

Chain Saw Safety¹

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Although once used only by professional lumberjacks, chain saws are now popular among many homeowners and farmers. Homeowners use them to cut firewood and to do general tree trimming around their homes. Farmers find them very useful for such jobs as clearing land, trimming trees and cutting firewood.

However, in the hands of a careless or inexperienced operator, chain saws can be very hazardous. The U.S. Consumer Product Safety Commission estimates that in 1979 approximately 50,000 people required hospital treatment for injuries associated with chain saws. Most accidents were caused by the operator coming into contact with a moving chain saw blade. Injuries from a chain saw are usually serious because they leave a jagged cut.

SHOPPING FOR A SAW

The first step to safely operating a chain saw is selecting a saw that fits your needs and is quiet, balanced and equipped with safety features.

First, you must decide whether a gasoline or electric chain saw is best for you. Consider the following points when selecting a saw.

Electric-powered saws (Should be listed by the Underwriters' Laboratories (UL)):

- Require a nearby, convenient source of electricity.
- Need no fuel.

- Run quietly.
- Start easily and instantly.
- Are limited in guide bar length (usually under 14 inches).
- Can be used indoors.
- Have potential for shock hazard.
- Usually cost less.
- Vibrate less.
- Have no exhaust fumes.

Gasoline-powered saws:

- Can be used anywhere; not limited by electric cord.
- Use gasoline-oil mixture as fuel.
- Are relatively noisy and smokey.
- Require some effort to start.
- Available in many engine and guide-bar sizes.
- Intended for outdoor use.
- Have potential for fire or burn hazard.

Second, consider the length of the guide bar. Match the bar size to the type of job you expect to do most often.

Mini or lightweight saws have 8- to 12-inch guide bars; they are for light and occasional use for limbing, cutting small logs and felling very small trees.

Midweight saws have 14- to 20-inch guide bars; they can be used for frequent log cutting and felling of small trees.

1. This document is GO1959, a series of the University Extension, the University of Missouri-Columbia, Columbia, MO 65211. Publication date: October 1993.

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Heavyweight saws have guide bars that are more than 20 inches long. These saws are not generally recommended for non-professional saw owners.

If the guide bar is substantially longer than the thickness of the wood to be cut, accidental contact between the guide bar tip and a branch, the ground or other object could result in a serious kickback injury.

If the guide bar is too short, you will have to bury the tip of the guide bar in the cut. Although most manufacturers indicate that a saw can cut a log twice as thick as the guide bar, burying the tip of the guide bar in the wood could also result in a serious kickback injury.

YOU AND YOUR SAW

First, in preparing to operate the saw safely, read and study the operator's manual. Even if you are an experienced operator, you should periodically review safe operational procedures. If you buy a used saw, ask the previous owner for the operator's manual or write the saw manufacturer for a copy.

Before you cut firewood or timber, outfit yourself with the proper clothing and personal protective equipment that will help reduce the possibility of a serious injury. Use the following list as a guide.

- **Clothing** should be well-fitted and free of dangling or ragged edges that could become tangled in the saw. For additional protection, use nylon mesh protective leg chaps and/or knee pads to provide increased protection to your legs.
- A **hard hat** protects your head from falling limbs or branches. A properly fitted hat is cool, comfortable and provides important protection from serious head injury.
- **Safety goggles or safety eye glasses** with side shields prevent injury from flying wood chips, twigs and sawdust.
- A good pair of comfortable **ear muffs or ear plugs** protect your ears from continual exposure to the 95 plus decibel noise level from the saw.
- A good pair of light-weight **leather gloves** protect your hands from abrasions, splinters and cuts.
- A pair of **safety boots** or shoes with high tops will help protect your ankles in the event of accidental contact with the moving saw blade. Steel toes will

help protect your feet from injury from falling limbs or logs.

PREPARE THE SAW

A saw in good condition is safer and easier to operate. Preventive maintenance will allow you to cut more wood quickly and safely. Maintenance includes sharp teeth, correct chain tension, proper lubrication and a properly tuned engine. Check your operator's manual for this maintenance information.

A properly sharpened chain. If you notice that the chain tends to walk sideways while cutting or the cut shows fine powder instead of chips, or if you find yourself pressing down hard to keep cutting or smell burnt wood, your saw needs sharpening.

Follow the instructions outlined in your owner's manual when sharpening the chain. If you do your own sharpening, use the proper tools. Wear gloves or use a rag over the chain to protect your hands from the sharpened cutters.

Correct chain tension. To assure good cutting action and a long chain life, check chain tension. If too loose, a chain will derail; if too tight, a chain will bind.

All chains stretch with use. Most of the stretch occurs during the first half hour of operation. Follow the manufacturer's recommendation on chain tension. Most manufacturers recommend that a cold chain be tightened to where the chain tie straps hang away from the bar rail about 1/32 of an inch at the center of the bar. A warm chain should be adjusted to a 1/8-inch gap.

Proper lubrication. Lubrication will prolong a chain's useful life. On saws with automatic oilers, be sure the oiler is properly adjusted so it doesn't over-oil and run dry during operation. Remember that automatic oilers need an extra squirt of oil occasionally.

Occasionally the bar-oiling mechanism plugs up; serious damage to the saw can result if this is not corrected. If the chain smokes while operating, there is not enough lubrication. To check for bar oiling, hold the saw tip above a light colored, dry surface and accelerate the engine. Oil should spatter on the surface if the oiler is operating properly. If not, remove the guide bar and check the chain oil discharge slot.

Tool kit. Every owner should have a good tool kit to help ensure continued operation of the saw. The kit should contain the following:

- A few extra labeled cans or a plastic bottle (with attached pouring nozzle) of chain oil.
- Wrenches to fit all nuts and lugs on the saw.
- Screwdriver.
- Round file and guide for touching up the chain.
- Flat file and depth gauge to file the depth guides.
- Small brush (1/2 inch) to clean away sawdust and wood chips from around gas cap and cooling fins.
- Extra spark plug.
- Owner's manual (wrapped in a plastic bag).
- Cleaning rags.
- Sharp ax.
- Sledge hammer and wedges.
- Multi-purpose fire extinguisher.
- Shovel.
- Supply of fuel in a UL-listed and/or FM-approved safety can.
- First aid kit.

OPERATING TECHNIQUES

Refueling and starting the engine. Since the chain saw engine is a two-cycle engine, use the manufacturer's recommended fuel mixture. When refueling the engine, use a funnel or flexible nozzle to avoid spillage on the engine.

Only refuel the engine when it is cool.

If fuel is spilled, thoroughly clean the engine with the saw on the ground and in an area cleared of combustible materials.

Do not smoke during refueling.

Each time you refuel, check the refill oiler, air filter, chain tension and the tightness of all nuts, bolts and screws.

Starting the engine. With one foot placed in the bracket to the rear of the unit, start the saw engine on level ground. Set the starting controls. Grip the top handle of the saw firmly with one hand; use your other hand to pull the starting rope. Smaller saws may not have a foot bracket, so make certain the saw is held firmly on the ground. Never drop start the saw.

Felling procedures. Before you attempt to fell any tree, consider its characteristics. One tree may lean, and another tree might be unbalanced because of uneven top growth or breakage even though the trunk doesn't lean. Large diameter branches are also a good indicator of imbalance. Also consider wind conditions, which can have a dramatic effect on the direction of fall.

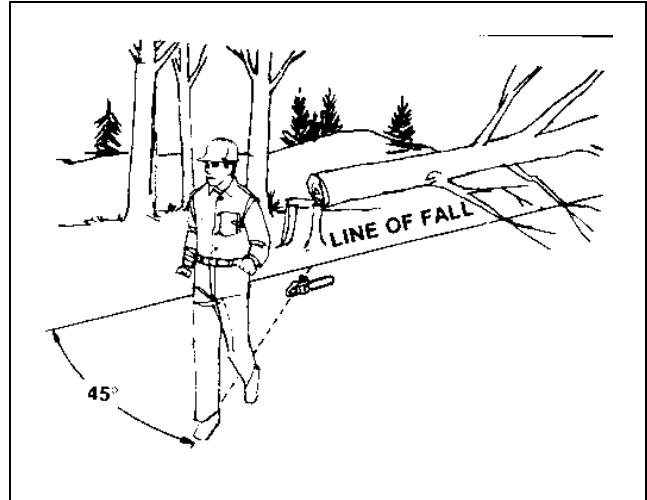


Figure 1. Plan a safe, unobstructed path of retreat before making felling cut.

Clear the ground. Before you start to cut, clear the ground around the base of the tree of low or dead limbs, underbrush and other obstructions. This precaution should provide clear vision, unrestricted movement and an unhampered escape route when the tree begins to fall (Figure 1).

A felling and safety plan. In advance, plan your escape route to either the rear or side, depending on the likely direction of the fall. When the tree starts to go, shut the saw off and drop it in a place that will allow an unhampered escape.

When you have determined a felling and safety plan, proceed as follows:

1. Hold saw firmly with both hands.
2. Make a cut close to base of the tree but high enough to conveniently avoid running saw into the ground.
3. Cut through trees up to 8 inches thick with one cut.
4. On larger trees, notch (undercut) at least one-third of trunk diameter on fall side of trunk. Make lower cut of the 45-degree notch first to prevent pinching or binding of the chain by wedge.
5. Make felling or back cut on the opposite side of the trunk 2 inches above and parallel to the horizontal notch. Leave wood fibers to act as a hinge to keep tree from twisting and falling in the wrong direction or kicking back on the stump. (See Figure 2).

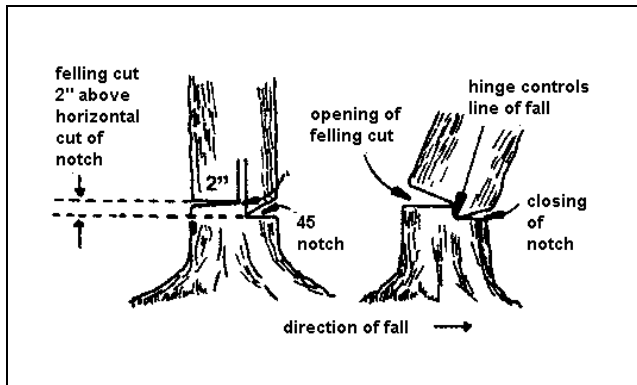


Figure 2. Tree fall direction can be closely controlled with properly made notching and felling cuts.

6. Keep the guide bar in the middle of the cut (horizontal) so cutters returning in the top groove do not re-cut. Guide saw into tree. Do not force it. Rate of feed will depend on the size and type of timber being cut.
7. Remove saw from cut and shut off before the tree falls.
8. Cutting completely through hinge fibers may allow tree to fall in any direction, possibly on the retreating operator. Move away from the tree at a 45-degree angle through the cleared retreat lane.

Wedges. A well-balanced tree may have to be wedged, pulled or pushed to fall in a desired direction. Wedges are the most dependable means of controlling the direction a tree will fall.

Use two wedges rather than one to insure that the tree falls forward. Use a sledge or mallet with a face at

least 1/3 larger than the breadth of the wedge. Strike squarely with firm, but not excessive, blows. Careless blows may pop the wedge out, swinging the tree backward. Using an ax head as a wedge or driver is dangerous. The steel is likely to splinter, and flying particles might strike the user.

LIMBING

After the tree is on the ground, take a look at each limb before making the cut to be sure that cutting the limb off will not bind the guide bar or cause the trunk to roll toward the operator.

Do not face the limb squarely. Stand at a 45-degree angle so that if the saw slips or completes the cut sooner than expected, the chain will not strike your leg.

Sawing with the point of the guide bar (nose sawing) greatly increases the chances of chain saw kickback (Figure 3). If the chain suddenly hits a solid object or takes too large of a cut, then the saw may be forced backward. This could result in a serious accident.

Preventing kickback. Follow these steps to prevent kickback:

1. Hold the saw firmly with both hands.
2. Grip the top handle by putting your thumb around it.
3. Use a saw equipped with a chain-brake or kickback guard.
4. Watch for twigs that can snag the chain.
5. Don't pinch the bar while cutting the log.

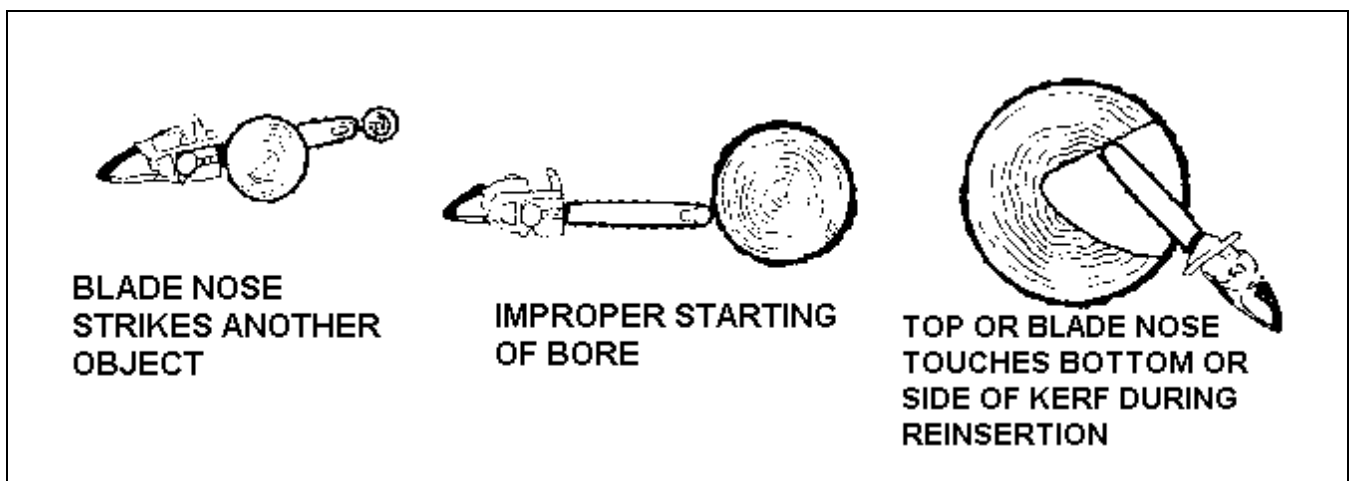


Figure 3. Avoid situations which can cause kickback.

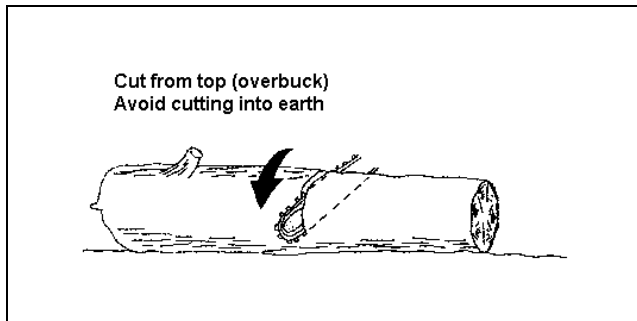


Figure 4.

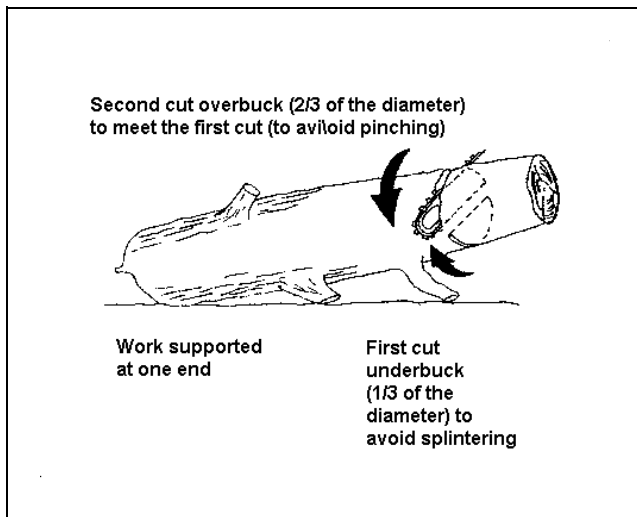


Figure 5.

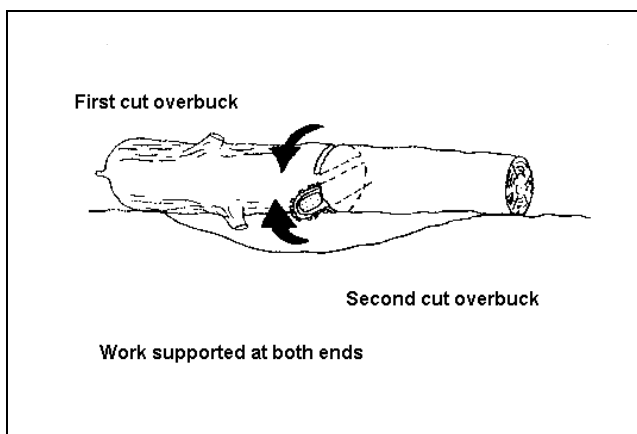


Figure 6.

6. Saw with the lower part of the bar close to the bumper, not on the top near the nose.
7. Maintain high saw speed when entering or leaving a cut in the wood.
8. Keep the chain sharp.

9. Don't reach above shoulder height to cut. The chain is too close to your face in this position.

Never make cuts with the saw between your legs. Never straddle the limb you are cutting. Always be aware of the direction the chain will go if it breaks, and keep people clear of this area. Stand on the side of the trunk opposite the limb you are cutting.

While limbing or cutting the trunk (bucking), make sure the chain does not hit the ground. An operator can cut 40 trees and not damage the chain the way striking the ground one time can.

BUCKING (CUTTING THE TRUNK)

If the trunk is supported along its entire length, overbuck. To overbuck, make cuts into 1/3 of the diameter of the log from the top down the length of the trunk. Then roll the log over and make the final cuts. This procedure prevents pinching the guide bar and chain (Figure 4).

If the log is supported on one end, make the first cut from the underside 1/3 the diameter of the log (underbuck). Then complete the cut from the top side (overbuck) (Figure 5).

When the log is supported from both ends, cut 1/3 the diameter from the top (overbuck) then complete the cut by cutting upward from the underside (underbuck) to meet the first cut (Figure 6).

Whenever the saw is being operated, keep people well out of the cutting area. If a person is assisting by removing limbs, be aware of your assistant's position and activity at all times.

When cutting logs with a large diameter, operate the saw with the throttle about three-quarters open. Overpowering the saw will waste fuel and create unnecessary wear. Under-powering will not push enough air through the cooling fins and may cause engine overheating. A saw buck is a handy device for safely cutting wood to the proper length. You can find plans in your owner's manual or at your local library.

ELECTRICALLY POWERED CHAIN SAW SAFETY

Electrically powered chain saws require some special safety precautions. Use only a three-wire cord of the proper size with three-pronged plugs and a grounded

three-wire outlet. A ground fault interrupter in the power supply line will help prevent fatal shocks.

The soil in the work area should be relatively dry. Avoid working in areas where foliage or the ground is wet.

Lay out the cord so it will not interfere with your work. Take care to place it so that you don't inadvertently cut it with the saw or trip on it.

Make sure the saw switch is in the "off" position before completing the electrical connection. Always unplug the power before making adjustments and when the saw is not in use.

TRANSPORT AND STORAGE

For transport, set the saw level with the gas cap up. Be sure the saw cannot tip over and spill gasoline. Avoid carrying the saw in the passenger area of a vehicle. Protect yourself and the chain. Use a chain guard or a carrying case to protect yourself as well as the chain.

For storage, drain the fuel tank in a safe area. Run the engine at idle until it stops to remove the remaining gas from the engine. Remove the chain and store it in a container of oil. Disconnect the spark plug wire to reduce the possibility of accidental starting. Store the saw out of reach of children.

FEATURES FOR CONVENIENCE AND SAFE USE

Balance. Saws should not tip to either side or rock back with the guide bar tilting toward the operator. The saw should feel balanced and comfortable.

Hand guard. This is a bar in front of the forward handle that keeps the left hand from slipping onto the chain.

Chain brake (Gasoline only). This feature is designed to stop the chain in a fraction of a second if a kickback occurs, thus reducing the chances of serious injury. A chain brake can also serve as hand guard.

Spark arrester (Gasoline only). A spark arrester keeps sparks from being ejected by the exhaust. It is required in some areas of the country.

Safety tip. A safety tip covers the chain as it passes around the nose of the guide bar. It reduces the chance

of kickback by keeping the chain from contacting anything at the guide bar tip.

Trigger or throttle lockout. This feature guards against inadvertent saw chain motion.

Chain catcher. A chain catcher helps with electrical safety. If you choose an electric chain saw, select one that has been UL listed.

Vibration reduction system. Rubber bushings between the handle and saw body or on the engine mountings help reduce the vibration you feel when sawing. This reduces fatigue.

Bumper spikes. Most saws have large spikes on the front of the engine or motor housing that grip the wood and help hold the saw in place during cutting.

Automatic chain oiling. This feature automatically oils the chain.

Automatic chain sharpening. This helps keep the chain sharp while on the job. Manual sharpening should still be performed every three to four hours of use. Excessive use causes chain wear.

Compression release (Gasoline only). This makes starting large engines much easier.

Case and/or chain sheath. This protects the saw from dirt during storage and transfer.

Adjustment tool. This is a tool with the proper wrench sizes for adjusting the chain and removing spark plugs.

Table 1. Selecting a Chain Saw.

Type	Guide bar length	Use
Mini or lightweight saws	8 to 12 inches	Light and occasional use for limbing, cutting small logs and felling very small trees.
Midweight saws	14 to 20 inches	Frequent log cutting and felling of small trees.
Heavyweight saws	Over 20 inches	Professional use, not generally recommended for consumers.

Table 2. Chain saw troubleshooting guide.

Symptom	Problem	Correction
Difficult or poor cutting	Chain dull	Sharpen chain
	Improperly sharpened chain	Check chain
	Chain installed backward	Turn chain around
	Improper chain tension	Correct chain tension
	Bar and chain aren't being lubed	Fill oil tank, adjust oiler
	Damaged guide bar	Inspect guide bar
	Exhaust ports dirty	Clean muffler and exhaust ports
	Fuel filter dirty	Clean fuel filter
Oiler not working	Improperly adjusted carburetor	Adjust carburetor
	Out of oil	Fill oil tank
	Oil hole plugged	Clean oil supply hole
	Oil strainer dirty	Clean oil strainer
	Oiler adjusted incorrectly	Adjust oiler
Engine won't start	Plugged vent on oil tank cap	Clean vent on oil tank cap
	Improper starting procedure	Follow correct procedure
	Fuel tank empty	Fill fuel tank
	Engine flooded	Clean spark plug
	Carburetor adjustment incorrect	Adjust carburetor
Engine dies or accelerates poorly	Spark plug fouled	Clean or replace plug
	Fuel tank empty	Fill fuel tank
	Air cleaner dirty	Clean air cleaner
	Spark plug fouled	Clean or replace plug
	Carburetor adjustment incorrect	Adjust carburetor
	Plugged vent on fuel tank cap	Clean vent on fuel tank cap