



This Best Practice Guide is being reviewed.

The future of Best Practice Guides will be decided during 2015.

Best practice guidelines for Chainsaw Use

Vision, knowledge, performance



He Mihi

| | |
|-----------------------------------|--------------------------------------|
| Nga pakiaka ki te Rawhiti. | <i>Roots to the East.</i> |
| Nga pakiaka ki te Raki. | <i>Roots to the North.</i> |
| Nga pakiaka ki te Uru. | <i>Roots to the West.</i> |
| Nga pakiaka ki te Tonga. | <i>Roots to the South.</i> |
| Nau mai, Haere mai | <i>We greet you and welcome you.</i> |
| ki te Wāonui o Tane | <i>To the forest world of Tane.</i> |
| Whaia te huarahi, | <i>Pursue the path,</i> |
| o te Aka Matua, | <i>of the climbing vine,</i> |
| i runga, I te poutama | <i>on the stairway,</i> |
| o te mātauranga. | <i>of learning.</i> |
| Kia rongo ai koe | <i>So that you will feel,</i> |
| te mahana o te rangimārie. | <i>the inner warmth of peace.</i> |
| Ka kaha ai koe, | <i>Then you will be able,</i> |
| ki te tū whakaiti, | <i>to stand humbler,</i> |
| ki te tū whakahī. | <i>Yet stand proud.</i> |
| Kia Kaha, kia manawānui | <i>Be strong, be steadfast.</i> |
| Tena koutou katoa. | |

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This Best Practice Guideline is to be used as a guide to certain chainsaw procedures and techniques. It does not supersede legislation in any jurisdiction or the recommendations of equipment manufacturers.

FITEC believes that the information in the guideline is accurate and reliable; however, FITEC notes that conditions vary greatly from one geographical area to another; that a greater variety of equipment and techniques are currently in use; and other (or additional) measures may be appropriate in a given situation.

Other Best Practice Guidelines included in the series:

- Cable Logging
- Fire Fighting and Controlled Burnoffs
- Ground-based Logging
- Land Preparation
- Loading
- Maintenance Inspections of Yarder Towers
- Manual Log-making
- Mechanised Harvesting and Processing
- Mobile Plant
- Personal Protective Equipment
- Road and Landing Construction
- Silviculture
- Transport
- Tree Felling
- Tree Planting
- Working with Helicopters

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Best Practice Guidelines for Chainsaw Use

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Introduction

Purpose of these guidelines

The Best Practice Guidelines for Chainsaw Use have been developed by FITEC to improve worker safety and performance. They combine industry training standards and best practice information to provide a valuable reference manual for people involved in silvicultural pruning.

These guidelines should be read in conjunction with the Approved Code of Practice for Safety and Health in Forest Operations. In particular, these guidelines provide direct support for Part 3 – Section 6 (Chainsaws) of the code.

They are a valuable reference document for the following Unit Standards registered on the NZQA framework:

Unit 43 – Maintain a Chainsaw

Unit 1247 – Thin Plantation Trees to Waste

Unit 6916 – Demonstrate Knowledge of the Code of Practice Relating to Chainsaw Use

Unit 6917 – Operate a Chainsaw

Unit 6924 – Process Trees on a Landing

Unit 6972 – Prune Plantation Trees with a Chainsaw from off the Ground

Unit 6973 – Prune Plantation Trees with a Chainsaw from the Ground

How to use these guidelines

These guidelines have been arranged in two main sections:

- **Chainsaw Basics** provides information on chainsaw operations and hazards commonly encountered.
- **Cutting Procedures** describes the basic procedures of cutting with the chainsaw.
- **Maintenance and Tuning Procedures** describes the correct maintenance and tuning of the chainsaw.

The **Glossary of Terms** gives the meaning of terms used throughout these guidelines.

The **Index to Unit Standards** allows the reader to locate information specific to the relevant Unit Standards.

Acknowledgements

FITEC acknowledges the assistance of the Occupational Safety and Health Service, Liro Forestry Solutions, and numerous forest industry trainers, forestry contractors, and forest company staff in the development of this Best Practice Guideline.

About best practice training material

FITEC has developed the material in this publication. It has been reviewed by representatives of the forest industry. At the time of publication, FITEC considers the practices and approaches in this publication to exceed accepted industry standards with regard to production and business management. In addition, the practices recommended in the publication exceed all the New Zealand regulatory standards, in particular those related to health and safety, environmental management, and human resources / employment as applicable.

This material is reviewed and reprinted regularly by FITEC.

Chainsaw basics

Types of chainsaw operations

The chainsaw is a highly versatile tool with thousands sold every year. They are used to cut wood in a range of occupations and ways.

In forestry, chainsaws are used for felling and delimiting large and small trees in clearfell and production thinning operations. They are also used in thinning to waste, processing, pruning, land clearing, road-side clearing, and stream cleaning.

Chainsaws are also commonly used on farms (land clearing, shelterbelts, fencing, firewood) and by casual users for trimming trees, cutting firewood, etc. They may be used in operations by district councils for roadside felling and clearing and for clearing trees from stream banks.

Choosing the right saw

Factors to consider

When purchasing a chainsaw there are some critical questions you should ask:

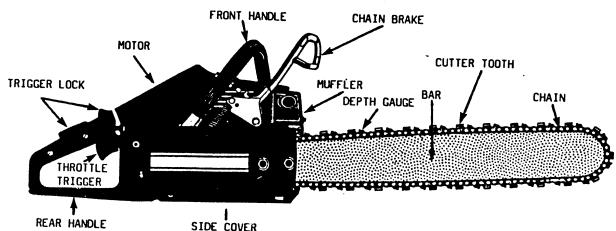
- What size timber will I be working in? This will determine cc rating and required bar length. For felling, you want a bar which will enable you to fell the majority (more than 50%) of the trees from one side. As a rule, the length of the bar should be at least half the diameter of the trees being felled or crosscut.
- What back-up service will I receive? Remember, they have not yet invented the chainsaw that does not break down. This question is best answered by talking to those you work with.
- Does it have all the minimum required safety features? (These are listed later in this section).
- Does the person selling you the chainsaw draw your attention to accessories that you should also purchase, and what additional information do they provide on the safe use of the chainsaw?

Industry standards

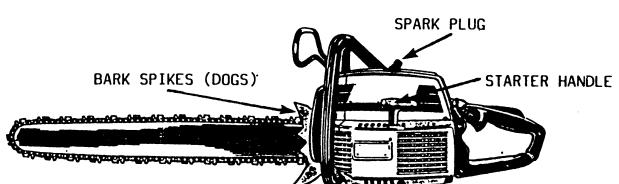
The following standards are intended as a guide to show how chainsaw size is matched to task.

| | |
|-----------------------|---|
| Silvicultural pruning | <40cc motor, short cutter bar, throttle on top handle, chain and bar guard is required on the top of the cutter bar |
| Thinning to waste | 50–70cc motor, 30–45 cm cutter bar |
| Production thinning | 70cc motor, 45 cm cutter bar |
| Clear fell | 85cc motor, 60 cm cutter bar |
| Large clear fell | 80–95cc motor, 60–70 cm cutter bar |

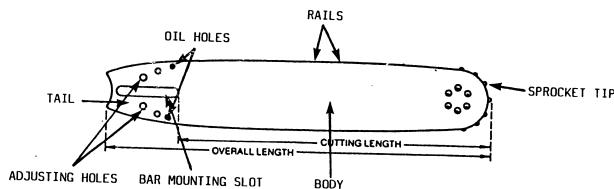
Parts of a chainsaw



External features of a chainsaw (right hand view)

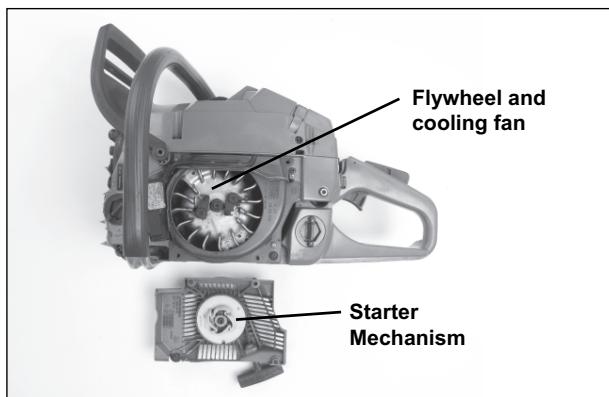
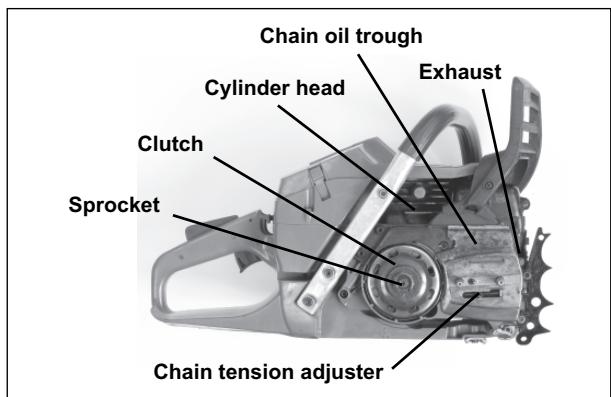
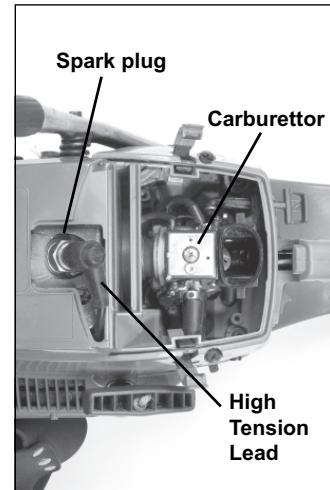
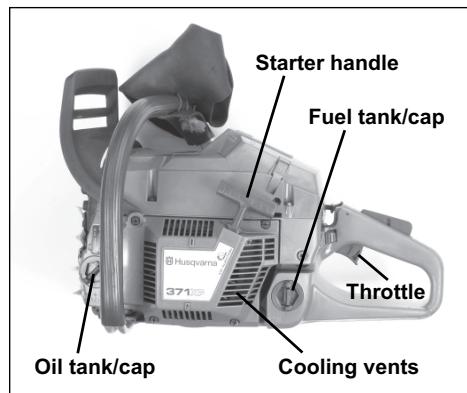
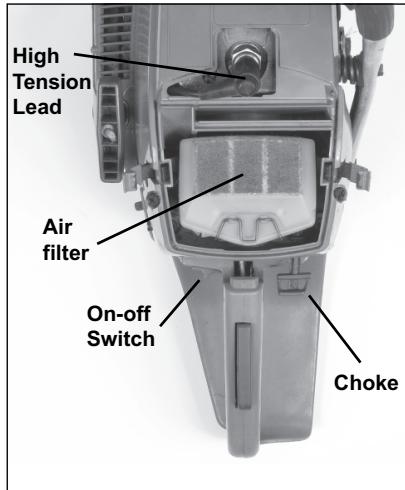


External features of a chainsaw (left hand view)



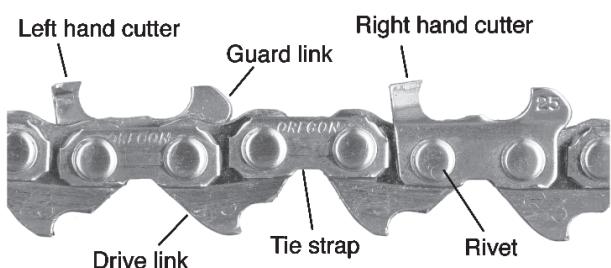
Parts of a cutter bar

Note that there are two bar configurations that may be found. The "sprocket tip" shown in the diagram at left is an enclosed sprocket which the chain moves as it passes over the tip. An alternative is the "solid tip" that does not have a sprocket.

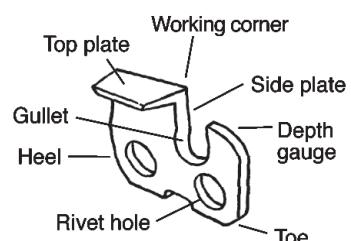


Parts of the power unit

Parts of the chain



Parts of the chain



Parts of a cutter



**Chipper
(Round shaped side plate)**

There are two main types of chain available, which refer to the basic shape of the cutter teeth.

The round (or chipper) chain, is generally considered to be easier to sharpen with a round file, and to stay sharp for longer.



Chisel
(Square shaped side plate)

The square (or chisel) chain is more efficient and will cut faster, but is a little more difficult to sharpen with a round file.

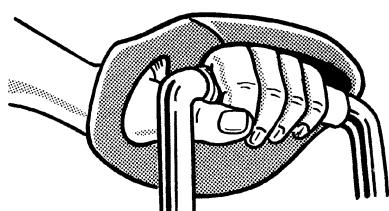
Some chain manufacturers give the chain names which confuse the descriptions, but it is common for round cutter teeth to be described as "chipper" and the square teeth as "chisel".

The chipper chain is considered better for cutting hardwood and dirty wood, and the chisel is suited to softwood such as radiata pine.

Chainsaw safety features

Standards

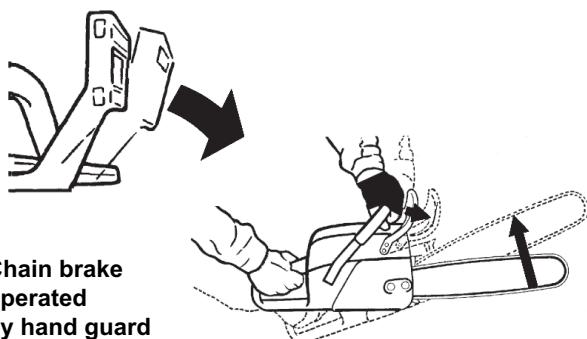
- Chainsaws shall comply with NZS 5819:1982 Chainsaw Safety Part 1: Code of practice for the safe use of petrol and electrical chainsaws. Part 2: specification for the safe design of petrol and electrical chainsaws; or any other standard that has the same or more stringent criteria.
- All hand-operated chainsaws are required to have fitted, in good working order, a chain brake and a safety mitt.
- The chainsaw must be inspected and checked before it is used to ensure it is in safe working condition.
- Except for fine tuning the carburettor, no cleaning, oiling or adjusting of the saw shall be carried out while the motor is running.
- All operations relevant to sharpening and tensioning the chain and any other maintenance will be carried out in a safe manner and to the manufacturer's specifications or recommendations.



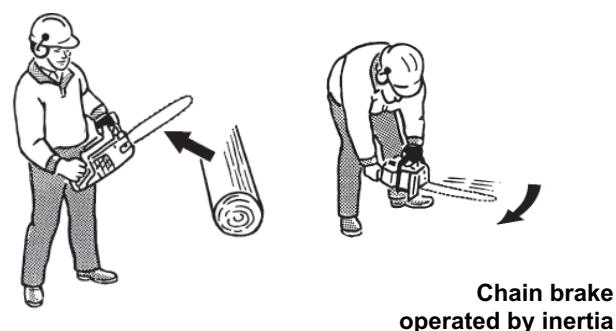
Mitt on front handle

Mitt

The mitt is a protective leather mitt attached securely to the front handle, but free to rotate around and slide along the handle. It is there to provide a secure grip in case of kickback, and provides some protection for your hand. The mitt should be attached using nylon or leather cord, not with shoe laces.



Chain brake operated by hand guard



Chain brake operated by inertia

Chain brake

The chain brake is designed to stop the chain moving if the front guard is moved forward. It can be activated if the saw is thrown back at the operator by kickback, and the operator's hand rotates around the handle and contacts the guard.

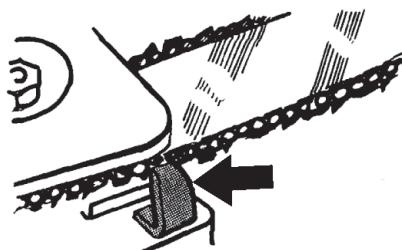
You can also activate the chain brake manually. If the chain brake is engaged it needs to be disengaged manually by pushing it back towards the rear handle so that the chain can run free again.

Inertia chain brake

Modern professional saws are fitted with an inertia chain brake (I.C.B.) which have the advantage over mechanical chain brakes of triggering in any position if the saw jumps suddenly due to kickback. This is especially important if the saw is being used with the cutter bar in the horizontal position.

Chain catcher

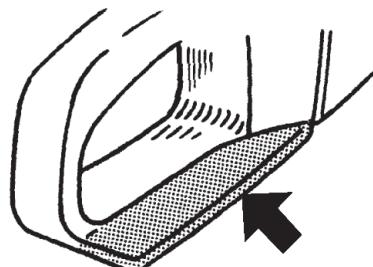
The chain catcher is a small metal arm fitted to the saw, underneath the side cover, which is there to catch the chain if it jumps off the bar or breaks. The catcher prevents the chain from flying back under the saw towards the operator.



Chain catcher

Rear hand-guard

The lower part of the rear handle is wider than the rest of this handle. This is to provide protection for the operator's hand in case the chain breaks or jumps off. The hand-guard is also used to place your heel on during a cold start.



Rear hand-guard

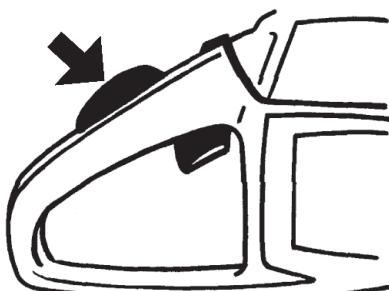
Anti-vibration mounts

Anti-vibration mounts are located between the motor and bar part of the saw and the handles.

They are designed to absorb the vibration created by the motor and chain operating. Excessive vibration in the saw handles can lead to a condition known as white finger, which is due to poor circulation in the fingers caused by the vibrations.

Muffler and spark arrestor

When operating, chainsaws are very loud. The muffler is designed to reduce noise, to direct exhaust gases away from the operator, and to catch sparks being emitted from the motor. Chainsaws with loose or holed mufflers should not be used.



Throttle lock-out

Throttle lock-out

The throttle lock-out prevents the accidental operation of the throttle. The throttle cannot be operated unless the throttle lock is being held down by the operator's right hand.



On-off switch

On-off switch

The On-Off or Stop switch is located so that it can be operated by the thumb of the right hand whilst the operator is still holding the rear handle. This is designed so that the saw can be quickly shut off in an emergency. Should this fail, open the choke to stop the saw.

Preparing to use a chainsaw

The chainsaw is a potentially dangerous tool that must be treated with skill, care, and respect in order for it to be used safely and productively.

Training and supervision

The most common injuries from chainsaw use are trips and falls leading to sprains, strains, bruising, lacerations, and broken bones. Chainsaws are also likely to inflict lacerations on the users directly, the most common being cuts to the feet, arms, hands, head and legs. Accidents can lead to operators losing income and/or being disabled, with increases in cost to the employer through increased accident insurance levies, and potential loss of jobs and contracts.

The Approved Code of Practice for Safety and Health in Forest Operations requires that before **any** worker begins chainsaw operation, the employer shall place them under the close (constant and one-on-one) supervision of a competent person. That person must continue to supervise the worker until they are sure the worker can use the chainsaw safely and is not likely to harm themselves or anyone else.

The employer must also make sure the worker receives enough training to ensure the worker can carry out the job safely.

Extra attention must be given to the training and supervision of new or inexperienced operators as most serious injuries occur to operators with less than 6 months' experience.

All operators must be under a documented training programme and should be aiming to pass the relevant NZQA units. All chainsaw users who do not hold a particular NZQA unit must be under the close periodic supervision of a holder of that unit.

Knowledge of hazards

As part of the supervision and training programme, operators need to be **shown** the hazards they will face on the job and the controls to avoid being harmed by those hazards.

Before starting any new operation, all operators must be involved in identifying any significant hazards **on the site** and the way those hazards will be controlled. There must be documented evidence on site listing the hazards and controls, and showing that all have been explained to all operators.

The two main hazard categories are **health hazards** and **operating hazards**. All operators should be familiar with both categories of hazards.

Health hazards

Operating a chainsaw is a very physically demanding job.

To maintain peak performance and prevent accidents through fatigue, operators must take special care of their bodies. This includes their physical fitness, diet, water intake, personal hygiene, and sleep. How you treat your body away from work affects your performance at work.

Health hazards

| Hazard | Control |
|--|--|
| Lack of rest/sleep | <ul style="list-style-type: none">• Build short frequent rest breaks into your work routine.• Ideally, take at least two evenly spaced 30-minute rest breaks during the working day. |
| Early starts | <ul style="list-style-type: none">• Ensure each night you replace the sleep you lose in the morning. If you get up earlier go to bed earlier.• Once early starts have finished, allow time for your body to recover. |
| Alcohol abuse | <ul style="list-style-type: none">• Avoid drinking alcohol for at least 24 hours before carrying out any hard physical work. |
| Lack of nutrition | <ul style="list-style-type: none">• Start each day with a high carbohydrate breakfast like porridge, cereal, toast, bananas, pasta, or potatoes.• Eat high protein foods like lean meat, chicken, eggs, milk, and cheese at night.• Eat at the start of a break, and rest to allow digestion.• Always eat a high-carbohydrate snack within 30 minutes of finishing work to aid recovery. |
| Drugs | <ul style="list-style-type: none">• Inform the boss if you are on any medication that may affect your work. Stay home if necessary.• Before receiving any medication, tell your doctor what you do for a living.• If you are on long-term medication for a serious health complaint, inform the boss or crew of your condition in case you are involved in an emergency at work.• Non-prescription drugs may affect your ability to work, if in doubt about any medication consult your doctor. |
| Exposure to sun | <ul style="list-style-type: none">• Wear sun block• Wear light shirts on hot days• Carry out regular skin checks. |
| Early over-exertion/sprains and strains | <ul style="list-style-type: none">• Start each day with a 10–15 minute warm-up and then a few stretches.• Start the day slowly until muscles are warmed up properly.• If starting a new job, allow time for the body to get used to it before working flat out.• Do some stretches at the end of the day.• Take particular care when starting back at work after the holidays. |

Health hazards (cont...)

| Hazard | Control |
|---|---|
| Hypothermia/chills | <ul style="list-style-type: none">Polypropylene clothing (thermal underwear) is excellent for cold, wet weather.If necessary also wear warm hats, rainwear, or chaps.Put a hat and warm clothes on when you stop for a break.Bring spare dry clothing even on fine days. The weather can change very quickly. |
| Lack of hygiene/infection | <ul style="list-style-type: none">Clean and dress any cuts or scratches received on the job as soon as possible and keep them covered.Make sure the first aid kit is kept fully stocked.Carry water and soap on the job to wash hands before smokos.Bath or shower every night.Eat a balanced diet to keep your body healthy.Wear clean clothes against the skin every day. |
| Repetitive Strain Injury (RSI) | <ul style="list-style-type: none">Use of correct techniquesGood tool maintenance.Regular medical examinations.Use pre-work warm-up and stretching techniques.Incorporate rest breaks into your day. |
| Dehydration/heat exhaustion | <ul style="list-style-type: none">Regularly drink fluids at a rate of 0.5 litres per hour and up to 1 litre per hour in hot conditions.Drink before you feel thirsty.Do not drink fluids, like soft drinks and cordials, that have more than 8% carbohydrate content.Drink high carbohydrate drinks after work to replace energy.Drink plenty of water at night to recharge the body.Drink a couple of glasses of water before leaving for work. |
| Back injuries (using a chainsaw involves carrying a weight and frequent bending) | <ul style="list-style-type: none">Keep the saw close to your body.Bend at your knees or hips, not your back.Stretch and warm up before commencing work. |
| Inexperience | <ul style="list-style-type: none">Ensure you have adequate knowledge or supervision to carry out the task at hand. |
| Working alone | <ul style="list-style-type: none">Have a method of communication with other members of the crew, such as a whistle, radio, or phone.Work in pairs, where practicable. |

Operating Hazards

Operational hazards relate to the equipment being used and the work environment. The chainsaw is the fastest unprotected cutting blade used in any industry. The most common injuries to chainsaw users are cuts to the feet and legs. These often occur during trimming. It is a potentially dangerous tool which requires skilled use and maintenance.

Many of the operational hazards relate to the use of the saw. Those presented below are related to general saw use. Operational hazards specific to tree felling and trimming are dealt with in detail in **Best Practice Guidelines for Tree Felling**.

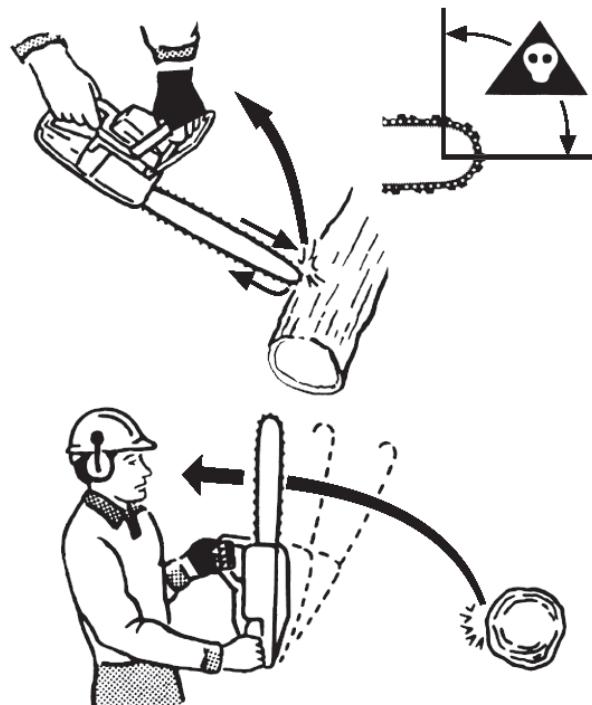
Kickback

Kickback is a potential danger whenever you use your saw. You need to know why it occurs and how to reduce it. Kickback occurs when the upper part of the bar nose contacts a solid object or is pinched. This causes a reactive force that may throw the guide bar in an uncontrolled arc towards you and can result in serious injury.

Kickback can occur when:

- The bar nose hits hidden limbs or light material.
- The saw is boring into a log.
- The bar nose is pinched while cutting.
- The bar nose contacts ends of logs or obscured material.
- The chain is loose.
- The depth gauge setting is too low.

Kickback occurs in the plane of the bar. It may occur when using the saw with the guide bar horizontal when making a felling cut, while making a bore cut, or while trimming.



Kickback

Operating hazards

| Hazard | Control |
|--|--|
| Ineffective personal protective equipment | <ul style="list-style-type: none">Do not use a chainsaw if personal protective equipment is ineffective or unavailable.Clean dirty hi vis garments and oil-soaked protective legwear.Replace any soiled or worn, damaged, or expired protective equipment.Routinely check the condition of your protective equipment. |
| Carrying chainsaws | <ul style="list-style-type: none">Turn saw off or activate chain brake when walking any distance or over obstacles.Carry a chainsaw in both hands so that it can be thrown clear if you slip. |
| Starting chainsaws | <ul style="list-style-type: none">If cold starting, place saw on ground, have left arm straight and in mitt, right foot in rear handle or knee on handle.If warm start, use step-over method of starting with the bar to your left, not in front in case of kickback. |
| Sharpening chain | <ul style="list-style-type: none">Work on a firm base.Use file handles and file guides.Replace file if worn.Always rotate chain towards bar tip. |
| Moving chainsaw chain | <ul style="list-style-type: none">Wear all required protective equipment, and ensure it is in good condition.Use correct stance and work techniques.Hold the saw securely in both hands while cutting. |
| Burns from exhaust/muffler | <ul style="list-style-type: none">Keep bare skin away from exhaust and muffler. |
| Chainsaw exhaust fumes | <ul style="list-style-type: none">Do not operate saw in poorly ventilated or confined areas for prolonged periods.Ensure fuel/air mix is correct and saw is correctly tuned. |

Operating hazards (cont...)

| Hazard | Control |
|---------------------------|---|
| Kickback | <ul style="list-style-type: none">• Hold the saw firmly with both hands.• Make sure your left thumb is wrapped firmly under the front handle and in the mitt.• Be aware of the location of the guide bar nose at all times.• Stand to the side when cutting, not directly behind the bar• Do not let the guide bar nose come in contact with any object.• Be especially careful when cutting small limbs or light material that may catch in the chain.• Do not over-reach or cut above shoulder height.• Use extreme caution when re-entering a cut.• Cut only one log at a time.• Correctly maintain your saw; make sure there are no loose-fitting nuts, bolts, or screws.• Ensure that safety devices are operable.• Make sure the chain is tensioned and sharpened, and that depth gauges are set to the manufacturer's specification.• Use the correct bar and chain combination. |
| Fires | <ul style="list-style-type: none">• Do not smoke when refuelling.• Move away from refueling area before starting saw. |
| Vibration injuries | <ul style="list-style-type: none">• Ensure the vibration damping mounts on the saw are in good condition. |
| Other workers | <ul style="list-style-type: none">• Apply the two tree length rule.• If being supervised or trained, ensure other worker is aware of your proposed actions, escape route and safe position.• If working together, only one person cutting at a time.• Only one chainsaw can operate while felling cuts are made.• Do not make chainsaw cuts if the result may pose a hazard to another worker (such as if a log rolls, a tree kicks, sawdust obscures their vision, or a branch falls). |
| Machines | <ul style="list-style-type: none">• The operator needs to be alert to the presence and movement of machines and what they are carrying (logs and stems). <p><i>(frequently chainsaws are operated in a workplace that has a number of mobile heavy machines such as loaders, skidders, and tractors)</i></p> |

Personal Protective Equipment (PPE) requirements

Professional loggers and chainsaw users are required to wear and use a range of safety equipment. All this equipment must comply with New Zealand Standards or their overseas equivalents. More detail on PPE standards is presented in **Best Practice Guidelines for Personal Protective Equipment**.



Chainsaw operator with required PPE

Chainsaw operators are required to wear the following

- Hi-visibility helmet
- Earmuffs (Grade 4 or better)
- Visor or safety glasses (if eye-related hazards exist) except where the eye protection is likely to cause a greater hazard
- Hi-vis shirt, vest, or coat (clean)
- Protective chainsaw legwear, chaps, or trousers
- Safety boots, steel capped, leather boots or chainsaw-resistant gumboots
- Basic First Aid kit, containing at least two large sterile wound dressings (except those working on a skid site)
- Communications System (either, whistle, radio, phone, pager, visual signals, or regular 2-hour checks on workers' well-being by other staff)

General clothing

This should fit fairly closely but be comfortable and allow free movement. Loose clothing may become tangled in equipment or scrub causing injuries or falls.

Chainsaw Accessories

- Fire extinguisher
- Approved fuel and oil containers with pouring spouts
- Tool belt capable of comfortably carrying accessories
- Tool kit containing:
 - bar wrench
 - round file and flat file (including file handles)
 - file guide with depth gauge setter
 - sprocket and clutch grease gun
 - grease
 - tuning screwdriver
 - cleaning cloth
 - operator's manual
 - feeler gauge
 - cleaning agent and brush.
- Spares kit, including:
 - sharp chain
 - starter cord
 - starter spring
 - air and fuel filters
 - spark plug
 - chain breaking/joining tool and spare links
 - casing and cover screws
 - side cover nuts.
- Water bottle—to keep operator's fluid level up.

If the saw is to be used for felling trees over 20 cm stump diameter, the operator must also carry three felling wedges and wedge driving hammer or axe. Even if the saw is not being used for felling, it can be helpful to have wedges and hammer available to prevent saw jamming.

Cutting procedures

Before starting the saw

At the beginning of each day's chainsaw use, a visual check should be made on the chainsaw to identify any faults.

A chainsaw shall not be used if:

- any safety device is inoperable
- the saw chain does not remain stationary when the motor is idling
- the saw will not idle smoothly
- the chain, cutter bar, handles, or controls are loose
- any parts are damaged, missing, or ineffective

The chain brake shall be activated by the operator at least every work period to test its effectiveness under operating conditions.

In addition, the safety of the operator and other workers must be considered. Safe work zones should be identified and communicated to others present at the site.

Starting the saw

There are two recommended methods of starting. These are known as **cold starting** and **warm starting**.

Cold starting

See the owner's manual for setting the choke and throttle control lockout.

The following technique is recommended for cold starting. An alternative technique requires the toe of the operator's boot to be placed through the rear handle. This technique is not recommended as most toes caps will not fit through the rear handle and the operator is required to bend their back.

The recommended procedure is as follows:

- Place the chainsaw firmly on the ground.
- Open the choke.
- Stand over the saw, which is pointing to your left.
- Position your left leg back to lower your hips.
- Place your right heel on the hand-guard of chainsaw. You should be positioned so that the starter handle can be reached with a straightened right arm.
- Grab the front handle with your left hand, hand in the mitt. Apply a downward force on the saw.
- Pull the starter cord with your right hand, using short sharp pulls until the motor fires.
- Close the choke, and pull the starter cord until the motor is going. Then release the throttle control latch by squeezing the throttle control trigger.



Cold starting



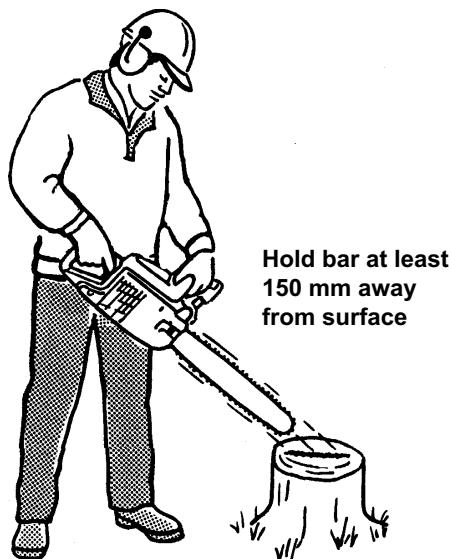
Warm starting

Warm starting

- Place your left hand in safety mitt. Keep left arm straight.
- Position saw on left thigh pointing left.
- Step over rear handle and secure saw behind bent right knee. Keep the right foot flat on the ground.
- Start with short sharp pulls on the starter cord.
- If the saw does not start, revert to the cold start method.

Warning on drop starting

Never drop start a saw. The danger is that the saw will swing in an arc at the end of the cord and cause serious injury, especially to the body or face.



Check oil from cutter bar

Before making cuts

Once the engine is running it is important to check that there is an adequate supply of oil going to the cutter bar.

This can be checked by holding the tip of the chain 150 mm from a clean stump or log and revving the motor.

You should be able to see a small amount of oil thrown off the tip and onto the clean area. If you can see oil appear then oil flow to the bar is adequate.

In addition, the effectiveness of the chain brake should be checked when the saw is going.

Cutting with the saw

There are three types of force encountered when cutting with a chain saw;

- traction
- recoil
- kickback

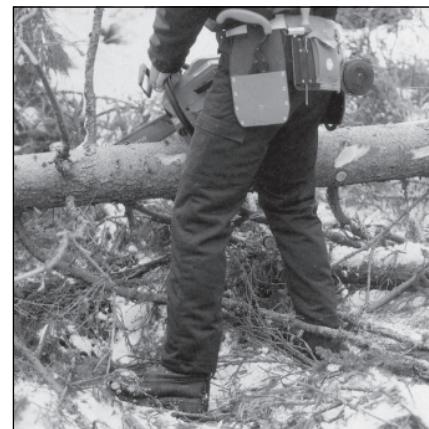
It's important that you hold the saw correctly and adopt the proper stance. It's also necessary to know the different types of cutting action.

Note:

Do not operate the saw when holding it above shoulder height.
(The only exception is chainsaw pruning.)

Holding the saw

- Place your left hand on the front handle and ensure the handle is gripped between thumb and finger, with your thumb under the handle.
- Use the mitt. Your right hand should grip the rear handle, with your index finger on the throttle trigger.
- Maintain control of the saw while the motor is running by keeping a firm grip with both hands.
- Keep your feet firmly planted slightly apart in a balanced position. Do not over-reach. Move feet closer to the cutting position.
- Hold the saw close to your body with the saw body close to the cut for better control. Slightly bent arms will improve your control over the saw.
- Position yourself to the side of the intended cut to lessen the chance of injury from kickback.
- Never use the saw with one hand as you can easily lose control over it.
- Start the cut at high speed and maintain engine speed as you cut.
- When the cut is almost finished, reduce speed to avoid a sudden finish with loss of balance, or the guide bar and chain hitting the ground or other objects.
- Regularly check chain tension and ensure that chain is correctly sharpened.



A firm stance, with feet apart

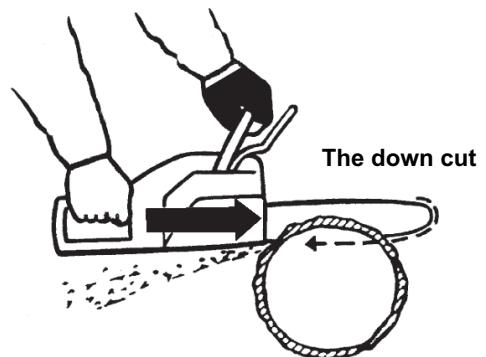


Hold the saw close to your body

Types of cutting action

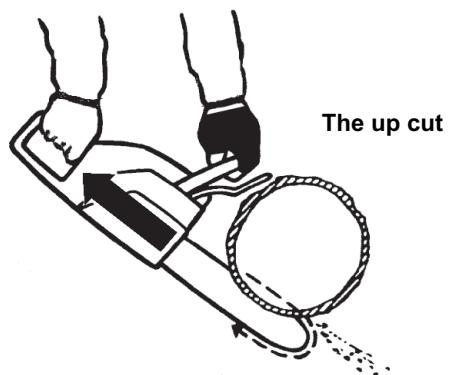
The down cut

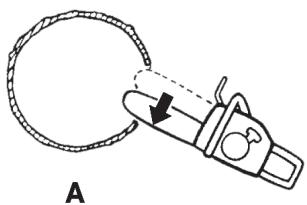
- This cut uses the bottom of the chain.
- It is the safest and easiest cut as the chain action draws the saw towards the cut and away from the operator. This is called traction.



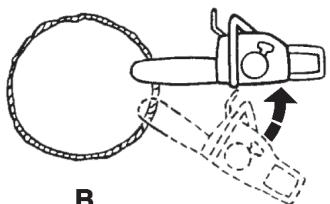
The up cut

- This uses the upper part of the chain.
- The chain's reactive force will push the saw away from the cut and towards you. This is called recoil.
- There is a risk of kickback if the saw is pushed far enough away from the cut for the nose of the bar to be used.

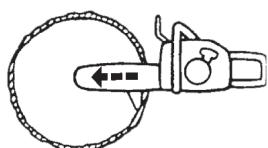




A



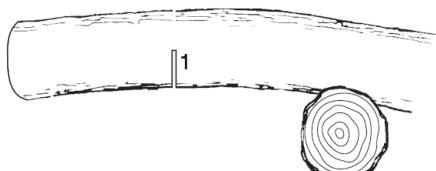
B



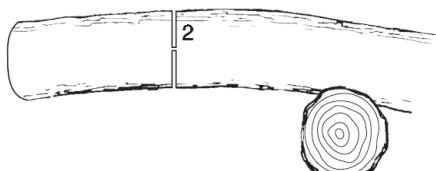
C

Bore cut procedure

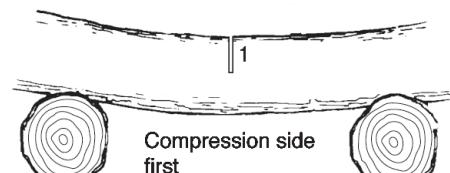
Cut compression side first



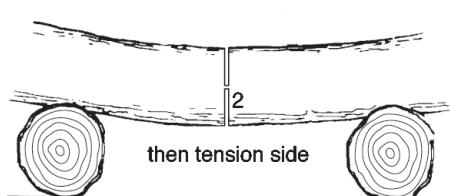
then the tension side



Cutting an unsupported stem



Compression side first



then tension side

Cutting a stem supported at both ends

The bore cut

- This cut starts by using the bottom portion of the nose of the bar and then the upper portion as the cut proceeds.
- Because of the likelihood of kickback, only trained or experienced operators should use this cut.

Proceed as follows:

- A** – Using the lower tip of the guide bar, cut until the depth is about bar width.
- B** – Align the saw towards the horizontal with the saw at full throttle.
- C** – Still at full throttle, press the saw forward whilst maintaining pressure down.

Bucking a stem where the is unsupported

When the end of a tree or log is unsupported there will be a tendency for it to bend downwards.

This creates **tension** on the topside, and **compression** at the bottom. To avoid the chainsaw jamming during the cut, it is necessary to complete the cut in two parts.

Bucking a stem supported at two ends

If a tree or log is supported at both ends, there will be a tendency for the unsupported portion to bow down.

This creates **compression** on the topside, and **tension** on the bottom. To avoid the chainsaw jamming or the tree splitting, it is necessary to complete the cut in two parts.

Refuelling the saw

Petrol—especially petrol vapour—can easily be ignited by a spark or even a hot surface while the saw is being refuelled. If you're careless, there's a risk of being badly burnt.

Follow the safe procedures:

- Stop the motor.
- Do not smoke while refuelling your saw.
- Place the saw on clear ground or on a firm surface such as stump or large log. If in the felling area, check for overhead hazards. On the landing, use designated safety zones.
- Fill the oil tank first to allow the saw to cool down.
- Take care not to spill fuel on hot motor components.
- Wipe any spilt fuel from the saw.
- Move at least 3 metres away from the fuelling point before restarting.
- Do not use glass containers for fuel or oil. Use an approved container that does not leak.

Note: Consult your owner's manual for correct fuel/oil mixtures, as serious damage can be caused by using incorrect mixes.



Refuelling the saw

Maintenance and tuning procedures

Proper Sharpening and Maintenance

The use of a poorly maintained chainsaw will affect cutting performance and can increase the risk for the operator. Potential impacts are:

- Damage to the chain
- Damage to the clutch
- Damage to the vibration mounts
- Excessive fuel use
- Increased fatigue to the operator
- Higher running and maintenance costs
- Damage to the cutter bar
- Damage to the motor
- Ineffective cutting
- Overheating of the bar and motor
- Increased risk of kickback

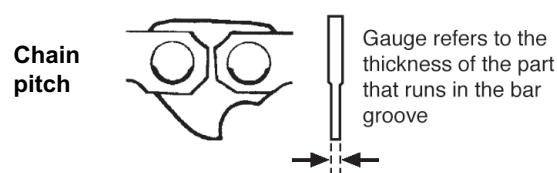
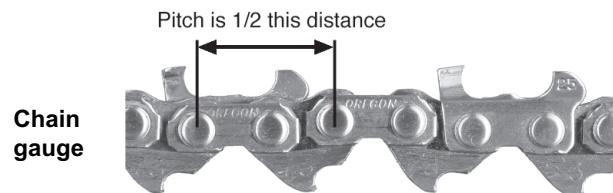
The following signs should alert the operator to the added risks:

- Incorrect and uneven length and sharpening angles of the cutters
- Excessive or incorrect depth gauge settings
- A dull chain
- Worn chain or damaged drive tangs
- Over-tightened or loose chain tension
- Any alteration to kickback-reducing features
- Inadequately oiled chain

Inappropriate matching of components will decrease efficiency and/or increase hazards. For instance, it is necessary to ensure matching of the sprocket and chain pitch.

It is also necessary to match the bar and chain for gauge. Incorrect matching will result in damage to the bar.

Note: It is common to run two chains alternately. When you have to replace the chains on your saw, replace the sprocket as well.

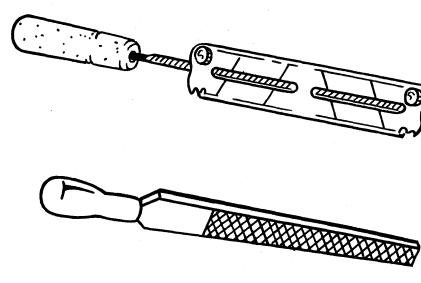


Sharpening the Chain

Requirements

The following are required to effectively sharpen a chainsaw chain:

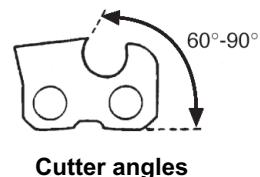
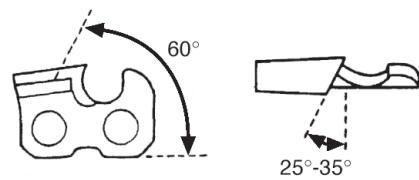
- Round file of the correct diameter (see Table) equipped with handle
- File holder, with the correct filing angle scribed on it
- Flat file with handle
- Depth gauge
- A firm work position that allows the saw to be firmly held. This may include a vice fastened to an upright off-cut, or supports cut into the top of an off-cut.



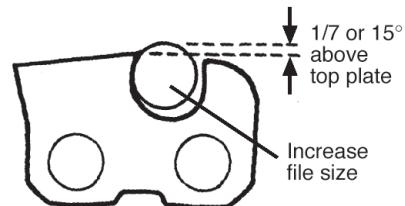
Files

| Chain Pitch | File Diameter |
|-----------------|-----------------------------|
| 1/4" | 5/32" (4 mm) |
| 0.325" | 5/32" to 3/16" (4.5 mm) |
| 3/8 low profile | 3/16" (4.7 mm) |
| 3/8 standard | 13/64" to 7/32" (5.5 mm) |
| 0.404' | 7/32" to 1/4" (5.5 to 6 mm) |

- There is a range of angles for cutters. The chain manufacturer will have recommendations for your particular chain.
- All cutters should be kept to an equal length and shape for the life of the chain.
- Use the correct file guide to ensure the file is held at the proper depth and angle.
- Do not use a file without a handle.



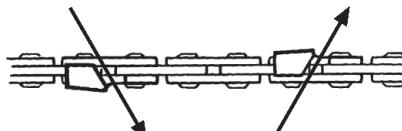
Cutter angles



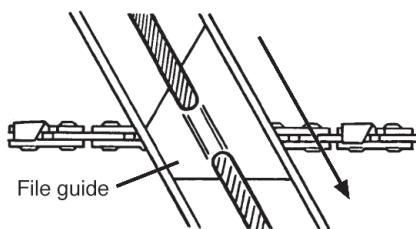
Ensure that the file is held at the correct angle and depth when sharpening

Sharpening procedure

- File from the inside out with smooth strokes of the file, using the file guide to maintain the correct angle.
- Sharpen cutters on one side of the chain first and repeat for the other side.
- If cutters are damaged, repair by filing them back to correct shape or replace if necessary.
- File replaced cutters back to the same length as the other cutters on the chain.

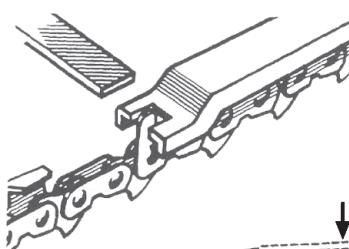


Sharpening the chain

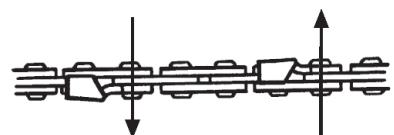
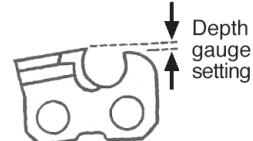


Depth gauge setting

- The depth gauges control the thickness of the chip the cutter will remove. Their proper maintenance is essential for good performance and safety.
- Basic tools are a flat file and the correct depth gauge tool as recommended by the manufacturer.
- Place the depth gauge tool in position and file from the inside of the cutter outwards. After lowering depth gauges, file off the leading edge.
- Maintain original shape of the depth gauge. Check depth gauges after four to five sharpenings.
- When setting or adjusting the depth gauges, always move the file from the inside of the cutter towards the outside.
- Sharpen one side at a time.



Setting the depth gauge



File at right angles to the chain

Servicing the bar

Clean the guide bar groove to remove any dirt or oil. Scrape away from the sprocket nose (if fitted).



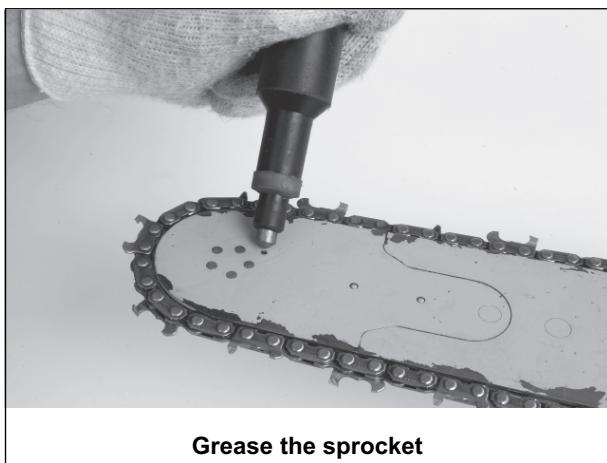
Clean the guide bar groove

Use a small screwdriver to clean the guide bar lubrication holes.



Clean the guide bar lubrication holes

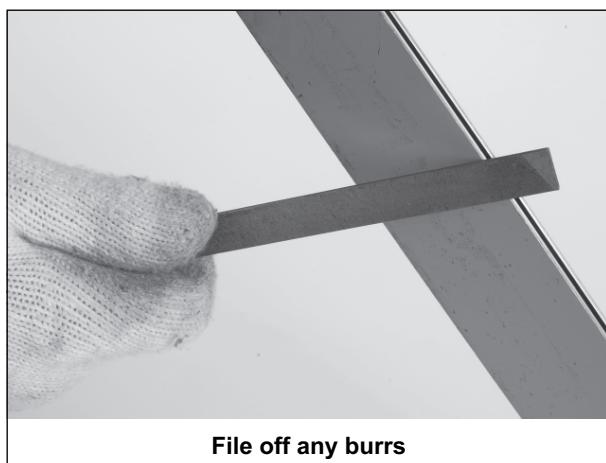
On some bars you will need to grease the sprocket every time you service the saw.



Grease the sprocket

File off any burring, filing away from the tip.

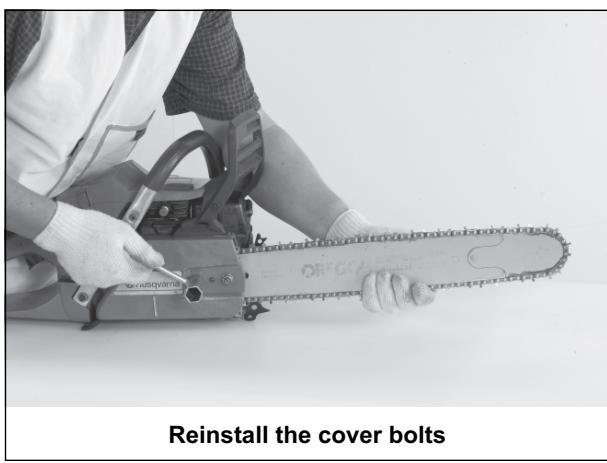
Be sure to remove any filings from the bar groove before reassembling.



File off any burrs

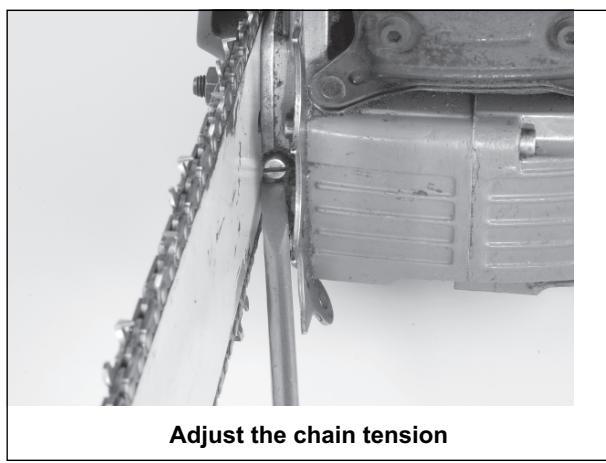
Adjusting the chain tension

Hold the bar up while you reinstall the cover bolts. Tighten them finger tight.



Reinstall the cover bolts

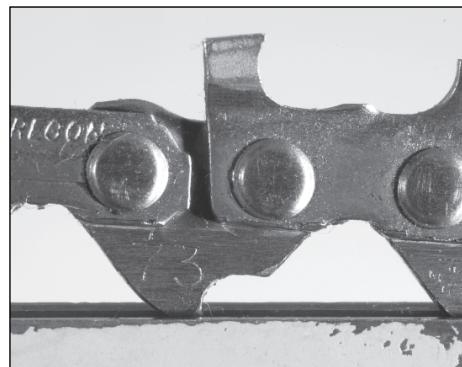
Adjust the chain tension with the chain-tensioning screw.



Adjust the chain tension

Adjust the tensioning screw until most of one drive link is visible when the chain is lifted and the chain is able to move freely.

Tighten the cover bolts. Then check the tension.



Tension the chain

Cleaning the air filter

When the saw will not idle properly or accelerate smoothly, a dirty air filter may be to blame.

Remove and clean the filter according to manufacturers' instructions.

Detergent in warm water, or compressed air, are commonly used.

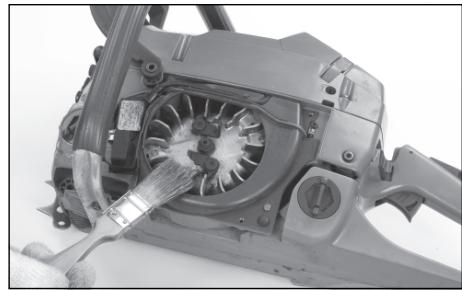
The use of petrol may damage the filter.



Use a brush to clean the air filter

Cleaning the flywheel and cooling fins

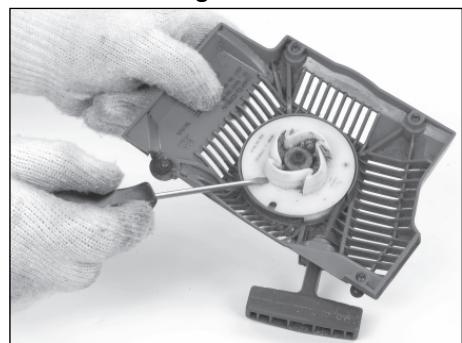
Dirt or deposits on the cooling fins and flywheel-cooling fan will reduce the cooling efficiency.



Clean the cooling fins

Cleaning the starter mechanism

Scrape off deposits using a small screwdriver.

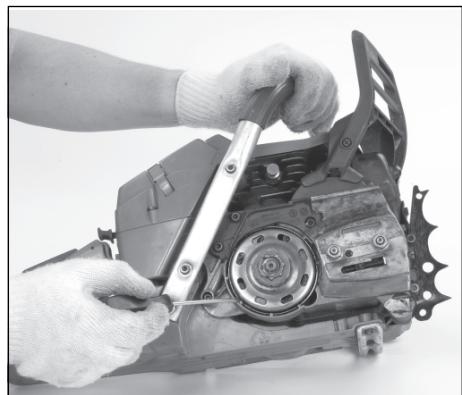


Clean the starter mechanism

Cleaning the chain brake

Keep the chain brake clear of sawdust and oil deposits by regularly scraping, or cleaning with compressed air.

If the brake band is damaged or broken, replace it before re-using the chainsaw.



Clean the chain brake

Checking the bar oil flow

- A constant supply of oil to your saw's guide bar, chain, and sprocket is essential to prevent excessive friction, wear, and damage.
- Regularly check that the chain oiling system is working.
- Always use chain-lubricating oil or other oil recommended by the manufacturer.
- Never use waste or used oils—these contain impurities that can damage the chain, and the oil mists thrown off the chain can cause health problems.

Timing of chainsaw maintenance

Daily maintenance

- Check the throttle trigger for smooth operation. If any binding occurs, or if the engine fails to return to idle, the saw should be repaired before it is used again. Be sure that the trigger cannot be activated until the throttle trigger lockout is depressed.
- Clean the chain brake and check its function according to the instructions supplied by the manufacturer. Make sure that the chain catcher is undamaged. Otherwise replace it immediately.
- Clean or replace the air filter as necessary. Check for damage or holes. Clean the cooling air inlets.
- The guide bar should be turned daily for even wear. Check the lubrication hole in the bar to be sure it is not clogged. Check for burrs and bends. Clean the bar groove, if the bar has a sprocket tip, this should be lubricated. Clean under the sprocket cover.
- Check the function of the oiler to be sure the bar and chain receive the proper lubrication.
- Sharpen the chain and check its tension and condition. Check the chain for cracked rivets or side links. Check the drive sprocket for wear, replacing if necessary.
- Check for any loose nuts and screws and retighten if necessary.
- Test the on/off switch to be sure it shuts off the engine immediately.

Weekly maintenance

- Check the anti-vibration mounts are not worn.
- Lubricate the clutch drum bearing.
- File off burrs, if any, on the sides of the guide bar.
- Clean the spark plug and check gap. (See manufacturer's specifications for appropriate gap.)
- Check the starter and starter cord for wear or damage. Clean the air intake slots on the starter housing.
- Check the starter and the recoil spring. Clean the fins on the flywheel. Oil the starter pulley.
- Clean the cooling fins on the cylinder.
- Clean or change the screen in the muffler.
- Clean the carburettor body and air box.

The sprocket should be replaced each time a new chain is fitted. If a new chain is run on a worn sprocket the drive tangs on the chain will wear faster than if it was run on a new sprocket. Bars should be replaced when the guide rails have reached the point that the chain can no longer seat properly, or before if the bar is damaged.

Monthly maintenance

- Check the brake band on the chain brake for wear.
- Check the clutch centre, clutch drum, and clutch spring for wear.
- Clean the outside of the carburettor.
- Check the fuel filter. Change if necessary.
- Flush the inside of the fuel tank and oil tank with petrol.
- Check all cables and connections.

Tuning the motor

There are three principal components to tuning a chainsaw:

- idle speed
- spark plug
- fuel and air mixture (carburettor).

The idle speed and spark plug are the easiest to check and adjust.

Idle speed

When the saw is idling the chain should not be moving and the saw should run evenly and continuously. Working with a saw that has a chain that runs at idle is dangerous; working with a saw that stalls when idling is tiring and dangerous as the operator tickles the throttle to keep it going.

The idle speed can be adjusted up or down by turning the idle screw with the saw spanner. Turn the idle speed up until the chain begins to run then turn it back till the chain has stopped. If the saw will not idle without stalling it may need further tuning.

Spark plug

For a saw to run well the spark plug needs to be in good condition.

The plug should be cleaned regularly to remove carbon build-up, and the gap checked and adjusted according to the manufacturer's specification.

Fuel-air mix

These can be adjusted by using a small screwdriver to reach through the top cover of the saw to the fuel and air adjuster screws on the carburettor.

Ensure the air filter is clean before tuning.

Adjusting of the fuel and air mix should be carried out by a mechanic or experienced operators only. It is possible to damage the carburettor or seize the motor when tuning if it is done incorrectly.

If a saw is running poorly or not responding smoothly to the throttle the procedure is as follows:

- Turn both fuel and air screws in fully, do not over tighten as this may damage the carburettor
- Open both fuel and air screws a full turn each
- Start saw
- Whilst saw is running, use a tachometer to adjust the air screw until the saw is operating properly.

Note: it requires two people to carry this out safely—one to hold and operate the saw and one to do the tuning adjustments.

Glossary of terms

| | |
|----------------------------------|--|
| Bar | see Cutter bar |
| Bore cut | A cut using the tip of the saw to cut into the wood rather than up or down through it |
| Bucking spikes (dogs) | Sharp metal spikes at base of cutter bar, used to grip log to allow saw to be levered around log |
| Buck | To cut through a felled tree or log |
| Chain brake | Device which stops the chain spinning if kickback occurs |
| Chain catcher | A pin or stud behind the bar, designed to prevent the chain from lashing back if it breaks. Sometimes referred to as peg. |
| Chaps | Cut-resistant leggings |
| Compression wood | Where a tree or log bends inwards. Can result in jamming of the chainsaw in the closing cut. |
| Cutter bar | Metal bar which chain rotates around |
| Cutter tooth | The sections of chain which cut |
| Depth gauge | Section of tooth which determines the depth of wood that each tooth can remove |
| Drop starting | Illegal method of starting a saw by holding starter cord in one hand and “dropping” saw in the other |
| Front handle (top handle) | Handle over the top of the saw gripped in the left hand |
| Gauge | The thickness of the drive link on a chain. Should be matched to the cutter bar gauge. |
| Guide bar | see Cutter bar |
| Guide rails | Sides of groove running around cutter bar, which keep the chain on the bar |
| Hand guard | Metal or plastic guard in front of top handle, usually incorporating the chain brake |
| Hi-vis | High visibility (often fluorescent) clothing and helmets |
| Kickback | Chainsaw is thrown back towards operator when chain is rotating |
| Mitt | Leather mitten attached to top handle to assist grip if kickback occurs |
| Pitch | A measure of chain size. Measured as 1/2 the distance between any three rivets. |
| Rear handle | Handle at the back of the saw gripped in the right hand; also contains throttle and throttle lockout |
| Side cover | Metal plate which covers the sprocket, oiler, and chain tension adjuster. When fitted, it holds the bar firmly in place |
| Tension wood | Where a tree or log bends outwards. Can result in splitting or sudden movement of the tree or log if not cut correctly. |
| Throttle lock | Locking mechanism that holds throttle at fast idle when not activated by hand on rear handle |
| Wedge | A felling aid for ensuring cuts remain open during the cutting procedure. Can also be used for limited control over felling direction. |

Index of unit standards

Unit

- 43 Maintain a Chainsaw
- 6917 Operate a Chainsaw
- 6924 Process Trees on a Landing
- 6972 Prune Plantation Trees with a Chainsaw from off the Ground
- 6973 Prune Plantation Trees with a Chainsaw from the Ground

Note: Information relating to Unit 6916 – Demonstrate Knowledge of the Code of Practice Relating to Chainsaw Use, can be found in Section 6 (Rules for Chainsaws) of the Approved Code of Practice for Safety and Health in Forest Operations.

Poroporoaki

**Whaia te huarahi
o te mātauranga**

*Pursue the path
of learning.*

**Ka pikī ake koe,
ka whānui atu nga pae.**

*The higher you climb,
the wider the horizons.*

**Rapuhia nga pae
i roto, i tōu nei ngakau.**

*Seek also the horizons
within your self.*

E tipu, e awhi, e tū.

Grow, embrace, stand tall.

Vision, knowledge, performance

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