

CHAIN SAW CUTTING TECHNIQUES

by Sharon Lilly, Ken Palmer and Rip Tompkins

Learning objectives— The arborist will be able to

- describe the items of personal protective equipment that are required for operating chain saws
- explain the reactive forces that can result when using a chain saw
- demonstrate safe working techniques for limbing and bucking
- explain the basic safety standards for using a chain saw in a tree

A chain saw is one of the most common pieces of equipment used by arborists. Without proper training, however, chain saws can be among the most dangerous to operate. A skilled tree worker can use a chain saw safely and efficiently to save time and effort. Safe chain saw operation requires proper training and adherence to all safety regulations. Become familiar with all applicable safety standards, and always read and follow the chain saw operator's manual provided by the manufacturer.

Review of Personal Protective Equipment

Never operate a chain saw without wearing the proper personal protective equipment (PPE). This equipment includes an approved hard hat, eye protection, hearing protection and boots. Leg protection, such as chain saw pants or chaps, is required when cutting on the ground (Z133.1, Section 4.2.8). Recent innovations in PPE include shirts, jackets, gloves, and boots that are equipped with chain saw protective materials.

Reactive Forces

Before using a chain saw, you should be aware of the reactive forces created when you operate the saw. If you are cutting with the bottom part of the bar, the saw tends to pull away from you, into the cut. When you cut with the top of the bar, the saw tends to push back toward you (Figure 1).

Sharon Lilly, a Certified Arborist, is ISA's director of educational goods and services. Ken Palmer is president and CEO of ArborMaster® Training, Inc., Willington, Connecticut, and is a three-time ISA international tree climbing champion. Rip Tompkins, vice president of ArborMaster® Training, Inc., is the owner of Barkbusters Tree Service in Weston, Massachusetts. He is the 1996 international tree climbing champion.

The most dangerous of the reactive forces is kickback (Figure 2). Any time the front, upper quadrant (kickback quadrant) of the tip of the chain saw bar contacts an object, the chain saw reacts by rotating back toward the operator. Kickback occurs at a rate seven times faster than a human can react. Dodging the saw's reaction is not possible (Figure 3).

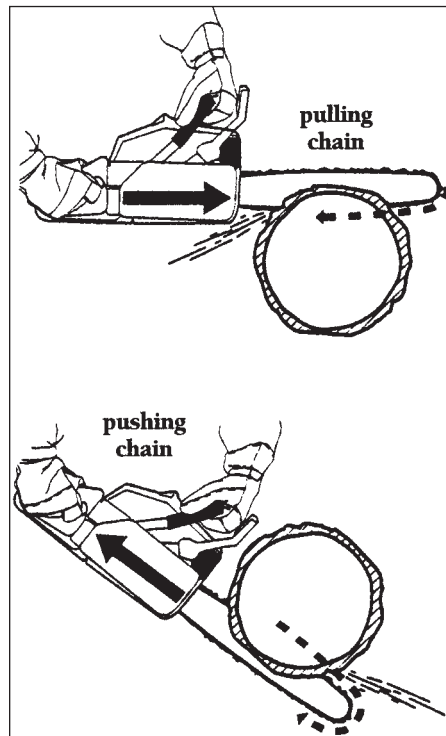


Figure 1. Reactive forces.

Safe Starting Positions

There are a couple of different ways to start a chain saw safely. The safest technique is to start the saw on the ground (Figure 4). If the saw must be started while standing, the leg-lock method is recommended. Drop-starting the saw is not recommended and can lead to loss of control of the saw.

On the Ground

Place the saw on firm, level ground, away from fuel or any obstructions. Turn the switch on (and the choke out for a cold saw). Some saws are equipped with a compression release button that should be engaged to facilitate starting. Engage the chain brake. Place your right foot in the rear handle and grip the front handle firmly with your left hand. With your right hand, pull the starter cord slowly until the starter mechanism engages. Then apply a short, sharp pull to the starter rope until the engine starts.

Leg-Lock Technique

Turn the switch on and engage the chain brake (Figure 5). Place your left hand on the front handle with your thumb around the handle bar and your wrist locked. Lock the rear handle into position behind your right knee such that the saw points away from your body. With your right hand, pull the starter cord in direct line with the starter assembly (Figure 6).

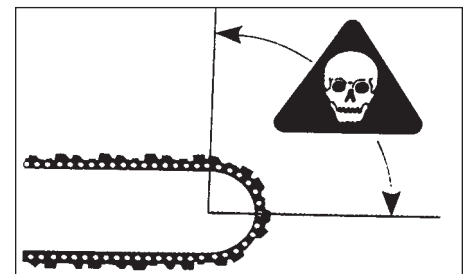


Figure 2. Avoid allowing the kickback zone of the bar to make contact with an object.

Safe Chain Saw Use

When you operate a chain saw, the thumb of your left hand should be wrapped around the front handle and your right hand should be on the rear handle. This is true for both right- and left-handed people. Never operate a chain saw with one hand. A firm grip will help you maintain control of the saw and reduce the chances of kickback. Stand with your feet firmly planted. Never cut above shoulder height—the saw is harder to control and the likelihood of injury from kickback is much higher.

Limbing

Limbing is the process of cutting off the side or lateral branches of a downed tree.

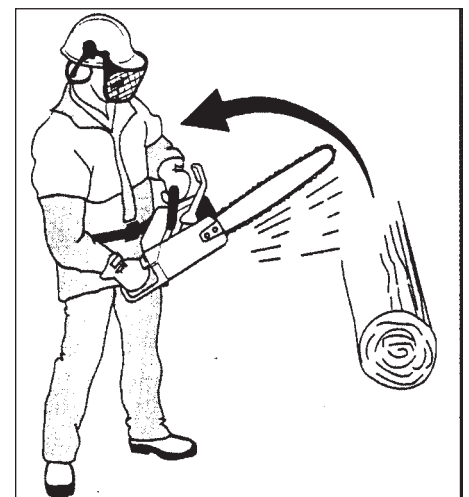


Figure 3. Kickback occurs much faster than a human can react.

Before beginning, be sure the tree cannot roll. Block or shim the tree if necessary. Work on the uphill side, and be sure that you have stable footing. Avoid being in a position where a limb could hit you.

Take extra care when there is more than one worker. The cuts that one worker makes can affect the part of the tree where

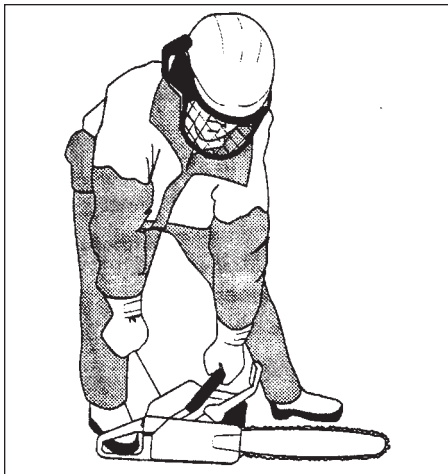


Figure 4. Safe starting position.

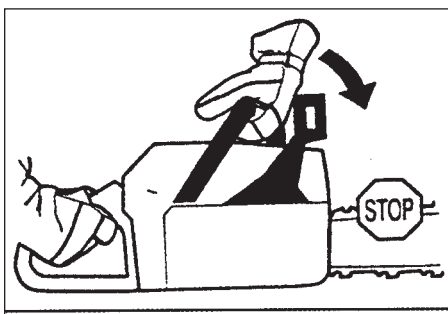


Figure 5. The chain brake is designed to stop chain rotation immediately when engaged.

another is working. Workers should stay at least ten feet apart.

Always engage the chain brake if you must take one hand off the saw to move a limb or when taking more than two steps with the saw running. It is easy to trip or lose your balance when walking around logs and limbs.

Body positioning is an important factor both for safety and efficiency. Using the saw in the most ergonomic way can reduce fatigue and the potential for injury. When practical, cut on the opposite side of the tree from where you are standing. Keep the saw close to your body to reduce fatigue. Keep both hands on the saw, with your thumbs wrapped around the handle bars. Be conscious of the kickback corner and the reactive forces of the saw.

Cutting Limbs Under Tension

Branches bent under tension can be hazardous. When the tension is relieved in making the cut, they can spring back toward you. If you cut on the wrong side of a branch under tension, the saw bar may become pinched.

If the limb is under downward pressure, start with a small undercut (or a small notch) on the underside of the limb, then finish the cut from the top to release the branch. If there is upward pressure, start with a small top cut or notch, then release from below (Figure 7). To direct a limb, use a face notch and a back cut, and position yourself out of the way of the falling limb.

Bucking

Cutting up the main logs and branches of a felled tree is called bucking. Once again, it is important to be sure the tree cannot roll. Work on the uphill side. Be conscious of the kickback corner and the reactive forces of the saw. Use your body to brace the saw, especially when cutting with the top of the bar. When cutting low to the ground, position your body low to reduce back fatigue and lessen the chances of hitting the ground with the chain saw.

Always be aware of the tension of the limbs. If the trunk is still attached to the stump, the bottom side will be under tension, while the top is compressed. Branch configuration and topography can cause tension and compression to change even along the trunk of a single tree. Take care to avoid getting the chain saw bar pinched in the log. One trick is to place smaller logs under the trunk before it drops to relieve the tension and allow the worker to saw all the way through.

Another trick is to use wedges to prevent pinching. Wedges can also "lift" a trunk section to allow cutting through. A good technique for efficiency is to cut most of the way through all of the bucking cuts, then roll the log to finish each cut.

Basic Safety for Chain Saw Use in Trees

Remember, tree climbers should always carry a hand saw when working in a tree. The use of a chain saw is not appropriate for all cuts. In addition, there are times when it is safer to finish a cut with the hand saw.

Many tree workers believe that small, top-handled chain saws are designed to be used with one hand. This is absolutely not true. The top-handled design is for balance and maneuverability. Keep both hands on the chain saw whenever it is in use.

Be sure of your footing and grip when starting and using the chain saw. If possible, it is best to start the saw with the leg-lock method. Always engage the chain brake before starting the saw.

You must use two tie-ins whenever using a saw in a tree (Z133.1, Section 7.2.8). Doing so usually means securing your safety lanyard in addition to your climbing line. Body positioning is an important safety consideration when using a chain saw in a tree. Be sure you are in a safe, stable position before cutting. Avoid placing yourself in a position where you could be cut if the saw kicks back, or by follow-through after a cut. Be sure of the location of your climbing line and any other ropes. The accidental cutting of a rope can be a fatal mistake. Consider what the limb will do when it is cut. Never place yourself in a position where you could be struck by a limb. Avoid cutting above the level of your chest.

Breakaway Chain Saw Lanyards

Some climbers use a chain saw lanyard that remains attached to the saw and the climber's saddle at all times. Such lanyards are designed so that the lanyard will cause the saw, if released, to drop below the climber. Breakaway lanyards are designed to detach at some point within the lanyard if loaded beyond a given point. This feature is important for climbers who use a chain saw lanyard on the saw while cutting. If the saw gets caught in a falling limb, the lanyard will break free, and the climber will not be caught in the middle.

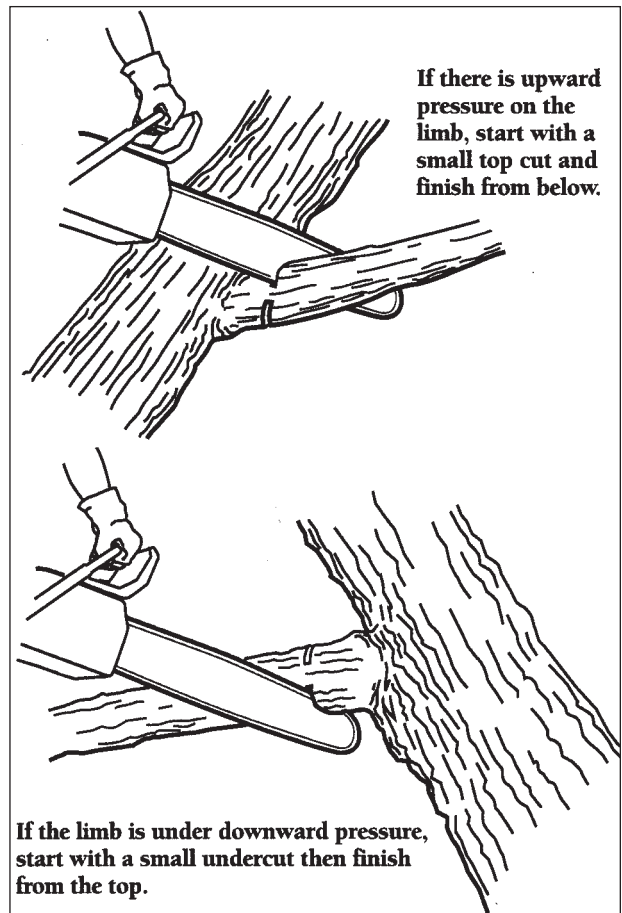


Figure 7. Cutting limbs under tension.



Figure 6. Leg-lock starting position.

Cutting Techniques

Tree workers employ a number of different types of cuts when using a chain saw in a tree. Different situations that arise when pruning or removing a tree present different challenges. A climber armed with an arsenal of cutting techniques can remove limbs in a safe and efficient manner.

“Mismatch Cut” or Snap Cut

The “mismatch cut,” or snap cut, is handy for controlling relatively small sections of wood that may not require roping. To make the mismatch cut, start by cutting slightly more than halfway through a section from the side. Then cut from the opposite side but several inches offset from the first cut. (The distance apart must be larger for larger limbs.) The two cuts will bypass, but the fibers should hold. Then shut off the saw and break the piece off manually. A variation of this cut can be used to remove the final stub from a large branch that has been removed (Figure 8).

Drop Cut

The classic three-point cut dates back to the early years of arboriculture and appears in almost every pruning text as the recommended technique for removing large limbs. Most climbers know it as the drop cut. The three-point cut starts with an undercut at least six to twelve inches out from the branch collar. The second cut is a top cut made several inches farther out on the limb. When the cuts bypass or the fibers break, the limb drops to the ground. The third cut removes the stub back to the branch collar.

This technique predates the use of chain saws in trees. When removing large limbs with a chain saw, you may need to modify the cut placement. When you cut a large limb with a chain saw, a kerf may be created

as the top cut bypasses the bottom cut. The kerf can pull the chain saw out of the climber’s hands. One technique that can avoid this problem is to form the top cut directly above the undercut.

Hinge Cut

The hinge cut is a variation of standard tree felling techniques. It employs the use of a notch and back cut to form a hinge and “steer” the limb. It can be used to swing a limb around rather than simply dropping the branch to the ground. Unless the limb is rigged with a drop line, however, there is a limit to how much the climber will be able to swing it before it drops. Also, if the hinge is formed too far up the side of the limb, it may be ineffective and may break before the limb swings. Making small kerf cuts on the sides of the limb, just back from the notch, can prevent fiber tearing down the side of the branch or trunk.

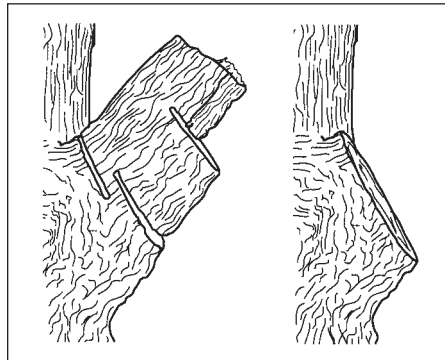


Figure 8. A variation of the mismatch cut can be used to remove a stub. Be sure the final cut is just outside the branch collar.

Lifting Cut

The lifting cut is another variation of the notch and back-cut technique. With this cut, the notch is cut on the top side of a rigged limb. When the back cut is made, the limb can be lifted until the face notch closes and the hinge breaks. This cut allows more control, and the butt of the limb does not swing wildly. Tension should be kept in the rigging line to prevent the chain saw bar from becoming pinched. You must estimate the angle that will be required for the notch. If the notch is too small, it will close before the hinge breaks. The use of kerf cuts on the sides is optional but recommended on trees that are not being removed.

Topping Cut

The topping cut is the technique used for cutting the top section out of a tree that is being removed (not to be confused with the poor practice of topping trees). It is very much like felling a tree and is sometimes referred to as a notched face cut and back cut.

The topping cut consists of a notch and a back cut. The angle of the face notch will depend on the lean. Usually 70 to 90 degrees is desired, but with a heavy forward lean,

less than 70 degrees may be in order. Ideally, the top of the tree is about horizontal when the hinge breaks. Using a 45-degree notch can cause a loss of control: when the top does break free, it can cause a reactive “kick” that can shake the remainder of the tree.

The desired thickness of the hinge will depend on the leverage used in bringing the top over, and other variables. Usually the hinge should be about five to ten percent of the diameter of the section. It is a good idea to scribe the line of the back cut with your hand saw so that the back cut can be made without straining to see the notch placement. Usually a straight back cut is employed, but a bore cut might be used if there is a strong forward lean. The use of a bore cut requires proper training and practice, especially before using it aloft. Placing kerf cuts on the sides below the notch is strongly recommended to prevent fiber tearing down to the climber’s tie-in or lanyard. A pull line may be used for added leverage and control.

Corresponding test questions for this article are available in the ISA compendium entitled “Tree Maintenance.” The compendium is a collection of *Arborist News* CEU articles with corresponding test questions worth a total of 9 CEU credits. ISA compendiums are available to purchase from the ISA online at www.isa-arbor.com or by phone at 888-472-8733.