

Chainsaw operation

Maintenance and Crosscutting



July 2016 Edition



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All photos were taken by David McElvenny.

All graphics were drawn by Kath Ware. Most of the drawings are based on graphics provided by Husqvarna for the related interactive CD project: *Chainsaw operation – beginner to advanced*.

Source material

This booklet is based on material contained in the interactive CD developed by Workspace Training called *Chainsaw operation – beginner to advanced*. The original CD resource was developed with funding provided by the Commonwealth Government's Workplace English Language and Literacy (WELL) Program.

The technical information is drawn from publications made available by Husqvarna and Stihl for the above WELL project, as well as the NSW State Forests *Chainsaw Operators Manual* (2001).

Copyright in the original interactive CD resource is owned by the Commonwealth Government under a Creative Commons 3.0 Australia Licence. It is still available for purchase from Workspace Training on a cost recovery basis under the original distribution arrangements granted by the WELL Program.

The CD resource has since been revised and updated by Workspace Training to meet changing Training Package requirements. The latest version is the 2016 edition, which is also available for purchase. The new interactive CD package contains a Powerpoint version of the presentation, downloadable assessment tools in a customisable Word format and a hard copy Trainer Guide.

To order the CD, go to: www.workspacetraining.com.au and follow the links.

Technical Advisory Committee

The following chainsaw experts were involved in the development and review of this booklet:

Ben Sparks – Training manager, Savco Vegetation Services

Ray Stone – Principal, Chainsaw Accreditation and Safety Training

Goetz Graf – Director, Tree Management Australia

All three experts were members of the original technical advisory committee involved in the development of the interactive CD resource. They and their students are featured extensively throughout the photos in the interactive CD and this booklet.

Disclaimer

Chainsaw use is an inherently dangerous activity. This booklet is designed to provide background information for participants undertaking a face-to-face course in chainsaw operation with a qualified trainer.

It is not designed to be used as a substitute for face-to-face training.

While all care has been taken in the preparation of this resource, McElvenny Ware Pty Ltd (trading as Workspace Training) and all individuals involved in its development do not accept any liability to any person for the information or advice provided in this booklet, the use of such information or advice, or any errors or omissions.

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The information is provided on the basis that all persons undertake full responsibility for assessing the relevance and accuracy of its content.

In all cases, chainsaw operators, trainers and other parties using this resource should follow the directions provided by the manufacturer of their equipment, and seek further advice from the manufacturer and/or their employer if they believe there are any discrepancies between the different sources of information.

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1. Introduction

There are two booklets in the *Chainsaw Operation* series:

Maintenance and crosscutting

Beginner to advanced (including tree falling at basic, intermediate and advanced levels).

These booklets are not designed to take the place of face-to-face instruction with a qualified trainer. But they will help you to learn the fundamental information that every chainsaw operator needs to know in order to work efficiently and safely.

Their purpose is to prepare you for the practical training sessions, so that you'll have an understanding of why you're being taught to do things in a certain way and why you need to wear and carry particular items of safety equipment.



This booklet – *Maintenance and crosscutting* – covers the basic skills and knowledge required to crosscut timber products and felled trees, and carry out operator maintenance on the chainsaw. It is aligned to the following units of competency:

Forest and Wood Products Training Package (FWP):

FWPCOT2237: Maintain chainsaws

FWPCOT2238: Cut materials with a hand-held chainsaw

FWPCOT2239: Trim and cut felled trees

Agriculture, Horticulture and Conservation and Land Management Training Package (AHC):

AHCMOM213: Operate and maintain chainsaws

2. Safety and environment care

A chainsaw is one of the most efficient cutting machines you're ever likely to use. But it's also one of the most dangerous.

In this chapter, we'll look at the safety features on a chainsaw, personal protective equipment, environmental care procedures, and some basic provisions in the Work Health and Safety (WHS) Act that are designed to protect you and your work mates from injury or mishaps.

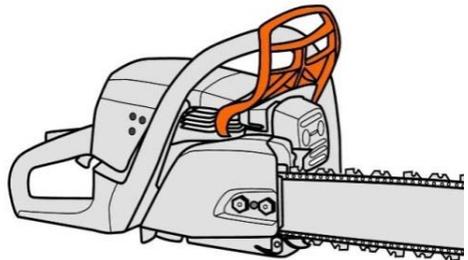
Safety features on a chainsaw

Modern saws have the following safety features:

1. Front hand guard and chainbrake

This protects your left hand and stops the chain if the saw suddenly kicks back while it's running.

When **kickback** occurs, the guard is designed to push into your left hand, forcing it forward and activating the chainbrake.



2. Inertia brake

The inertia brake is built into the internal chainbrake mechanism.

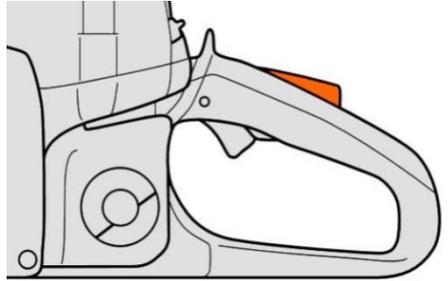
It is activated when it senses that the saw is flicking back suddenly.



3. Throttle lockout

This is a control on top of the handle which must be depressed when you squeeze the throttle trigger.

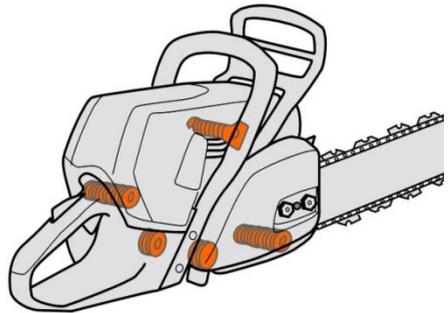
It's sometimes called a **double-action throttle**, and is designed to stop the saw from revving up if you accidentally bump the trigger.



4. Vibration dampeners

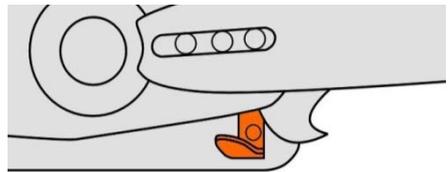
Dampeners reduce the amount of vibration transmitted from the motor to the handles.

They help to cut down on fatigue in your arms and hands, and minimise the chance of nerve damage developing from using the saw over a long period of time.



5. Chain catcher

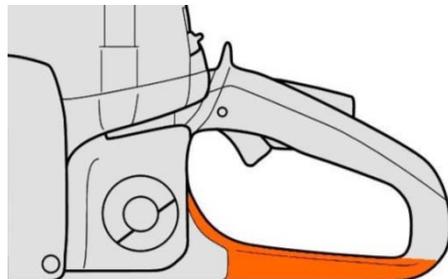
The chain catcher is designed to stop the chain if it breaks or comes off the bar while the saw is running.



6. Rear hand guard

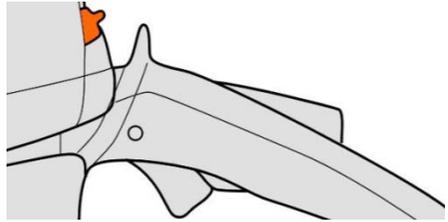
The rear hand guard protects your right hand if the chain breaks or derails from the guide bar.

Remember – there is no such thing as a left-handed chainsaw, so your right hand should always be at the back.



7. Ignition/stop switch

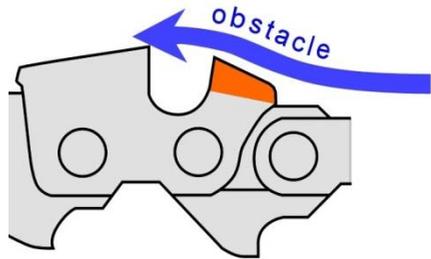
This shuts off the engine and stops the saw. Whatever the model of saw you're using, it will always be within easy reach of your right thumb.



8. Reduced-kickback chain

A reduced kickback chain has little ramps that help to guide obstacles over the front of the cutters.

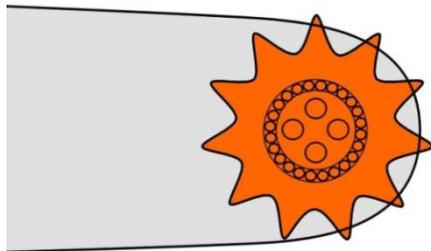
This lessens the chance of kickback occurring.



9. Sprocket nose and narrow nose profile on the guide bar

A sprocket nose on the guide bar allows the chain to run more tightly and with less friction than a nose without a sprocket would.

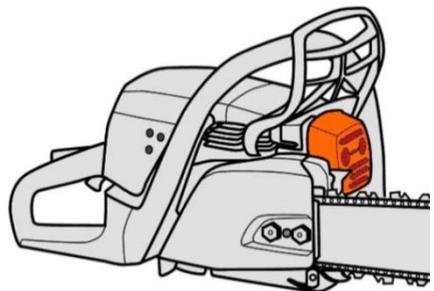
A narrow nose profile also improves safety, because it reduces the size of the kickback zone.



10. Muffler and spark arrester

The muffler reduces the noise level and helps to direct exhaust gases away from the operator.

The spark arrester is a small metal screen in the muffler that catches sparks to stop them from causing a fire.



Personal Protective Equipment

The personal protective equipment (PPE) you wear will depend on the type of work you're doing, and whether you're in the forest or at an established yard or factory. Below are the main items. Note that there are Australian Standards that govern some of these items.

- 1. Safety helmet or hard hat** – protects your head from falling objects.
- 2. Face shield or visor** – protects your eyes from flying particles. Some operators also wear wrap-around glasses for extra protection.
- 3. Ear muffs or ear plugs** – protects your hearing from the loud noise of chainsaws and nearby equipment.
- 4. High visibility vest or jacket** – helps to make you more visible to other workers in the area.
- 5. Gloves** – keeps your hands warm in cold weather. Also specified in some workplaces as a mandatory protective requirement.
- 6. Protective trousers or chaps** – contain cut-resistant material, which is designed to stall the saw if the spinning chain comes into contact with it.
- 7. Steel capped safety boots** – protect your feet from falling objects. In forest conditions, many employers require high lace-up safety boots with ankle support.



Other items of equipment

There are various other items of equipment that you may need to carry, depending on where you're working and what sort of work you're doing.

In the forest, you'll need:

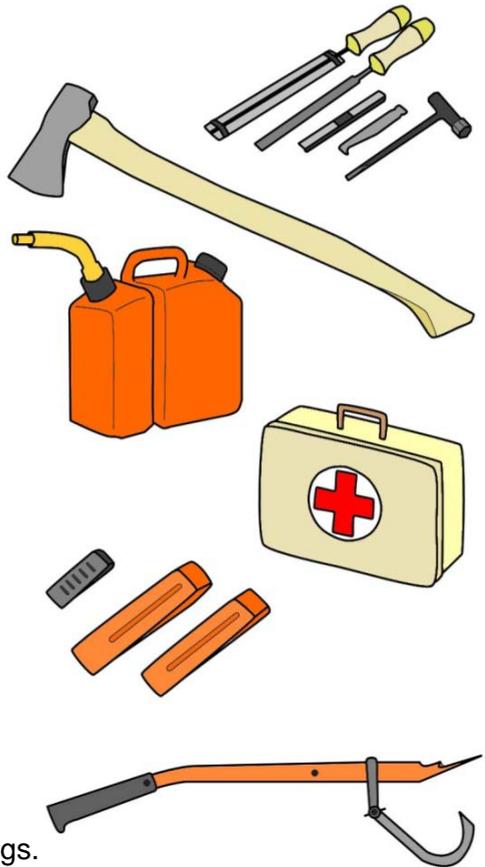
- **hand tools** – such as files, spanner, depth gauge, etc
- **axe** – for removing bark, hammering in a stump vice or wedges, 'sounding' a tree
- **fuel and oil** – sufficient quantity to cover the day's work
- **wedges** – for stopping a cut from closing up on the saw
- **first aid kit** – stocked with suitable supplies.

If you're working with large logs or fallen trees, you may also need a:

- **cant hook** – to move or roll the logs.

In remote areas, forest owners generally require all personnel to carry a **UHF radio**, to stay in contact with other people in the area while they're working. But generally speaking, the best advice for working in a remote area is:

- **don't work alone**
- **have a vehicle on hand**, so you can get out of the forest in an emergency
- **have a system in place** for regular checks to be made on you, either by radio or in person.



Legislation and regulations

In general, the policies and procedures you are asked to follow at work will make provision for the laws and regulations that apply to your job.

But it's worth keeping in mind that some laws go beyond the obligations placed on the company, and extend directly to everyone working on-site. This means that if you do the wrong thing, it's not just the company that will be in trouble – you might end up being prosecuted personally.

Safety laws

Depending on the state or territory you are in, your rights and responsibilities for safety will be determined by the national **Work Health and Safety (WHS) Act** or the state-based **Occupational Health and Safety (OHS) Act**.

The Act gives you the right to raise any safety problems with your boss or supervisor and have them taken seriously.

For example, if you think that something you've been asked to do is unsafe, you have every right to go to your boss and sort out the problem before anyone gets hurt.

The Act also imposes certain responsibilities on you, such as the responsibility to abide by the company's safety policies and procedures and to report any hazards that you notice.

You also have a '**duty of care**' towards others in the workplace, which means that you must take reasonable care of the health and safety of anyone who might be affected by your actions.



Sections 2 – 5 in full version of booklet

See below for Section 6 excerpt

6. Trimming & cutting felled trees

In this section, we'll look at the techniques used to trim and cut felled trees and deal with the typical hazards you're likely to find when you're working in a forest or bushland environment.

The 3 basic cuts

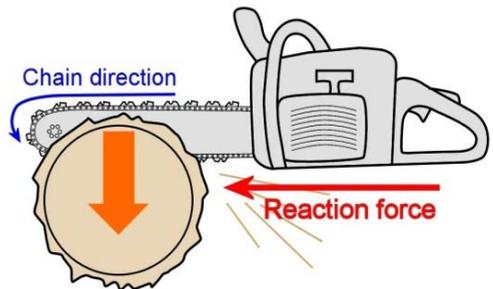
Although there are lots of advanced cuts used by professional chainsaw operators, every cutting technique is based on one or more of the following three basic cuts:



1. Downcut

The downcut uses the **underside of the bar**.

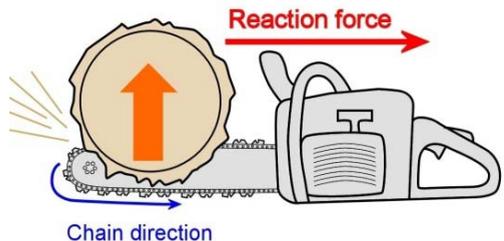
Because the chain is coming back towards the saw on the underside, the reaction force it produces tends to pull the saw **into the cut**, away from your body.



2. Upcut

The upcut uses the **top of the bar**.

This time the cutting part of the chain is moving in towards the log, so the reaction force tends to push the saw back **out of the cut**, towards your body.



3. Bore cut

The bore cut uses the **nose of the bar** to do the cutting.

The reaction force that you need to be most careful of when you start the borecut is **kickback**, because that's what will happen if you let the kickback zone on the nose come into contact first.

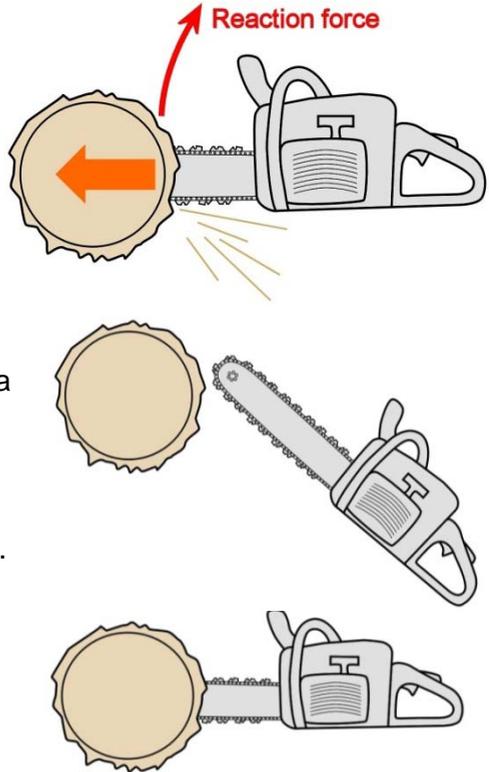
The safest way to do a bore cut in a log is to:

1. **Angle in at 45°**, using the bottom of the nose until the bar is in to the full depth of the nose.
2. **Straighten up** and push in to bore through the wood. It's best to use your legs for extra power as you push the saw in.

If you are cutting logs that are near ground level, you can angle in to do a bore cut by using the **top of the bar**.

But you must be careful to avoid using the **kickback zone** of the bar to do any cutting while you are still angling in.

Make sure that the **nose is buried** well into the timber before you straighten up the saw. Then **use your legs** for extra power as you push in.



When you're doing a bore cut, be extremely careful at all times not to let the **reaction force** push the bar out of the cut and cause kickback. It's also all the more important to consciously double check that you're following all the rules of good cutting practice, including:

- maintaining a firm stance
- keeping the chain sharp
- keeping the chain correctly tensioned
- cutting at peak revs throughout the cut.

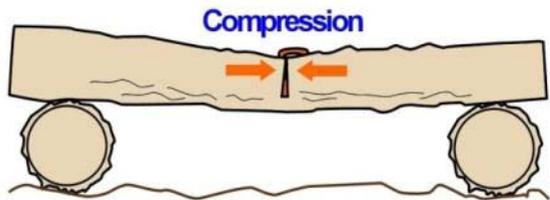
The 2 main stresses

There are two main stresses in logs and felled trees.

1. Compression

Compression occurs when the wood fibres are being pushed **towards** each other.

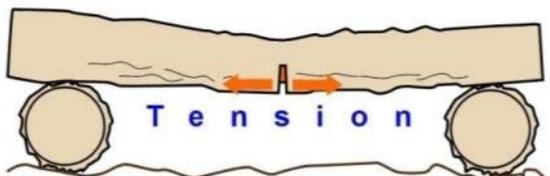
When you cut wood under compression, you need to be careful that the sides don't close up and **bind** the saw in the cut.



2. Tension

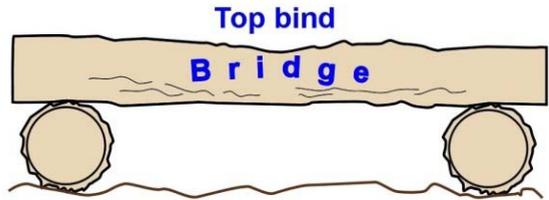
Tension occurs when the fibres are being **stretched**.

When you cut wood in tension, the two halves start to pull away from each other.



Bridging cuts

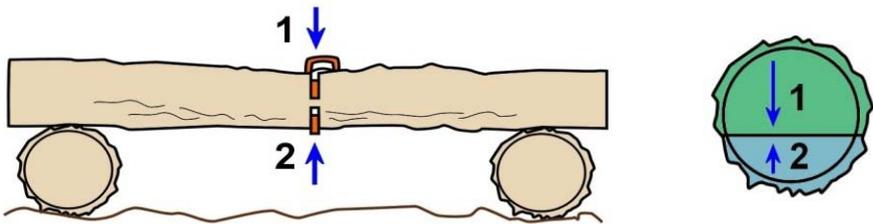
The log at right is in **compression** on top, because it's supported at each end and forms a bridge between the two supports.



This is called a **top bind**.

The best way to do a **bridging cut** on a log with top bind is as follows:

1. **Cut down as far as you can** before it begins to pinch the bar.
2. **Cut from the bottom up** until the two cuts meet.

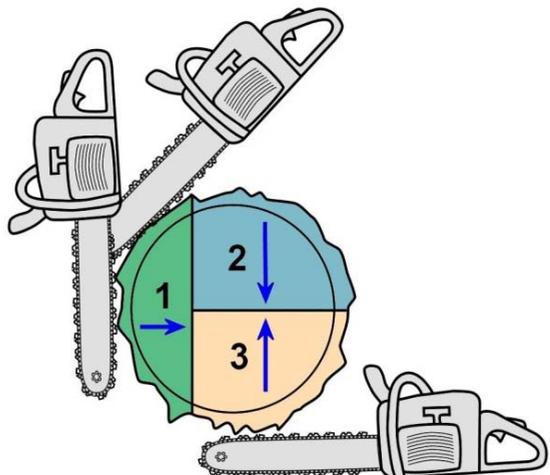


For logs that are thicker than the length of the bar:

1. **Put a cut on the opposite side of the log.**
2. **Pull the saw towards you** and cut down until the top gap starts to close.

Then release the trigger and withdraw the saw from the cut.

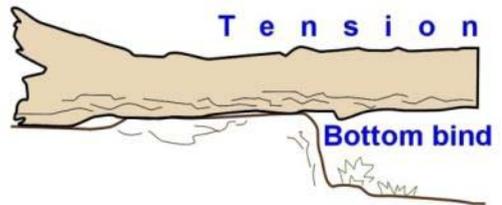
3. **Cut from the bottom up** to finish the 'release cut'.



If it is too difficult to reach over the log for the first cut (shown in the diagram above as 1), you can stand on that side of the log and cut all the way down. The walk around to the other side and put in cuts 2 and 3.

Swinging cuts

This log has the opposite problem from the log on the previous page. It is hanging over the edge of its support, so now the bottom is under compression and the top is in tension.



The log, therefore, has a **bottom bind**.

But unless it has a small diameter, say up to the thickness of your thigh, you can't simply cut straight down, or you'll risk tearing the grain on the bottom as it starts to give way.

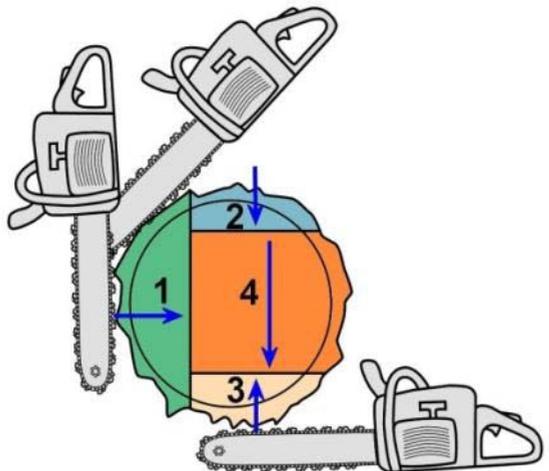
In this case, you need to do a **swinging cut**:

1. **Cut upwards** until you break the bind
2. **Cut down from the top** to finish the cut.



For logs thicker than the length of the bar:

1. **Put a cut on the opposite side of the log.**
2. **Pull the saw towards you**, cutting down slightly as you go.
3. **Cut from the bottom up** until you break the bind.
4. **Cut down** the rest of the way to finish the cut.



If you find yourself with a very large log, and you're unable to reach over to do the first cut, the easiest solution is to:

1. **Cut all the way down one side** of the log first
2. **Walk around to the other side** to complete the sequence of cuts.

Of course, you still need to use the right system for a top bind or bottom bind to avoid jamming the saw.



Wedges

If you find that the cut is closing up on the bar and jamming it, the safest way to get out of trouble is to use a **wedge**.

1. **Put the chainbrake on** to make the saw safe
2. **Tap the wedge into the cut**, using the back of an axe or a lump hammer
3. **Pull the saw out** once it's free.



Using a wedge with a bridging cut

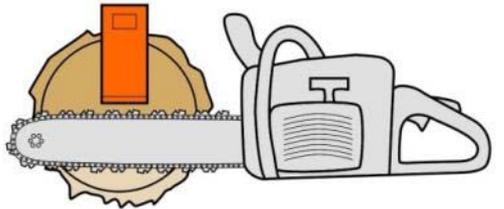
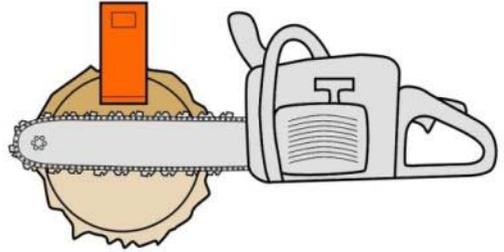
You can also use a wedge while you're carrying out a bridging cut to keep the width of the cut (or '**kerf**') open.



This is especially useful with heavy logs when they're lying flat on the ground.

In these cases:

1. **Cut down far enough** so you can tap a wedge in above the guide bar without it hitting the cutters
2. **Insert the wedge**
3. **Keep cutting and tapping the wedge** in progressively to stop the kerf from closing up on the saw.



Types of wedges used in cross cutting

Wedges are made of different materials. Some are more suitable than others for particular purposes.

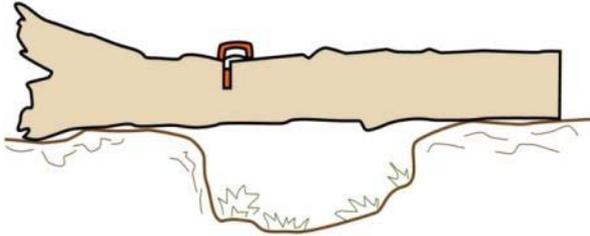
- **Plastic wedges** are commonly used in cross cutting, because they don't damage the chain if the cutters accidentally come into contact with the wedge.
- **Aluminium wedges** are also suitable, particularly if you also carry out tree falling, but they are not quite as gentle on a chain as plastic.



Steel wedges will definitely damage the chain if there is any contact with the cutters. These wedges are generally reserved for tree falling.

Step cuts and angle cuts

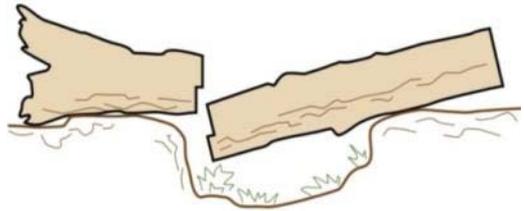
Now that we've covered the principles of bridging cuts and swinging cuts, let's go back to the scenario of a log suspended over two points.



In the above instance, the situation is slightly different from the top bind we looked earlier. This time, the left hand side of the log can't move when it's cut through, because there is too much weight on the other side of the embankment. So now only the right hand side is able to fall.

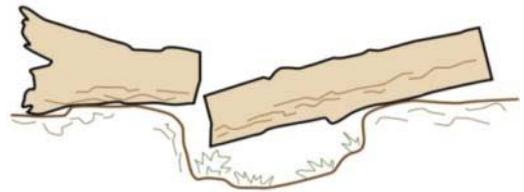
One of the problems with this scenario is that the log could jam in place and pinch the saw without falling through.

The best way to overcome the problem is to use a **step cut** when you do the upcut (as shown at right).



A variation of the step cut is an **angle cut** (shown underneath at right).

Note that in both of these cuts, the inside of the step or angle should be on the side that doesn't fall, because there will be less chance of the log jamming.



There are also times when you can use a step cut to help hold the saw up, so it doesn't fall through with the falling log. In these cases, the step is placed on the **opposite side** from the examples above, so that when the free side falls the guide bar is still supported by the step.

Always remember to cut through the **compression wood** first, and closely monitor any movement in the log or branch as you get close to the point where the kerf is about to start closing. Then cut the **tension wood**.

Also make sure that you finish the job with a final flush cut if the end of the log has torn grain or other protrusions.

This will help to keep the area safe for other people to walk through later on.



Planning your cuts

Before you commence any cutting, you should always think ahead and ask yourself:

... when I release the stresses in this log, what's it going to do?

... and where should I be when that happens?

Generally speaking, you will be able to predict the direction a log or branch will go as long as you take into account all of the forces acting on it.



But you still need to be alert for any movements that you hadn't allowed for, and take corrective action before you finish the release cut. It may also mean you have to change the sequence of cuts you'd originally planned.

The general principles on planning ahead and deciding where to stand are:

- **stand to one side** of the cut (and the saw) to avoid the hazard of kickback
- **stand on the opposite side** of the log from any springing or whipping action that might result when you release the stresses
- **stand on the uphill side** of the log when you do the release cut that will allow the log to roll
- **don't cut** a log or limb if you can't work out where the stresses are and what the reaction forces will be.

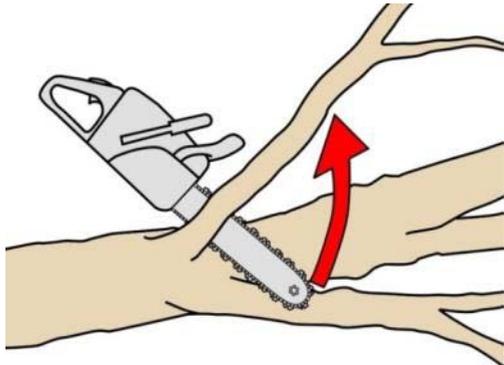
This last point particularly applies to **windblown** or **uprooted trees**. If the root system is still partly submerged in the ground, there is the risk that the stump could spring up suddenly when the trunk is cut through. In some cases you may need to get a machine to clear the windblown tree, or ask an expert chainsaw operator for help before you start.

Limbing

Limbing is the process of removing branches from a tree.

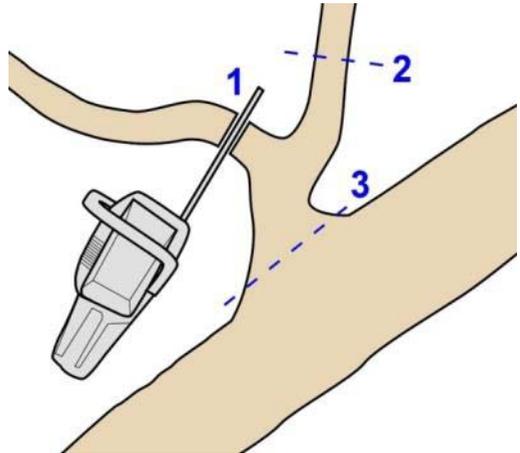
The biggest risk here is **kickback**, because there will often be times when the nose comes close to other branches that you're not watching.

Remember to stay aware of where the nose is, especially when you can't actually see it.



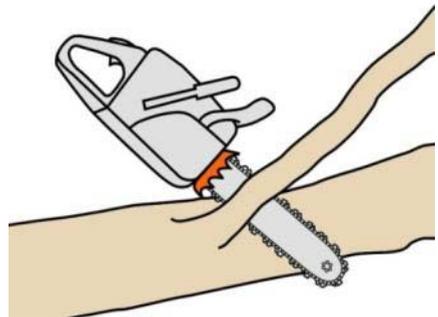
Here are some hints on safe limbing practices:

1. **Before you cut**, think about the stress forces stored up in the limbs, so you can plan your cuts to release the tensions in a controlled way, without the branches whipping back suddenly.
2. **Remove small branches first** and clear them the out of the way.
3. **Remove difficult branches piece by piece**, cutting in sequence from the outside towards the main trunk.



4. **Never work above shoulder height**, because that's when you have the least amount of control over the saw's movement.
5. **Use step cuts** or other techniques used in cross-cutting logs if you're cutting large limbs, so that you don't jam the saw.
6. **Let the tree support the weight of the saw** whenever you can.

The best way to do this is to stand on the opposite side of the trunk, and use the **spikes** (or '**dogs**') as pivot points as you cut up or down to trim the branches.



7. **Don't leave protruding branch stubs** on trimmed logs. Cut them flush.

Adjusting your grip

When you're limbing, you will need to re-adjust your grip on the saw to change its position for different cuts.

To hold the saw **horizontally**, shift your left hand around to the side of the front handle and change your rear handle grip accordingly.

Make sure you maintain the same upright balance and avoid awkward twisting of your shoulders or back.



Scrub clearing

You can clear scrub with a chainsaw by holding it horizontally and sweeping it backwards and forwards across the vegetation near ground level. The same cautions apply as for limbing – maintain a well-balanced stance, beware of kickback and always stay mindful of the pent-up stresses in the branches and stems.

You should also avoid leaving stems with points or sharp angles. These can cause injuries to people and also damage vehicle tyres.

Ripping

Ripping is the term used for cutting in the direction of the grain.

You can use the chainsaw to cut fence posts and other heavy section material by ripping the log lengthwise.

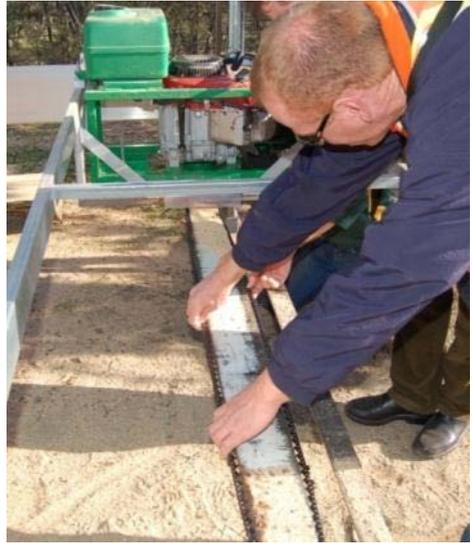
However, the saw needs to be high powered to cope with the extra stresses placed on it.



Note that a normal chain – sometimes called a **full complement chain** – will make your chainsaw work much harder than the **ripping chains** that are used in portable sawmills, such as a Lucas Mill.

This is because ripping chains have different cutter configurations and filing angles.

For example, a **skip tooth chain** has an extra link between the cutters, which helps to reduce the build-up of chips. It also requires less power to operate.



Nonetheless, you can still rip timber with a hand-held chainsaw and normal crosscutting chain using the following technique:

1. **Secure the log** so it can't roll sideways. Use branches or offcuts to chock up the sides.
2. **Stand to one side** of the log throughout the cut – don't straddle it.
3. **Maintain peak revs** while you're cutting
4. **Use the spikes** for leverage on the top of the log, and swing the guide bar into the cut, working along the length of the log.
5. **Keep the chain off the ground** at all times. If possible, try to raise the log up onto packing pieces before you start. If it's not possible, rip halfway through the log on one side, and then roll it over and rip through the remaining timber on the other side.