



# Safe Chain Saw Operation

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The chain saw is a versatile tool which can be used for many jobs. Homeowners use them to cut firewood and to do general tree trimming around their homes. Farmers and ranchers find them very useful for such jobs as clearing land, trimming trees, cutting fence posts, and cutting firewood. These saws are excellent tools for all these jobs. However, in the hands of a careless or inexperienced operator, they can be very hazardous. The U.S. Consumer Product Safety Commission estimates that in 1989 approximately 37,278 persons required hospital emergency room treatment for injuries associated with chain saws. Most of these accidents were caused by contact with the chain saw blade while it was moving. Many of the victims momentarily forgot that this same machine which is designed to cut through wood can also just as easily cut through an arm or leg.

## Preparing the Saw For Operation

The first step in safely operating a chain saw is to prepare yourself and your saw for operation. To prepare yourself, carefully study the operators manual so that you are thoroughly familiar with all aspects of safe operational procedures (Figure 1). The owners manual will also provide you with good detailed information about recommended maintenance practices necessary to keep your saw running smoothly and safely. Before you operate a particular saw for the first time and periodically thereafter, you should carefully review the owners manual. Always be sure when buying a new saw that it comes with an owners manual. If you buy a used saw, ask the previous owner for the manual, or write to the saw's manufacturer for a copy.

A sharp, properly tightened chain is an important part of preparing your saw for operation. When the chain is dull, you increase the effort needed to cut through a piece of wood. You always risk the possibility of injury to yourself and damage to the saw. Your saw needs sharpening when the sawdust turns from chips into a fine powder and you find yourself pressing down hard to keep cutting. Smoke or the smell of burnt wood are also good indications that the chain is dull.

Sharpening a chain is a relatively easy task if you use the proper tools and follow the instructions outlined in owners manual. Be sure to use the recommended filing guides and depth guides for the particular chain you are using. The use of these guides will assure that you get the proper angle on the cutters and that the depth gauges are filed to the correct depth

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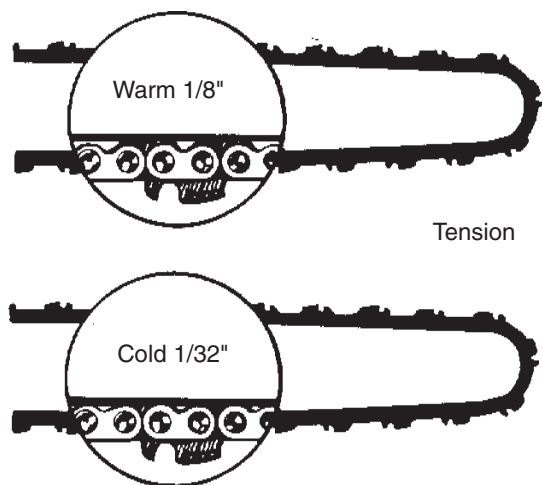


**Figure 1. The owners manual is your best source of information on safe operation and maintenance.**

for maximum cutting efficiency. Whenever you are sharpening a chain, be sure to wear gloves, or use a rag over the chain, to protect your hands from the sharpened cutters.

Correct chain tension is very important to ensure good cutting action and long chain life. Chain tension should be adjusted to ensure quick, smooth cutting action. Too loose a chain will derail, too tight a chain will bind. A cold chain should be tightened to where the chain tie straps hang away from the bar rails about  $\frac{1}{32}$  of an inch at the center of the chain span. A warm chain should be adjusted to where the chain hangs about half way out of the bar at the center of the chain span. This would leave about a  $\frac{1}{8}$  of an inch gap between the tie-straps and bar rails (Figure 2).

Proper lubrication will prolong chain life. During operation, pump the oiler frequently. Periodically you should stop the engine and pump the oiler while pulling the saw chain around by hand. This will ensure good, even oiling of the chain. Be sure the motor on-off switch is turned to off and the spark plug wire is disconnected. During cold weather, you can dilute the oil with kerosene to ensure good, even lubrication. You will need to lubricate the chain about twice as often when using this mixture. When the chain is not being used, keep it soaking in a can of oil.



**Figure 2. Correct chain tension is very important to ensure good cutting action and long chain life.**

On chain saws with automatic chain oilers, be sure the oiler is properly adjusted to that it doesn't over-oil and run dry between refueling stops. One thing to keep in mind is that even automatic oilers need an extra squirt occasionally to ensure proper lubrication of the chain. One indication of not enough oil is the presence of smoke while the chain is operating.

Occasionally the bar oiling mechanism plugs up, and this can cause serious damage to the saw if not corrected. To check for bar oiling, hold the saw tip above a light colored, dry surface and rev the engine. Oil should spatter on the surface if the oiler is operating properly. If this does not happen, remove the guide bar and check the chain oil discharge slot.

Proper tension and lubrication are crucial when a new chain is being broken in. Never break in a saw chain under a heavy cutting load. Improper break-in procedures can quickly ruin a new chain. To ensure long chain life, carefully follow the manufacturers recommendations for proper break in procedures.

The following are some additional tips for chain saw care:

1. Always use a chain guard when transporting a saw, it will protect you and your saw.
2. Keep the carburetor adjusted such that the engine operates at the recommended speed during cutting and the chain clutch disengages immediately on release of the throttle trigger.
3. Turn the bar over after each full day of use to equalize wear on the bar rails.
4. Keep the entire unit well oiled and cleaned. In particular, clean the bar grooves, fins, air filter, muffler, and hand grips on a regular basis.
5. Inspect the entire unit regularly. Replace damaged or worn parts.

## Personal Protective Equipment

The proper use of personal protective equipment should be a major concern of every chain saw operator, from the occasional user to the full-time professional. Before beginning to cut firewood or timber, you should outfit yourself with the proper personal protective equipment to help reduce the pos-

sibility of a serious injury (Figure 3). Your personal protective equipment should include the following items:

- A hard hat to protect your head from falling limbs or branches. A properly fitted hat is cool, comfortable and provides important protection from serious head injury.
- A pair of safety goggles or eye glasses with safety lenses to prevent injury from flying wood chips, twigs, and sawdust.
- A good pair of comfortable ear muffs or ear plugs to protect your ears from continual exposure to the 95+ decibel noise pressure from the saw engine. The unprotected operator should limit his operating time to a maximum of one hour per day.
- A good pair of light weight gloves to protect your hands from abrasions, splinters, and cuts.
- A pair of heavy work boots or shoes. A pair with high tops will 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.
- Clothing which is well-fitted and free of dangling or ragged edges which could become tangled in the saw. The use of nylon mesh protective leg chaps and/or knee pads can provide increased for your legs.



**Figure 3. Proper personal protective equipment should be a major concern of every saw operator.**

## Back-Up Equipment

Saw-related back-up equipment is also important. Shovels and fire extinguishers are required by law in some areas. A two-to-five gallon pressure type garden sprayer filled with water makes a good extinguisher for most conditions. A two-to-five-pound, AB class, chemical extinguisher would also provide the necessary protection. Other back-up tools should include an ax, sledgehammer, and wedges. A saw case or protective chain scabbard can help reduce damage to a sharp chain during transport. Maintenance tools including a sharpening file for dressing the chain and a screwdriver and wrench for making needed throttle and chain tension adjustments should also be readily available.

You should have plenty of fuel readily available in a well-marked can that is small enough for easy handling. A small funnel or pouring spout should be available to minimize spilling. Sufficient chain oil should also be handy in a dispenser bottle or small container to keep the saw properly lubricated.

## Safe Operational Procedures

A major concern during chain saw operations is the potential for fire. During a period of dry weather conditions, it is important to exercise extreme caution. Care should be taken to keep the engine head and muffler, which can become very hot during operation, from coming in contact with dry leaves, needles, or sawdust. Sawdust should be brushed from the motor regularly. Oily sawdust accumulations on the chain saw can easily ignite, drop off, and start a fire. Hot exhaust sparks directed into dry tinder could also cause a fire, as could sparks caused by the chain striking a stone or piece of metal.

To refuel the saw without mishap, take it to a clear area away from the work area. This will help prevent spills onto leaves, needles, or sawdust where a spark could easily start a fire. It is a good practice to always allow the saw to cool for five minutes or so before refueling. This will reduce the possibility of the hot engine igniting the fumes that are always present when gasoline is poured from one container to another. When removing the fuel tank cap, slowly turn it a quarter of a turn to allow any built-up pressure to escape before removing the cap completely. Use proper funnels and spouts to prevent spills and a fuel can small enough for easy handling. Be sure to leave recommended expansion space in the tank. Never smoke while refueling, or refuel in an enclosed area near a gas hot water heater or other flame source. Always start the saw in a different location from where it was refueled.

When starting the saw engine choose a clear, level surface as close to the work area as possible. Hold the saw firmly against the ground by placing one hand on the front handle and the inside of one knee on the rear handle. Pull the starter rope as briskly as you can to give the engine a rapid spin. Do not yank the cord out to the very end as this could damage the starter mechanism. Also, hold the grip and let the starter cord rewind evenly instead of letting it snap back. If the saw is cold, allow it to warm up for a minute or so before beginning work.

It is safer to carry an idling saw into a cluttered area rather than start it under adverse conditions. Carrying a running saw is dangerous-but, it is more dangerous to start it in an unsatisfactory location. Plan your approach path ahead of time and watch your footing and balance when crossing obstacles. Always carry the saw whether it is idling or stopped with the

muffler away from your body and with the chain in the rear. Be aware of helpers or bystanders when carrying an idling saw.

When operating the saw, hold it securely with both hands. Keep your weight well balanced on both feet. Since you will be exerting pressure to cut, guard against loss of balance by being ready to hold up on the saw as it cuts through the wood. Make sure thumbs and fingers completely encircle the saw handle. Keep your elbows and knees slightly flexed for maximum control. Avoid cutting above shoulder height as you could lose control on completion of the cut and the saw would swing into your body. Operate the saw to the side of your body so it will not swing into your body if it suddenly kicks back, comes out of the cut, or cuts thorough unexpectedly (Figure 4).

Cut with the lower side of the saw as much as possible. This is the safest and least tiring position. Keep the guide bar in the middle of the cut so that the cutters on the opposite side do not bind. A wide kerf (cut), fine sawdust instead of chips, or a need for force indicates a sharpening is due. Be careful not to allow a running saw chain to contact the ground or metal because it can dull the chain more than cutting dozens of trees.

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.



Figure 4. Keep your body to the left of the cutting plane.

A ground fault interrupter (see Fact sheet BAE-1900) 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 in a manner which will not interfere with your work. Care should be taken to place it in such a manner that it will not inadvertently be cut by the saw or be underfoot where it could trip you. Check to be 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.

## Preventing Kickback

In the operation of a chain saw, engine torque is transferred to the chain. This energy is then used to cut wood. If the chain suddenly hits a solid object (or takes too large a cut) and is stopped for an instant, the engine torque is transferred to the guide bar and chain saw as a rotation around the center of mass. The direction of this rotation depends on where the contact is made along the guide bar. If the contact is made at the upper 90 degree quadrant of the bar nose, the rotation will be an upward arc toward the operator. This arching movement of the saw blade is called kickback. Kickback is the most dangerous of all chain saw hazards (Figure 5).

The degree of violence with which a saw will kickback is increased by: 1) a dull chain, 2) too low a chain depth gauge setting; 3) chain tension that is too loose; 4) making chain contact at the upper quadrant of the bar nose section; and 5) blind-cutting or boring with the bar nose at less than full throttle speed.

A chain can lock or a saw can kickback for many reasons. The most common cause of kickback is that small, hidden limb that catches the upper quadrant of the bar nose. Watch for these other kickback causes:

- Abrupt changes in wood characteristics, i.e., green to dry knots, etc.
- Running the saw too slowly.
- Build up of damp sawdust.
- Twisting the saw so that the cutters grab in the wood.
- Sawing with the point of the guide bar.
- Improper filing of the chain which results in "hooks" on the cutters or sharp corners on the depth guides.

Kickback is responsible for about one-third of the serious injuries which occur each year with chain saws. Avoiding kickback should be a major concern of all chain saw operators. To avoid kickback, take these precautions:

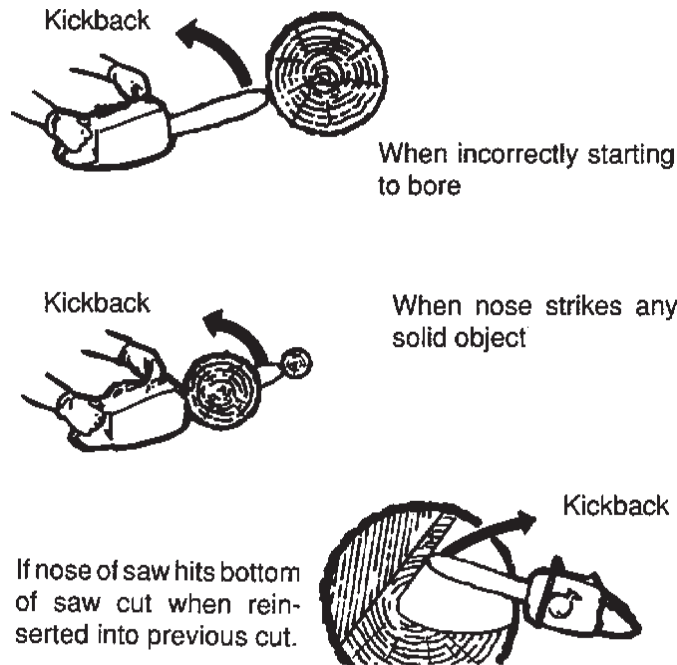


Figure 5. Situations which can cause kickback.

- Keep a firm two-hand grip on the saw with your thumb securely wrapped under the front handle.
- Avoid standing directly in line with the cut.
- Do not cut above shoulder height.
- Be alert for obstructions such as limbs and twigs which could catch in the chain.
- Use safe operating techniques at all times.

## Transport and Storage

For transport, set the saw level with the gas cap up. Be sure the saw can not tip over and spill gasoline. Avoid carrying the saw in the passenger area of the vehicle. Protect yourself and the chain with a chain guard or by placing the saw in a carrying case.

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.

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