is just exactly as you want it relative to the line you want to follow. Here's a tip real carpenters use, especially when accuracy really counts.

Raise the heel of the saw and align the blade where you think is best (if you're going to miss, miss on the scrap side), then lower it into the wood *as slightly as you can.* (It's easier to do this with the blade guard raised a bit out of the way.) You want to barely kiss the wood with the blade.

The idea is to make the shallowest test cut you can possibly make and then examine it to see whether it lines up with your line. If it doesn't you shift your saw right or left and make another test-kiss. Do this till you're on the money, then lower the saw into the wood all the way and proceed with the cut.

One of the three reasons you want to kiss the wood as lightly as possible is that, if you do mistakenly chew into the keeper side rather than the scrap side, the damage will be minimized. Another reason is that sometimes your scrap side will the next person's keeper side.

How to make an incomplete cut TOP

Most cuts you make with a circ saw will go all the way through the material from one edge to the other. But sometimes, such as when cutting stringers for staircases, you will need to make an *incomplete cut,* i.e., a cut that stops somewhere in the middle of the wood. (See "How to make a plunge cut," below, for information on how to *start* a cut in the middle of wood.)

Presumably you're sawing your way up to a pencil or chalk line that crosses the cut line you're following, and the question is how far to go relative to that line. As we now know, the top of the wood always gets sawn a little ahead of the bottom, so if you stop the saw as soon as the top of the cut reaches the line, the bottom will not yet be cut far enough. But if you push so far that the bottom of the blade reaches that line, you will have cut past the line at the top of the wood. So, what is the solution?

There are two, and which you choose depends on the circumstances and your level of experience.

The preferred method, especially for smaller thicknesses of wood and anywhere where it will show, is to stop when the *top* of the cut reaches the line, then to use a hand saw to finish the cut down to the bottom. You insert the hand saw into the kerf and saw perpendicularly till you've sawn away that last little bit. In big wood, a carefully controlled reciprocating saw can also be used for this purpose.

The other method, which might be used for staircase stringers, may be used only with the site supervisor's permission. The idea is to more or less split the difference.

You will not have sawn *too* far on the top side but you will have a small piece of wood left at the bottom (which can often simply be chipped off with the claw end of your hammer, or a chisel if one is handy).

How to make a plunge cut TOP

It can be useful to know how to make a *plunge cut,* which is where you start the saw blade not at one edge as usual but rather in the middle of the wood. A typical example is sawing a rectangle out of a sheet of OSB, perhaps for a window. Assuming you've already marked the four pencil or chalk lines that define the rectangle, here's how to make a plunge cut.

1. With your non-trigger hand, rotate the blade guard out of the way.

2. Place only the toe of the sole plate on the wood, i.e., raise the rear of the saw so it is off the wood and the blade is hovering just above it. Place the saw so that, as best you can tell, when you lower the heel you'll be on your cut line and close to the perpendicular cut line behind the blade.

3. Then pull the trigger and, while keeping the toe stationary, barely lower the spinning blade into the wood, i.e., make a test-kiss. Check to see whether you're lined up with your cut line. If you aren't, make the appropriate correction of the toe or heel or both.

When you are lined up with your cut line, keep an eye on the *back* of the blade to see where it's going to end up relative to what will become the beginning of your cut. If it's going to end up too far back, nudge the saw forward. If it's going to end up too far ahead, raise the heel of the saw and nudge it backwards, then lower the blade again.

Keep adjusting the saw's position till, when you finally get the sole plate lowered all the way, the back of the blade just cuts into or barely behind the perpendicular line behind it

4. Now that you've got the saw positioned correctly right and left and the back of the blade is positioned correctly and the sole plate is flat on the wood, go ahead and lower the blade guard and push the saw forward in the usual way. See "How to make an incomplete cut," above, for information on how to *end* the cut before you get to the other edge.

Safety tip: As you're lowering the heel of the saw into the wood, the blade will try to move the whole saw backwards. You must and can control that tendency by using your muscles to resist the rearward force. If even that doesn't work, then raise the heel of the saw as much as you need, make the correction, and plunge slowly back in. No matter what, **don't ever let the saw get started going backwards of its own accord.**

How to make a 45-degree cut TOP

Two significant problems arise when making steep-angle cuts with a circular saw – such as for a 45-degree decorative top for a 6 by 6 newel post – that are less severe when making simple square cuts.

One is determining exactly where the cut will start, and the other is merely making the cut straight.

- When the blade is at 90 degrees and you make a test-kiss, you see where *both* sides of the blade will cut, and you see them at the same moment.

  When the blade is tilted at 45 degrees to the sole plate and you make a test-kiss, you can see only where the "bottom" side of that 1/8th-inch blade will cut. Only when you go a little farther can you see where the "top" side of the blade will cut, and that is a longer distance than when you're test-kissing at 90 degrees. So, remember to test-kiss farther away from the keeper side than normal and to push far enough or deep enough to see where *both* sides of the blade will cut.

  (In case you're interested, the Pythagorean Theorem tells us that a kerf at 90 degrees will be 41.4% wider when it's tilted to 45 degrees, because the square root of 2 is 1.414.)

- And even after you've set the saw in the correct place to make the cut, you still have to follow a straight line, and on steep-angled cuts that's always harder than when the blade is set to the typical 90 degrees. As you're pushing through, pay extra-close attention to where your blade is relative to your cut line.

Making a good 45-degree cut is easier if you know how to use your Speed Square as a fence.

How to use a Speed Square as a fence TOP

If you're having difficulty making a straight crosscut with your circ saw that follows a square line, an option is to use a Speed Square as a fence. This method is particularly useful when making cuts at angles much less than 90 degrees. Here, again assuming you're right-handed, is how to do it.

(1) With your right hand place the saw on the wood roughly where you think it should be, remembering to favor the scrap side.

(2) With your left hand place the flange of your Speed Square against the length of the wood, to the left side of the saw, with the perpendicular leg to the right.

(3) Slide the Speed Square right so that that perpendicular leg presses up against the left side of the sole plate of the saw. From now on, these two sides must always be held flush to each other.

(4) Scoot the square and the saw left or right as needed.

(5) When the left-right location is correct, press the flange of the Speed Square firmly against the wood so it won't move.

(6) Proceed with the cut. Push the saw forward so that it is guided by the fence formed by your square.

How to shorten a 6 by 6 post TOP

Circular saws with standard 7-1/4-inch blades can cut only about 2-1/2 inches deep at their deepest, which is plenty for all the cuts through 2 by wood, which is only 1-1/2 inches thick. But when it comes to a 6 by 6 post, a circular saw can't cut through it all in one pass. If you want or need to use a circ saw to shorten a 6 by 6 post, which is actually 5-1/2 inches on a side, you must make a cut into one face, then rotate the post 90 degrees, make another cut, rotate, cut, rotate and cut.

(Note that this cut is better made with a big-enough miter saw, which will always cut square and in one pass. A carefully guided reciprocating saw can do it in one pass. And although you probably won't get permission to use one, so will a masterfully guided chain saw make such a cut in one pass.)

With the circular saw, if you aren't careful you'll end up with two or three or even four mis-matched cuts. Happily, these ends are often covered up in the finished product, but it's still necessary to end up with a flat new face that's square to the length. As expensive as 2 by 4 lumber is, 6 by 6 lumber is maybe ten times more expensive, so you want to get this right the first time.

Before you start, make sure you measured and marked correctly. If you want the post to be 60 inches long then you must make sure you've marked your cut line at 60 inches, not 59-7/8. The first rule of carpentry is "Measure twice, cut once," so do feel free to test whether you've measured and marked correctly.

(1) Using a Speed Square as a fence as described in the section immediately above, make a test-kiss. Once you're on your mark then go ahead and finish the cut, being sure to make it as accurate and as square and as straight as you possibly can.

(2) Rotate the top of the post 90 degrees towards you. Again using your Speed Square as a fence, line up the

blade *with the kerf from the previous cut.* Test-kiss till you've got it matched up perfectly, then go ahead and make your next cut.

(3) Repeat Step 2 for the third and fourth cuts, then use a hand saw to cut the part still left at the center.

How to make serial cuts TOP

Serial cuts are multiple cuts of the same length made from the same piece of material. For example, you might be called upon to cut what are called *lookouts,* which are short pieces, typically of 2-inch lumber, used at the eaves of the roof. Dozens might be needed, and let's say they all need to be 10 inches long. You grab a 12-foot-long board and set it up on saw horses, and you grab your tape measure and your pencil.

What's next?

Here's an obvious but wrong way to do it. Hook your tape over one end of the board and make marks at 10 inches, 20 inches, 30 inches and so on till you run out of wood, which you will at 140 inches. If you then saw on those cut lines in the usual way, your first piece will be 10 inches, but every subsequent piece will be 1/8-inch short! The reason, as you learned above, is that the blade has width.

Here are three solutions to this problem. Choose whichever one is best for your circumstances.

Solution #1 The most obvious method is to measure, mark and cut the first piece, then measure, mark and cut the second piece, then the third piece and so on till you run out of wood. As long as you mark accurately at 10 inches and remember to place the saw blade on the scrap side of the cut line, this method will produce the desired result.

From a 12-foot board you will get 14 pieces that are 10 inches long (and you will have used up 141-3/4 inches of wood).

This is also the least efficient method of making serial cuts because of all the picking up and setting down of objects. To measure, mark and cut a typical piece you must (1) set down your saw, (2) pick up your tape, (3) pick up your pencil (and mark a crow's foot), (4) set down your tape, (5) pick up your square (and mark a cut line), (6) set down your pencil, (7) set down your square, and (8) pick up your saw. That's eight instances of picking up or setting down an object times 14 pieces, for a total of 112 instances.

Solution #1 also requires that you make each of your 42 pencil marks (two crow's-foot marks plus one cut line mark) accurately, which we know some novices volunteers sometimes aren't always careful enough at.

Solution #2 Pull your tape measure out along the whole 12-foot board and make all the crow's-foot marks at the same time. Make the first mark at 10 inches. But mark every subsequent cut line at another 10 inches *plus an extra 1/8th of an inch for the width of the blade.* In this example your second cut line will be at 10 plus 10-1/8, or 20-1/8. Your third cut line will be at 20-1/8 plus 10-1/8, or 30-2/8, and your fourth will be at 40-3/8. For a 12-foot board, your last cut line will be at 141-5/8.

If you now cut on all those lines, remembering to place the entire 1/8th-inch width of the blade on the scrap side of the cut line each time, the result will be correct.

Solution #2 requires only six instances of picking up or setting down an object for all 14 pieces, but it suffers from the significant drawback that it requires you to do math 13 times. Quick! How much is 67-7/8 plus 9-5/8?

Solution #3 Use one known-good piece as a gauge – a simple template – to mark all the other pieces.

(1) Very carefully measure, mark and cut a piece to 1/8th of an inch longer than the length you want, which in this example would be 10 plus 1/8 inch = 10-1/8 inches. Make sure both ends of this gauge block are

square and flat and that both edges really are 10-1/8 inches long. Take a moment to mark it – perhaps with your initials or a smiley face – so it doesn't get lost among the other supposedly identical pieces you're about to cut. (This is the last time you'll need your tape measure or your square.)

(2) Place your gauge block on top of what remains of the long board, flush up the pair of ends and the two pairs of edges, and mark a cut line along the other end of the gauge piece. Just to be sure, measure your cut line to make sure it really is 10-1/8 inches. If it is not, figure out why and fix the problem so you don't repeat it several times.

(3) Flush one end of your gauge block to the cut line mark you just made and mark the next cut line at the other end. Repeat this step till you run out of wood.

(4) Saw on the cut lines, making sure to place your blade on the ***keeper*** side. Normally, as you know, you should place all of the width of the blade on the scrap side, but in this case, remember, the gauge block you made was one blade-width longer than the 10 inches you want to end up with, so you must remove that 1/8 inch by *leaving* all of the *scrap* side. (When you're finished with your gauge block, cut a blade's width off of it and you'll have one last piece.)

This is by far the most efficient and most foolproof method, and here's why: (a) There's no math. (b) You measure only once. (c) You use your square only once. (d) You make only 14 easy-to-make pencil marks instead of 42 error-prone ones.

Vinyl saw TOP

As discussed (with the exception of the plunge cut), for cutting wood it is the leading edge of the teeth of the blade that must cut into the material from below. But for cutting vinyl such as for vinyl siding, which we do a lot of on job sites, the blade's teeth work better when they cut in from the *trailing* edge. It so happens that when you cut vinyl siding in the usual way using a circular saw, it can chip and spatter, especially when it's cold and the vinyl is brittle, which means your cuts will be jagged.

But it also so happens that if you merely turn the blade over, it cuts vinyl very nicely, thank you.

This means two things.

(1) If you mean to be cutting vinyl, make sure the blade is turned over. With the blade installed backwards, it cannot be used to cut wood or much of anything else except flesh, but it's the better way to saw vinyl.

Whenever a blade is installed backwards then the entire saw is called a *vinyl saw.* If someone yells at you, "Hey, you're trying to cut wood with a vinyl saw," your first reaction should be to check which direction your saw's blade's teeth are facing.

(2) If you mean to be cutting anything except vinyl then you must make sure the blade is installed in the regular way (with the teeth curling up at the front of the saw and down at the back).

Note also that, however loud your saw is cutting through wood, it will be significantly louder cutting through vinyl, so be especially careful about protecting your hearing.

How to change the blade TOP

It is useful to know how to change the blade of a circular saw, whether to turn it backwards to turn it into a vinyl saw or to turn it forwards to turn it back into a wood saw or maybe just to replace a worn-out blade.

First, unplug the saw.

Second, note that for some saws the bolt that holds the blade to the final axle is threaded in reverse. Normally if you turn a bolt clockwise it tightens and if you turn it counter-clockwise it loosens: Right-tighty, lefty-loosey. But in the case of some circular saws, the bolt's threads are reversed, which means you loosen it by turning it clockwise and you tighten it counter-clockwise.

Third, before you start disassembling, you'll want to make sure you'll know how to put all the parts back together in the correct order and orientation, so study them before you remove them. Usually there's just the blade and the bolt, but if there's a washer or something, make sure you observe how it's positioned.

● You will need a tool to change the blade. If an Allen wrench is supplied, use that. Otherwise a socket or an open-end wrench is best, but the proper pliers properly applied will also work. Loosen the bolt and remove it, remove any other parts, then remove the blade. Reverse or replace the blade, then re-assemble the parts, ending by tightening the bolt.

● It can take a considerable amount of force to loosen the bolt, so be careful not to round off the six corners on the head. The more often that bolt is carelessly loosened and tightened, the rounder those corners can get, till eventually it becomes more of a circle than a hexagon of six flats, at which point even more force is required, which makes it even more likely that you'll round off the corners some more.

It's a downward spiral that we want to avoid, so make sure to use a wrench of the correct size if one is available. If you must use pliers such as Channellocks, take care to position the teeth so they won't slip when you squeeze hard and then turn hard.

● Whether you're tightening or loosening the bolt under force, it will just spin the motor when you turn it unless you can lock up that motor somehow. Some saws are equipped with a ***shaft-lock*** mechanism. It's typically a small button that you push in and hold down to lock up the shaft of the motor so it won't spin when you turn the bolt or the blade; it's intentionally small and kind of hard to get at, so you don't accidentally push it while the saw is running.

If your saw doesn't offer that feature, you can lock the blade by placing a carpenter's pencil or similar object crosswise into one of the teeth of the blade and then positioning it against the frame or the foot plate of the saw, which will have the same effect of stopping the motor from turning.

How to make a dado TOP

Sometimes you need to make a dado in stick lumber. A *dado* is a crosscut channel sawn into the wood, usually into an edge but sometimes into a face. A circ saw is frequently used for making such a cut, which is really a series of parallel cuts.

For this example we'll gradually saw a dado into the edge of a stick of 2 by 6 lumber, and we want it to be 3-1/2 inches wide by 1-1/2 inches deep (perhaps to receive a 2 by 4 in crosswise fashion). We'll assume you've already marked the two parallel pencil lines on the edge of the wood that are 3-1/2 inches apart.

The next step is to set the depth of the cut to 1-1/2 inches. See here, above, for more information on how to set this depth correctly, but the safest method is to make test cuts in scrap wood and keep adjusting.

Now, the idea is to make a series of parallel cuts into the edge from one face to the other across the whole 3-1/2 inches. Each cut will be 1-1/2 inches deep. Start at one end (if you're right-handed start at the left end) and make your first cut at the pencil line, placing the blade on the scrap side as always.

Now set the saw about 1/4 inch farther along and make another cut parallel to the first. This will leave a little slab of wood behind. Keep doing that, making a cut and moving a little bit farther to make another one. Eventually you'll get to the other end of the dado. For 3-1/2 inches you'll make maybe 7 to 12 cuts. (As noted above, make sure to finish each cut, i.e., push all the way through and past the far face of the wood.)

You'll be left with a series of skinny slabs of wood still sticking up, with your kerfs between them. Now comes the fun part. Set down your saw and pick up your hammer. When you smack sideways into the tops of those slabs of wood that are still left after all your sawing, they'll snap off at or pretty near the 1-1/2-inch depth. Good job.

Some of the little slabs you snapped off with your hammer will not leave a smooth surface at the bottom of the dado. Depending on the circumstances, you may ignore those little bumps, or you can bash down the taller ones with your hammer, or you can very carefully sweep your saw like a router across the area using two hands, or you can get a wood chisel and really clean them up neatly.

Designated sawyer TOP

Sometimes it is desirable for one person to be the designated sawyer, meaning that person will be manning the saw making cuts for a number of people on the site, maybe for the whole day. If you find yourself in the position of designated sawyer or apprentice thereto, here are a few tips that will make you safer, more accurate, and more efficient.

● Since you will be so close to the spinning saw for so long, it is even more important that you wear *"eyes and ears,"* meaning eye protection and hearing protection.

● Take the time early on to set up the saw table the way you want it.

● When people come to you with a request for something to be sawn, make sure you understand exactly how they want it cut before you get started. Make no assumptions you should not, ask questions, and use your ever-growing experience to try to foresee problems they do not.

● Keeping in mind that materials, whether wood or siding or anything else, cost money, use your ever-growing experience to figure out ways to cut down on waste as much as possible.

● When it can be helpful, take the time to write the dimension on the wood. If you've cut three pieces in a row that are 14-1/2, 14-3/4, and 14-3/8 inches, mark each one with its size so whoever needs them can tell them apart quickly. Similarly, sometimes it is useful to mark a piece with a reminder such as "TOP" or "NORTH."

● Since you'll probably be doing a lot of measuring and marking, you'll want always to be able to lay your hands on your pencil, your tape measure, and your Speed Square. If you are wearing a tool belt then you already have this figured out. If you are not wearing a tool belt, try to find a nail apron. What you should learn not to do is set down any of these three objects randomly wherever you happen to be. Do get in the habit of taking an extra moment to store them on your person before you move on.

● Sometimes people will come to you as the designated sawyer with a piece that's already marked with a cut line. If it makes a difference, find out which is the keeper side and which is the scrap side so you know on which side of that line to place the blade. If one side is marked with an "X," that's the scrap side.

● "Leave the line." "Take the line." Sometimes when you're sawing for other people's needs you'll hear one of these commands. Keeping in mind that the cut line made by a carpenter's pencil or a chalk line has width, the convention is to split the cut line, with the blade on the scrap side as always.

But if you're told to "leave the line," that means to make the cut so that *all* of the line's width is on the keeper side. "Take the line," of course, means just the opposite, that all of the line's width should be cut away. This is carpenter talk for "I marked it a tiny bit too short [or long], so here's how I want you to fix it for me."

More details TOP

These yet more details are also in no particular order, so please read them all.

● If you examine the sole plate you'll see that the blade is not centered left and right. One side of the sole plate might be only 1-1/4 inches from the blade and the other side 3-1/8 inches from the blade. Normally this doesn't matter to you, but it does on cuts that are really short. For example, if you're trying to shorten a 2 by 4 by only half an inch, you'll want the wider half of the sole plate resting entirely on wood.

Fifty percent of the time it will work out right by chance, but for the other 50% just use either of these solutions so that the wider side of your saw's sole plate is resting on wood: (1) Cut from the other end of the board, or (2) walk around to the other side of the board.

● Generally you'll want the larger part of the board on your free-hand side. For example, assuming you're right-handed, if you're shortening a 12-foot 2 by 4 to 11 feet, you should choose to cut off the right end, not the left. This way you can use your left hand to hold onto the heavier side of the wood while you push the saw through with your right.

● Sometimes when you're working on the roof or on a ladder you need to set the saw down to free up both hands, but there's no good place to set it. Here are two solutions.

(1) Some saws, usually of the inline style, are equipped with a handy hook. Just fold out the hook and hook the saw on any nearby piece of 2 by lumber or on your ladder.

(2) If you have no better choice, try this: After raising the blade guard, into the edge (not the face) of some non-vertical 2 by lumber make a plunge cut into the wood lengthwise *and just barely deep enough,* then let go of the trigger and let the saw spin down. If you sawed deep enough, the saw will then just sit there.

● Power tools on job sites such as circular saws have short cords, so for 99% of cuts they are used with an extension cord. As you're making a long cut you don't want to unplug yourself, which is both a rookie mistake and potentially dangerous. Also, since you'll be looking at the cut you won't be able to see when you're about to trip on a cord, which you really don't want to do while holding a spinning circular saw. So, pay attention to where – from the beginning to the end of the cut – your cords will be. One solution to the unplugging problem is to knot the ends of the cords together before you plug them together.

● Sawdust blower. Sometimes the wind and the design of the saw you're using and sheer gravity combine to continually throw sawdust on the very cut line you're trying to follow, making it difficult to see it and thus stay accurate. One solution is to enlist the help of a sawdust blower, i.e., someone with a good set of lungs who will stay ahead of you and blow the sawdust away when needed.

● Particularly when you're cutting a piece into two pretty much equal parts, it's easy to lose track of which one is the scrap and which one is the keeper. The convention is to mark the scrap piece with an "X" just after marking the crow's foot or the cut line, so start getting into that habit now.

Now that you've read this How-To article on circular saws, you might know more than others on the site, so we'll hope you'll pass on your new knowledge. Circular saws replaced hand saws generations ago because they are so much more efficient at sawing. But with a hand saw you could make only one push or pull before you realized you were cutting into a person. With a circular saw, spinning along at over 4,000 rpms, you might not realize till it's much too late. Follow the rules above, always keep thinking about safety, and you'll enjoy a fine and happy day with us.

We thank you for volunteering on a construction site, and we hope you find the experience pleasurable and educational and worthwhile. Your hard work and earnest efforts will help a deserving family afford a house you built, and that is always worthwhile.