TREEFELLING

BEST PRACTICE GUIDE

FOREST OWNERS ASSOCIATION

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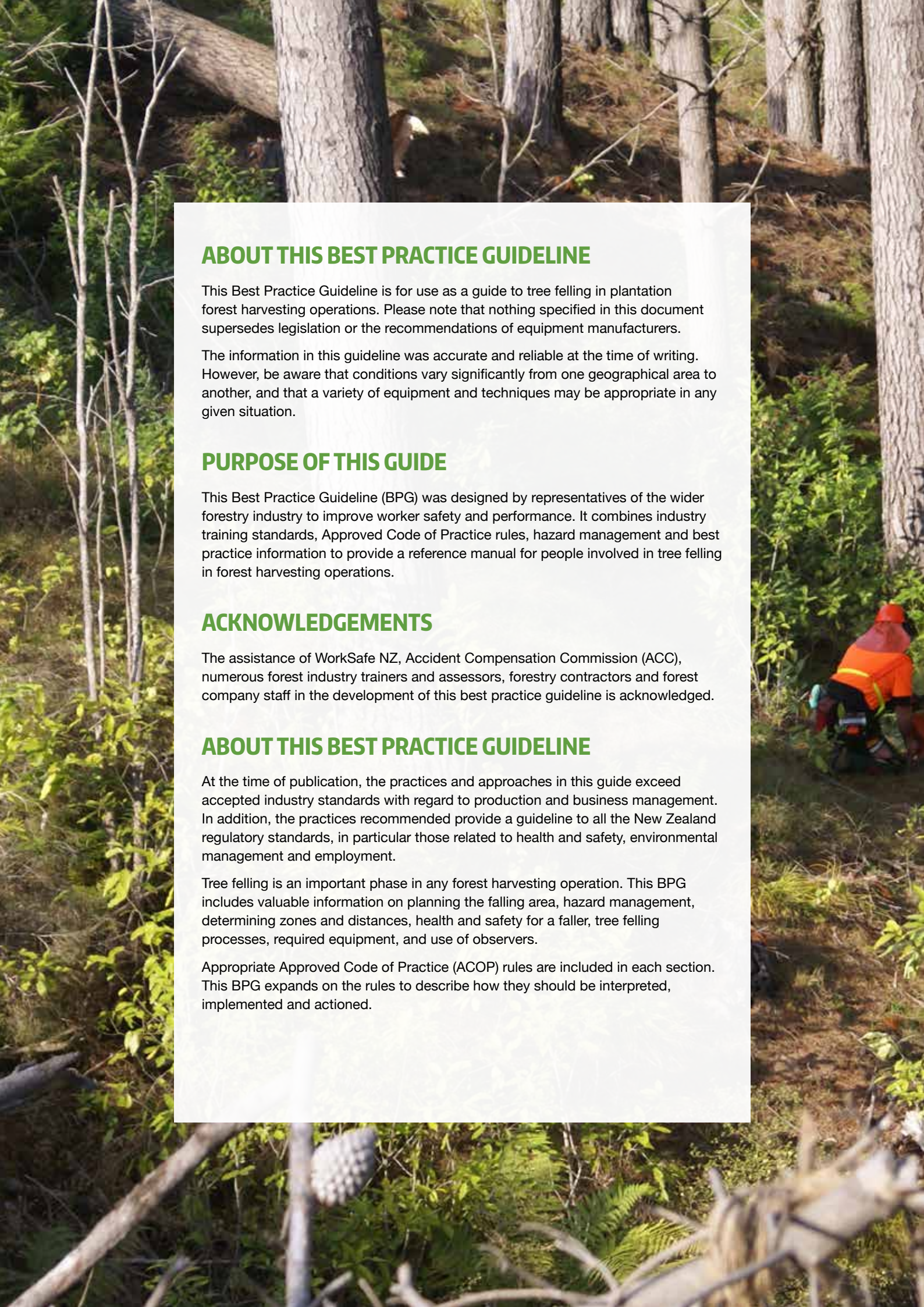

ABOUT THIS BEST PRACTICE GUIDELINE

This Best Practice Guideline is for use as a guide to tree felling in plantation forest harvesting operations. Please note that nothing specified in this document supersedes legislation or the recommendations of equipment manufacturers.

The information in this guideline was accurate and reliable at the time of writing. However, be aware that conditions vary significantly from one geographical area to another, and that a variety of equipment and techniques may be appropriate in any given situation.

PURPOSE OF THIS GUIDE

This Best Practice Guideline (BPG) was designed by representatives of the wider forestry industry to improve worker safety and performance. It combines industry training standards, Approved Code of Practice rules, hazard management and best practice information to provide a reference manual for people involved in tree felling in forest harvesting operations.

ACKNOWLEDGEMENTS

The assistance of WorkSafe NZ, Accident Compensation Commission (ACC), numerous forest industry trainers and assessors, forestry contractors and forest company staff in the development of this best practice guideline is acknowledged.

ABOUT THIS BEST PRACTICE GUIDELINE

At the time of publication, the practices and approaches in this guide exceed accepted industry standards with regard to production and business management. In addition, the practices recommended provide a guideline to all the New Zealand regulatory standards, in particular those related to health and safety, environmental management and employment.

Tree felling is an important phase in any forest harvesting operation. This BPG includes valuable information on planning the falling area, hazard management, determining zones and distances, health and safety for a faller, tree felling processes, required equipment, and use of observers.

Appropriate Approved Code of Practice (ACOP) rules are included in each section. This BPG expands on the rules to describe how they should be interpreted, implemented and actioned.

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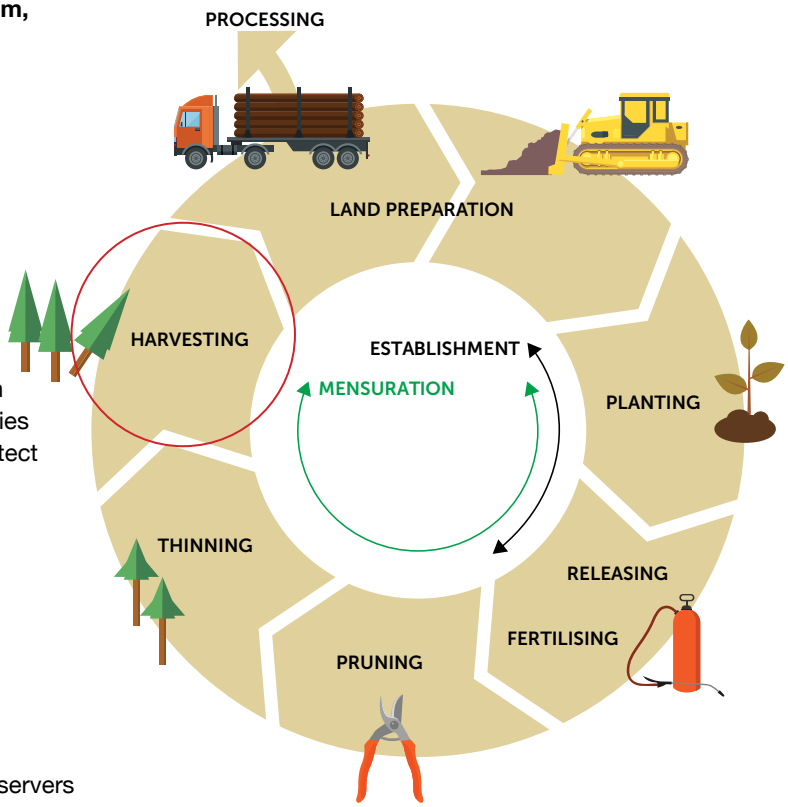
OVERVIEW OF FOREST HARVESTING OPERATIONS

The forest industry cycle includes all operations from preparing the land and planting the trees, to loading the harvested trees on a truck for transport out of the forest.

The harvesting operation, highlighted in this diagram, has four stages:

1. Tree Felling
2. Extraction
3. Processing
4. Loading



This BPG covers the tree felling stage.

TREE FALLER SAFETY

Faller safety is an extremely important consideration in a forest harvesting operation. This BPG details strategies and procedures that, if correctly implemented, will protect fallers from harm.

These include:

- planning the felling area to minimise hazards
- hazard identification and management
- determining safe zones and retreat distances
- maintaining faller health and safety
- correct tree felling procedures
- ensuring equipment is up to standard and using observers

ENVIRONMENTAL STANDARDS

Any business or person engaging a contractor to carry out a forest harvesting operation must consider the impacts of that operation on the environment. Environmental standards defined by the forest owner, local and regional authorities must be followed by the harvesting crew.

They must be aware of:

- environmentally sensitive, cultural, and historical sites and how to proceed when working around sites, or when new sites are found
- the effects of adverse weather on the operation
- the visual effect poor harvesting techniques can have on the landscape
- trees bordering sensitive areas such as streams or cultural sites and plans to avoid damaging the sites
- the effects of the operation on neighbouring properties

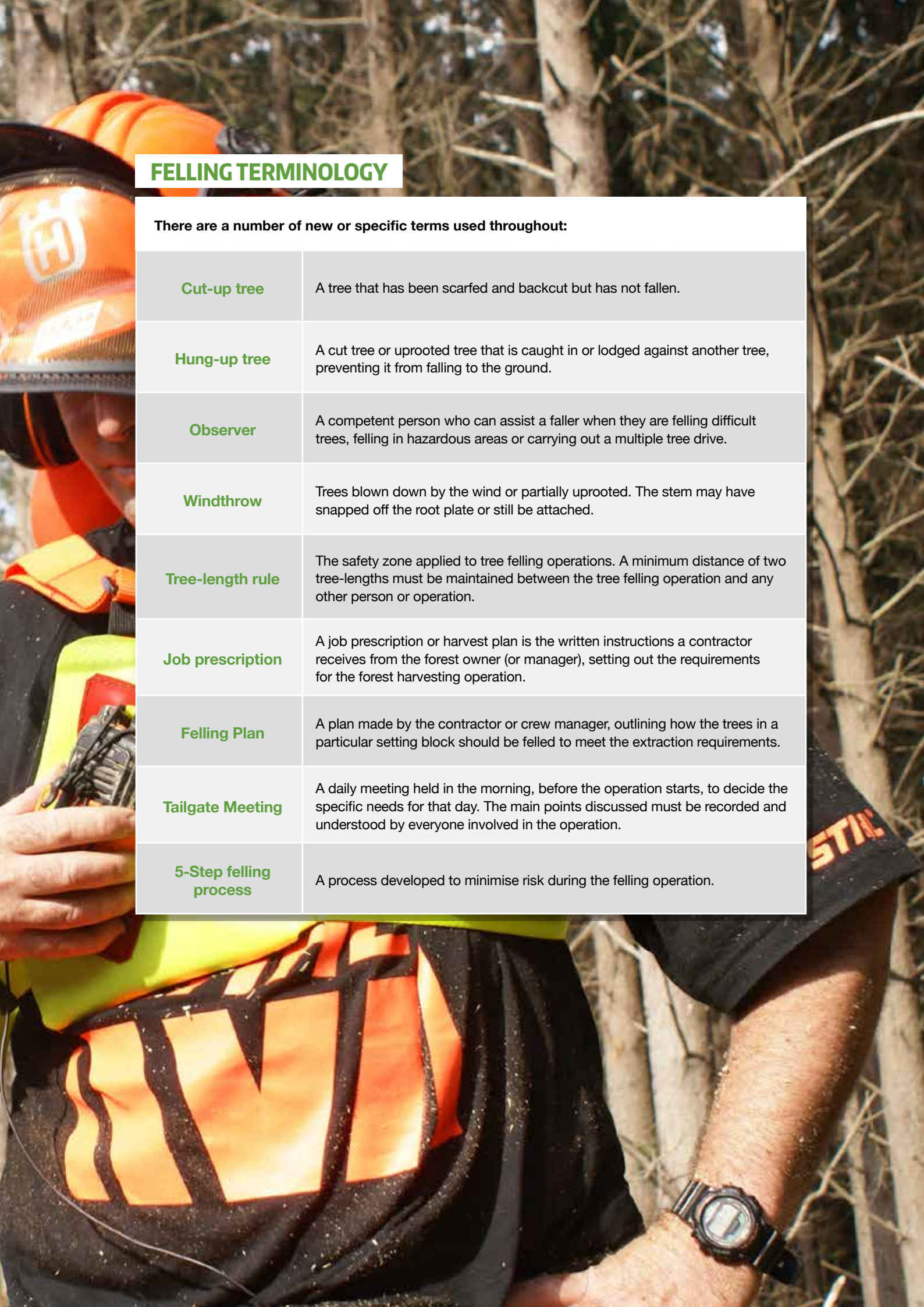
PRODUCTIVITY

The primary productivity objectives of tree felling are to:

- minimise value-loss by minimising damage to the tree during felling
- maximise production through increased payloads during extraction

The productivity and quality of the whole harvesting operation is significantly affected by the tree felling phase.

Note: never compromise safety for production.



FELLING TERMINOLOGY

There are a number of new or specific terms used throughout:

Cut-up tree	A tree that has been scarfed and backcut but has not fallen.
Hung-up tree	A cut tree or uprooted tree that is caught in or lodged against another tree, preventing it from falling to the ground.
Observer	A competent person who can assist a faller when they are felling difficult trees, felling in hazardous areas or carrying out a multiple tree drive.
Windthrow	Trees blown down by the wind or partially uprooted. The stem may have snapped off the root plate or still be attached.
Tree-length rule	The safety zone applied to tree felling operations. A minimum distance of two tree-lengths must be maintained between the tree felling operation and any other person or operation.
Job prescription	A job prescription or harvest plan is the written instructions a contractor receives from the forest owner (or manager), setting out the requirements for the forest harvesting operation.
Felling Plan	A plan made by the contractor or crew manager, outlining how the trees in a particular setting block should be felled to meet the extraction requirements.
Tailgate Meeting	A daily meeting held in the morning, before the operation starts, to decide the specific needs for that day. The main points discussed must be recorded and understood by everyone involved in the operation.
5-Step felling process	A process developed to minimise risk during the felling operation.

TREE FELLING ROLES

The tree felling team includes the faller, a crew manager, an observer, and a contact person.

Each member is responsible for their own area of work. It is essential that all members of the felling team work together to achieve common results including safety, production and quality.

CREW MANAGER

The crew manager sets a tree felling plan that ensures the safe and efficient felling of trees. This tells the faller where to start and the direction the trees must be felled for ease of extraction. The crew manager also manages the tree felling operation and ensures compliance with all rules set down in the ACOP and as specified by the forest owner, forest manager or contractor e.g. safety, environment, quality.

The crew manager monitors the felling process to ensure that:

1. All safety precautions and hazards are identified and notified to the fallers.
2. The tree felling plan reflects the safest and most efficient way of felling the setting, while also meeting the forest owner's specifications.

CONTACT PERSON

The contact person monitors the radio call-ins from the faller.
The call-ins can be electronically recorded or written down in a felling log throughout the day. Standard call-in intervals are 30 minutes or after each tank of fuel is used, whichever is the shorter interval. The call-in person also records the start and completion of any tree drive undertaken.

Common practice is for the contact person to be a machine operator.

If a call-in is not received from the faller as scheduled, the contact person asks the nominated observer to go and check on the faller.

TREE FALLER

A manual faller cuts down standing trees, taking care to meet the requirements of the job prescription.

An experienced, competent faller has a good understanding of tree felling rules and regulations. They can accurately identify hazardous trees and know effective techniques to fell them safely. The faller may have to adapt the felling methods to suit the changing conditions of the environment, e.g. terrain, soil conditions, undergrowth, overhead hazards, and weather conditions.

Clearfell fallers must be in constant radio contact with another person.

They must also know what equipment is required to do the job safely, and ensure that equipment is on site and used. This is a physically demanding job and a high level of stamina and strength is required.

Tree falling can be risky, so particular attention must be paid to training and using correct felling techniques. Tree felling training usually happens on the job and includes: hazard identification, safety instruction, health and safety rules, and environmental compliance.

APPROVED CODE OF PRACTICE

» **RULE 2.5.1**

The employer must ensure that a competent person is in charge of each operation, who must supervise and ensure work is supervised and performed in a safe manner. 1989.

APPROVED CODE OF PRACTICE

» **RULE 11.1.1**

Clearfell tree fallers must be in constant radio contact with another person.

» **RULE 11.1.2**

A person shall always be available on site to monitor and assist with any tree felling activity if required.

TREE FELLING ROLES

In addition, a competent faller has the ability to:

- make intelligent decisions, particularly when faced with multiple hazards
- maintain physical strength and stamina
- accurately judge distances
- pay attention to detail
- assess whether equipment is operating correctly
- listen carefully
- stay alert while performing repetitive tasks
- comply with safety regulations

OBSERVER

The observer assists the faller to do their job safely.

To comply with **ACOP Rule: 11.7.4,** the observer must have advanced felling skills and knowledge to effectively assist with management of tree drives.

The observer's role when assisting with the felling of hazardous trees is to:

- offer advice to the faller
- help the faller to deal with the situation and
- warn the faller of impending hazards as the felling cuts are being made

Observers must be competent at carrying out this role and skilled in the task of felling hazardous trees.

They must be on site at the felling face and have an effective means of communicating with the faller while the chainsaw is running. A dedicated radio channel for the fallers and an ear piece in their earmuffs is recommended.

Ensuring the safety of the faller and the observer is crucial in manual felling operations.

T**o be effective, the observer must be able to:**

- carry extra equipment such as fuel cans, tools and extra wedges for the faller
- identify and stand in a safe position, clear of the faller's intended escape route
- maintain a clear view of the top of the tree
- alternate roles with the faller to improve fatigue management and call-in to the contact person at the designated intervals

The observer must stand at least 2m away from the faller when felling cuts are being made. For example, the observer should not assist with driving in wedges.

Note: If the observer is under training as a faller and is not skilled in dealing with hazardous trees, they are not competent to carry out the observer role where a one-on-to-two tree drive has been unsuccessful.

APPROVED CODE OF PRACTICE

» **RULE 11.7.4**

The tree faller shall notify the person available to them that they intend to undertake a tree drive.

- the faller shall notify the person available to them that the tree drive has been completed successfully.
- if a one on to two tree drive is unsuccessful falling shall cease until an observer is present to help plan management of that hazard.

TRAINING AND SUPERVISION

Tree felling is a high risk operation, exposing fallers to hazards such as falling debris, unexpected stem movement, adverse terrain, heavy undergrowth and unfavourable weather conditions.

Tree felling accidents are usually serious, and can result in lost time, disability or death. They cost the employer through increased accident insurance levies, loss of workers and potential loss of contracts. Workers involved in tree felling need to be qualified, fit for task, active, alert, properly trained or supervised, and appropriately equipped.

The Approved Code of Practice for Safety and Health in Forest Operations requires a competent person to supervise workers who are new to the operation or task. Regardless of their training status, new workers should not be allowed to work unsupervised until they've demonstrated that they're unlikely to harm themselves or others. Records of supervision and training must be kept, as well as evidence that a competency check has been done.

DEFINITIONS FROM THE ACOP

Competent person

A person who can consistently demonstrate the skill and knowledge derived from experience and/or training for the type of work in which the person is employed and the approved code the person is required to work under.

Qualified

A person who holds an industry recognised NZQA qualification for the type of work in which they are employed.

Under training

A person who is not competent or qualified to carry out the task unsupervised and is working toward an industry recognised NZQA qualification under the guidance and training of a competent person.

Close Supervision

Direct and constant one-on-one supervision.

TREE FELLING QUALIFICATIONS

(Current as at May 2016. See the Competenz website for the latest versions)

All inexperienced workers should be under a documented training programme. One way to achieve this is training towards NZQA unit standards and qualifications. Fallers who hold the New Zealand Certificates listed below, and are able to demonstrate the above qualities, are considered qualified and able to work without supervision. Fallers who don't hold the qualifications or are under training for particular tree felling tasks are not considered qualified, and need to be supervised when felling trees.

New Zealand Certificate in Forest Harvesting Operations (Level 3) Tree Felling Strand (Ref: 2326)

New Zealand Certificate in Forest Harvesting Operations (Level 4) Tree Felling Strand (Ref: 2327)

For more information, please refer to the Competenz website www.competenz.org.nz or contact a Competenz Account Manager on 0800 526 1800.

ONGOING COMPETENCY CHECKS

On-going competency checks for all workers through audits, safe behavioural observations or certification are a recent initiative introduced to some sectors of the industry. These demonstrate that workers in high risk jobs are maintaining the standards required to achieve their original qualifications. All of these checks must be documented.

KNOWLEDGE OF HAZARDS

Before starting any new block, the harvesting crew must help each other to identify significant hazards on the site and decide how to manage the associated risks.

Documented evidence on site must list the hazards, risks and controls, and show that these were explained to all harvesting crew members as part of their training and supervision.

The two main categories are health hazards and operational hazards, and fallers need to be familiar with both.

HEALTH HAZARDS

Tree felling is physically demanding. Health hazards that could affect fallers are:

- dehydration (extreme thirst leading to hyperthermia and heat stroke)
- sunburn and the risk of skin cancer
- exposure to extreme cold which can lead to hypothermia
- fatigue, particularly long-term fatigue, which affects judgement
- operator overuse OOS or repetitive strain injury
- joint pain, arthritis
- soft tissue injuries, muscle strains, back injuries
- inhalation of fumes from the chainsaw
- vibration-induced damage to blood vessels in the fingers
- anaphylactic shock (severe allergic reactions to bee or wasp stings)
- infections from minor cuts and abrasions
- stress resulting from excessive work pressure
- respiratory conditions caused by inhaling pollen or other dusty substances

To maintain peak performance and prevent accidents, fallers must take special care of their bodies. This includes:

- staying physically fit
- avoiding drugs and alcohol during the working week
- eating a healthy diet
- drinking plenty of water
- applying sunblock to exposed skin
- doing warm up exercises to stretch muscles
- dressing properly for the weather conditions
- treating minor injuries straight away
- maintaining equipment in good condition
- maintaining personal hygiene and
- getting enough sleep

How people treat their bodies away from work affects their performance at work.

THE SEVEN KEY CAUSES OF HARM

The seven key causes of harm in tree felling are:

1. A faller working too close to other people or plant
2. Broken limbs or top hitting the faller
3. Incorrect or poor felling technique
4. Felling dead trees
5. A faller being struck from behind by an object or tree
6. Hung-up trees left standing, or not felled using the correct methods
7. Stem movement/rebound and butt swing.

During the harvest planning stage, the principal and contractor must put a process in place to address the seven key causes of harm. This identifies the hazards in a block and assesses the risks before work starts. This process is part of developing the tree felling plan.

APPROVED CODE OF PRACTICE

» **RULE 11.4.3**

No person shall be closer than two tree lengths to a tree being felled, unless that person is:

- the faller
- assisting the faller
- supervising
- training others or being trained
- observing or auditing

FALLER WORKING TOO CLOSE TO OTHER PEOPLE OR PLANT

The danger zone of a standing tree is a circle around the centre of the stump of the tree, with a radius equal to twice the height of the tree. Any person, machine or operation within two tree-lengths of a tree being felled is at risk of being hit by the falling tree, or one that it contacts on its way to the ground.

The two tree-length rule must be enforced to control this risk.

See also: Two tree-length rule on page 26.

BROKEN LIMBS OR A TOP HITTING THE FALLER

Broken limbs or a top caught up in the branches of a standing tree may be hidden from the faller's view. If these are dislodged as the tree starts to move, they could hit the faller. Tree to tree contact can also snap off branches and heads which can ricochet backwards towards the faller. This hazard may extend beyond the width of the crown if it brushes another tree as it falls.

The main action to control this hazard is careful assessment of the tree and its surroundings to identify broken limbs or tops.

If the faller feels unsafe felling such a tree they should:

- call their observer to help work out an appropriate plan to manage it
- use a machine to dislodge the hazard if possible
- drive the hazard down with another tree

INCORRECT OR POOR FELLING TECHNIQUE

Serious harm can occur where the faller loses control of the tree as a result of using incorrect felling cuts, or using the cuts incorrectly.

Common causes are:

- not assessing the tree properly
- failing to clear around the tree
- inadequate escape route preparation
- over-cutting the scarf
- standing in the wrong position when putting in the backcut
- continuing the back cut after the tree has started to fall
- not retreating far enough from the falling tree
- walking directly behind the falling tree

Good technique includes a thorough hazard assessment and fallers must have the knowledge and skills to recognise a hazardous situation developing around them and react accordingly. They must know when to stop felling until their observer is in place. Fallers must always follow the five-step felling procedure.

See: Five-step felling procedure on page 30.

Good technique also requires a competent faller. The faller must hold appropriate qualifications for the task they are completing, and regular refresher training is recommended to maintain competency.

Fallers must be audited on a regular basis to ensure that they are felling safely in a variety of circumstances. These audits should be completed by a person who is experienced and competent in auditing felling operations.

APPROVED CODE OF PRACTICE

» **RULE 11.6.1**

A hung-up or cut-up tree shall be brought to the ground immediately or the hazard managed until such time as it can be brought to the ground.

If the cut-up tree is to be brought down, refer to section 11.7: Tree driving.

FELLING DEAD TREES

Dead, broken or rotted trees are unpredictable and very hazardous. They can fall in any direction at any time without warning, and may break up as they are falling. Driving dead trees can also pose a danger as they may break with the upper part of the stem falling backward towards the faller.

The only work carried out in the two tree-length zone around the dead tree should be to make the danger area safe. Dead trees should not be left standing while other trees are felled around them.

Fallers must notify their contact person that they intend to fell a dead tree, and where possible, dead trees should be removed by machine before work begins in that area. If machine assistance is not available fallers must follow the recommended procedures for felling dead trees.

See: Felling dead trees on page 60.

FALLER BEING STRUCK FROM BEHIND BY AN OBJECT OR TREE

Fallers may be struck from behind by branches, vines or tree crowns intertwined with other standing trees behind the one being felled. They will look at the falling tree, and not necessarily watch out for hazards behind them.

Two other scenarios are:

- the vibration of a large tree hitting the ground may be enough to cause a dead or unstable tree to fall.
- removing a tree which is sheltering an unstable tree may expose it to the wind and cause it to fall.

The danger zone extends behind the tree being felled. The faller's assessment must include checking surrounding trees for any structural weakness or damage, interlocking branches, entangled vines, or broken tops. Fallers must remove scrub from around the trees, and make sure the escape route is well clear of anything that could be dragged forwards or dislodged by the falling tree.

This hazard is relative to the direction of the fall and emphasises the importance of directional felling techniques and proper use of scarf and backcut.

HUNG-UP TREES LEFT STANDING, OR NOT FELLED CORRECTLY

The definition of a hung-up tree is a cut-up, windthrown, uprooted or pushed over tree that is caught or stuck against another tree, preventing it from falling to the ground. Attempting to eliminate a hung-up tree is the leading cause of fatal injuries in tree felling.

Fallers should apply five basic rules:

1. Never work under a hang-up
2. Advise the contact person of the hazard
3. Bring down hung-up trees as soon as practicable
4. Use a machine to bring down the hang-up where possible
5. Use an observer for drives which exceed one on to two.

Fallers must follow the recommended procedures for felling hung-up trees.

See: Hung-up and Cut-up Trees on page Error! Bookmark not defined.

STEM MOVEMENT, REBOUND AND BUTT SWING

A number of factors can cause a stem to rebound into the safe work zone after the tree has fallen.

The main causes are:

- a falling tree crosses over a hung-up tree and cantilevers sideways or backwards
- a tree felled uphill slides back down the slope
- a tree felled into standing trees kicks back off the stump towards the faller
- a falling tree strikes an obstacle as it falls e.g. a rock, another stem, other terrain features

Any tree felled uphill can slide back down the hill and strike the faller, so it is important that the escape route is out to the side of the tree rather than at a 45° angle downhill. It is vital the faller has a clearly defined escape route and retreats through it.

To minimise the hazard of stem rebound, fallers should:

- have an escape route cleared at an angle to the felling direction
- finish the felling cut on the safest side of the tree
- watch the tree as it falls
- move away from the stump as the tree falls and
- avoid felling uphill where possible

The faller will minimise the risks from stem movement, rebound and butt swing by following the 5-step felling plan and retreating along the full length of the escape route.

See the 5-step Felling Procedure on Pwwage 30.

Clear escape route

EQUIPMENT

Tree felling equipment consists of personal protective equipment (PPE), the chainsaw, and other tools required to fell trees safely. It is essential that fallers clean, maintain and replace equipment to ensure it is effective and fit for purpose.

PERSONAL PROTECTIVE EQUIPMENT

The Approved Code of Practice for Safety and Health in Forest Operations requires manual fallers to have and use the following PPE:

- hi-vis shirt, vest, or coat
- hi-vis helmet
- class 5 hearing protection
- protective legwear, chainsaw chaps or trousers
- eye protection
- safety footwear that provides ankle support
- means of communication

All PPE must comply with the relevant standards and be worn correctly.

APPROVED CODE OF PRACTICE

» **RULE 3.2.2**

High-visibility clothing must be worn on the outside of other clothing.

» **RULE: 3.3.1**

All workers using a chainsaw must wear protective legwear that meets the relevant standards.

» **RULE 3.4.1**

Workers engaged in forest operations must wear footwear which provides foot and ankle support, traction and protection appropriate to the task they perform and that meets the relevant standards. Footwear worn in all forest operations must have protective toe caps.

» **RULE 3.4.2**

When fitted, laces must be securely tied at all times.

» **RULE 3.5.3**

Safety helmets must be of high-visibility colours for daytime work. And meet the relevant standards.

» **RULE 3.5.4**

Helmets must be inspected regularly for damage and deterioration.

» **RULE 3.5.5**

- helmets must be replaced:
- immediately if damaged
- three years after the issue date or in accordance with the manufacturer's specifications.

» **RULE 3.5.7**

Hoodies and peak caps must not be worn under helmets.

» **RULE 3.6.1**

Class 5 hearing protection must be worn when working with or around chainsaws or forestry machinery.

» **RULE 3.6.4**

Any clothing or item that interferes with the hearing protection must not be worn or used while working.

PPE equipment

CHAINSAW AND FUEL

Fallers must use the recommended tree felling equipment to do the job safely and professionally.

The equipment includes:

- a chainsaw of suitable size, in good working order (refer to Best Practice Guidelines for Chainsaw Use) and an adequate fuel and oil supply stored in approved containers.

TOOL KIT

The tool kit should include:

- bar spanner
- file guide with depth gauge setter
- feeler gauge
- round file and flat file (including handles) and
- cleaning cloth

Tool kit

A suggested spares kit includes:

- sharp chain
- starter cord
- clean air and fuel filters
- spark plug
- casing and cover screws and
- bar cover nuts

APPROVED CODE OF PRACTICE

» **RULE 3.7.1**

Eye protection must be used for chainsaw use or where there is potential for harm.

Exception: Where the eye protection itself is likely to cause a greater hazard.

» **RULE 3.8.1**

Gloves of the appropriate material must be worn when there is potential for harm

» **RULE 4.2.1**

All chainsaws must comply with NZS 5819:1982 chainsaw safety, reconfirmed 1989

» **RULE 4.2.2**

All chainsaws must be used and maintained in accordance with the manufacturers recommendations

» **RULE 4.2.3**

Hand held chainsaws must be in safe working order and have all safety features fitted. Safety features include:

- a safety mitt
- an inertia chain brake
- a chain catcher
- a rear hand guard
- anti-vibration mounts
- a throttle lock
- an on-off switch
- a muffler and spark arrestor

» **RULE 4.2.4**

Chainsaw chain must be maintained in accordance with the manufacturer's recommendations.

» **RULE 9.4.7**

- Only approved containers meeting the following standards must be used:
- AS/NZS 2909:2001
- ASTM F-852-99el

These containers must:

- have an appropriate sealing cap
- be made of metal or a durable plastic that will not react with the fuel
- be clearly labelled or marked to identify the fuel and the potential hazards, e.g. petrol – highly flammable

FIRST AID AND FIREFIGHTING

Fallers should carry:

- a fire extinguisher in accordance with forest company requirements
- a first Aid Kit with at least two large sterile wound dressings.

WEDGES

Wedges are an integral part of a faller's kit. They are used to:

- stop the tree sitting back as the felling cuts are completed
- assist felling trees in a desired direction
- alter the tree's balance and weight distribution when felling trees against their natural lean
- keep the saw cut open when crosscutting logs

Typically, wedges are made of plastic, although aluminium and steel wedges are available if required. Wedges and driving tools vary in size and capability. They are selected according to tree size and expected lift requirements.

Small plastic wedges are usually sufficient for smaller trees which are not being felled against their natural lean. Long-tapered plastic, aluminium, or steel wedges may be required for larger trees and when felling trees against their lean.

Note: Drive steel wedges using wooden mauls or plastic headed hammers only.

All fallers are required to have a set of at least four wedges and a driving hammer when felling trees greater than 20cm in diameter. Many fallers now carry a minimum of 6 wedges, putting the two additional wedges in their backpacks. Plastic wedges must have at least 75% of their tips sharp enough to be inserted into a chainsaw cut. Any wedge below this may be used as a back-up, but must not be considered as one of the four needed to comply with ACOP rule 11.3.1. Damaged wedges can be sharpened with a rasp or other abrasive tool, but it's important not to have too big a shoulder on the taper.

Fallers must also have a suitable equipment belt to carry all of the required felling aids and tools.

Fallers tools

APPROVED CODE OF PRACTICE

» **RULE 2.2.4**

Chainsaw operators (except those working on a skid site) must carry on their person at least two large sterile wound dressing or haemostatic gauze pads protected against contamination by dust, heat, moisture or any other source.

» **RULE 11.3.1**

When felling trees greater than 20 centimetres in stump diameter, the tree faller must carry:

- four wedges suitable for the size of the tree being felled
- a suitable tool for driving wedges

» **RULE 11.3.2**

Metal on metal contact during wedge use must be avoided

COMMUNICATION AND SAFETY EQUIPMENT

Technology is used to improve faller safety. This includes radios, GPS units for signalling faller locations, range finders to measure the two tree-length requirement and man-down devices to trigger an alarm if a faller is hurt and not moving.

APPROVED CODE OF PRACTICE

» **RULE 11.1.1**

Clearfell tree fallers shall be in constant radio communication with another person.

RADIO

Fallers must carry a radio to communicate with their contact person, and to call for help in emergencies. Radios with ear pieces inside the ear muffs are ideal, as these allow for easy communication while the saw is operating.

Note: NO ONE is allowed to work alone unless every practical step has been taken to make sure they can call for help in an emergency,

GPS

Wearing a GPS unit can accurately determine a crew member's location using signals sent by GPS satellites orbiting the earth. GPS units can be set up to sound warning alarms if the wearer moves inside a predetermined zone or comes within two tree-lengths of another faller, a road, a landing site or significant hazard e.g. powerlines.

A GPS transceiver that communicates with an on-site computer system may be acceptable as a monitoring device. It must be connected to an alarm, and it must record transmissions electronically.

RANGE FINDERS

A rangefinder measures the distance from the observer to a target. Most rangefinders use a laser to do this.

They can be used to determine an accurate two tree-length distance when felling, to setup up felling signs and road closed signs, and to implement risk management plans when working close to other personnel or machines.

The range finder can also be used regularly during the day to check the agreed safety distance to a hazard.

MAN-DOWN DEVICES

Man-down devices are attached to the faller and send an alarm to the contact person if the faller has not moved for a pre-determined period of time.

ANEMOMETERS

Anemometers are used for measuring wind speed. The wind speed is matched to the Beaufort wind scale and determines the risk presented by the wind when tree felling.

COMMUNICATION PROCEDURES

GENERAL EMERGENCIES

All crew members, including fallers, must know the communication procedures for general emergencies and evacuations. An emergency procedure must be setup and operational before work commences.

This procedure must include:

- emergency RT channel numbers
- list of who to call and how to call
- current worksite location i.e. forest, road name, harvest area and GPS coordinates
- RT locations and how to use them
- a daily process for testing communication systems
- identification of call-out locations and dead spots
- a plan to ensure vehicles are prepared for an emergency
- emergency calling procedures must be clearly displayed on site

Vehicles must be roadworthy, parked facing the exit with no obstacles in their path, unlocked with keys in ignition and have sufficient fuel to reach assistance.

CHECK-IN PROCEDURES

Fallers cannot always avoid being isolated from other workers and they must have an effective means of communicating with their nominated contact person. Regular check-in procedures help to maintain faller safety.

Fallers must:

- be aware of the hazard of isolation and plan for circumstances that isolate them
- use a full time observer if constant radio contact cannot be maintained
- establish a clearly defined call-in system, that specifies the system being used and the frequency of call-ins
- communicate when work is affected by adverse weather
- check the communication system before commencing work, and check it again on arrival at the felling face
- ensure the communication system is available and ready for the following day's activities, i.e. charge the radio overnight and have spare batteries available

They must also define the procedure to be followed when:

- communication cannot be established or maintained with the contact person
- a check-in is missed
- an alarm must be raised in the event of an emergency

All call-ins must be recorded by the contact person.

APPROVED CODE OF PRACTICE

» **RULE 2.1.2**

No person shall work alone unless there is an effective means of getting help.

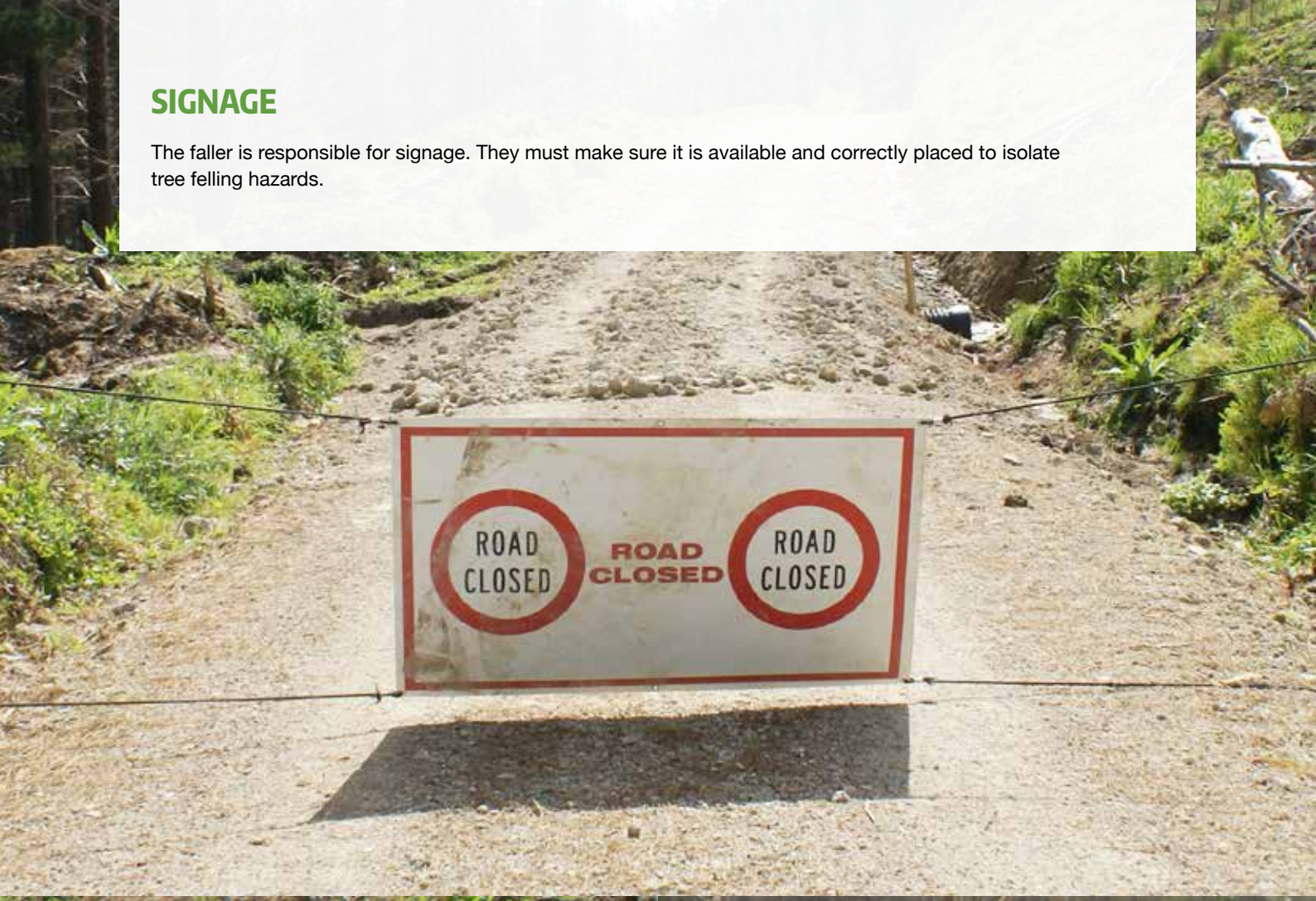
» **RULE 11.1.1**

Clearfell tree fallers must be in constant radio contact with another person.

Radio

SIGNAGE

The faller is responsible for signage. They must make sure it is available and correctly placed to isolate tree felling hazards.



TREE FALLER RESPONSIBILITIES

Fallers cannot be monitored constantly. Maintaining a safe working environment requires them to take personal responsibility for maintaining safe work practices and procedures.

Fallers are legally responsible for the safe performance of their work. If they are unable to do their work safely, they must report the situation to the crew manager.

MAINTAIN A SAFE WORK AREA

Tree fallers must maintain a safe work area and the Health and Safety at Work Act 2015 requires all workers to avoid any activity that will harm them or any other person in their workplace. It is vitally important to check for hazards before felling starts.

Before any felling can commence, fallers must:

- inform all personnel in the immediate area
- check the distance to other operations to ensure a minimum safe working distance of two tree-lengths
- check that there are no people or animals in the work area
- ensure adequate provisions are made to control traffic on any road, railway or public access way
- make sure they have a clear work area
- make sure that call-up or check-in procedures are clearly established and working

FOLLOW ALL SAFETY RULES

Tree fallers must follow all the accepted industry safety rules detailed in this guide.

In particular, fallers must ensure they:

1. Always work within their capabilities and seek assistance whenever they feel unsure
2. Maintain mental alertness, physically fitness, hydration and nutrition
3. Ensure they are adequately trained and supervised

When felling they must:

4. Carry, use and maintain all the correct PPE and tree felling equipment
5. Maintain effective communication with their contact person and observer
6. Identify and assess all hazards and manage all risks within the immediate felling area
7. Ensure they, and everyone else in the operation, follow the two tree-length rule
8. Always follow the five step felling process
9. Use an observer to assist with planning and managing hazardous situations
10. Always follow approved procedures when working in upset conditions

Fallers must be aware of particular hazards and ensure they:

11. Never work forward of, or underneath, or turn their back on a cut-up tree.
12. Always have stable footing and do not have to over-reach or work off balance.
13. Ensure they have a clear escape route and use it to retreat well clear of the falling tree
14. Always fell trees into an open area unless there is no alternative
15. Avoid working in adverse weather conditions such as high winds, heavy rain or snow.

APPROVED CODE OF PRACTICE

» **RULE 2.6.1**

No employee shall work in a manner likely to cause harm to themselves or others.

» **RULE 2.6.2**

Employees have the right to refuse to undertake work that they consider likely to result in serious harm.

» **RULE 2.8.1**

All employees must identify and regularly review hazards in the place of work (existing, new and potential) to determine whether they are “significant hazards” and require further action.

HAZARD IDENTIFICATION

Before starting any new block, the principal and contractor must identify and assess any significant hazards and add them to the harvesting plan or job prescription. The whole crew must be informed of the hazards identified and of the controls planned to manage the associated risks.

A job prescription also specifies standards for quality e.g. stump heights, salvage expectations and the environmental management required for the harvest area. It's important that fallers are aware of the contents of the job prescription and how it relates to their job.

INITIAL HAZARD IDENTIFICATION

Before the crew starts work they must be involved in identifying any additional hazards on the site, assessing the significance of those hazards and developing a management plan for each one. There must be documentation onsite (not necessarily at the felling face, but in the crew records), listing the significant hazards, detailing the management plans, and showing evidence that all crew members have been involved in the process.

A tree felling plan must be developed by the contractor and the fallers, with reference to the job prescription, after they walk through the block.

The felling plan should include:

- preferred felling direction for the best extraction
- strategies to manage environmental constraints
- location to start the felling, and the width of the strip being taken
- specific site hazards identified during the walk through
- alternative strategies for upset conditions e.g. wind comes up, too close to the ropes, etc

The plan should also contain personnel details including:

- the name of the faller
- faller capability, especially limitations
- the name of the any person assisting the faller
- the name of the observer
- the name of the contact person

ONGOING HAZARD IDENTIFICATION

Fallers must identify the hazards they expect to encounter throughout the day and document them in the daily felling plan at the tailgate meeting.

Items related to felling that may be included in a tailgate meeting are:

- specific hazards not already identified in the felling plan
- changes in conditions or personnel that may influence the operation on that particular day, e.g. fallers starting a new block, the main faller is absent, equipment failure, changing weather patterns, etc
- responsibilities for jobs that may not be normal practice, e.g. ensuring tree falling signs are correctly located and displayed

The faller must also re-assess hazards on an on-going basis during the day. Additional hazards can be added during the day by the contact person. If the hazard is significant, fallers must stop and wait for their observer. The faller and the observer can then develop a plan to deal with the hazard together. If the plan is a significant departure from normal practice, on the faller's instructions, the contact person advises the crew manager and records the plan on the call-in sheet. The crew manager must approve the plan before it is implemented.

APPROVED CODE OF PRACTICE

» **ACOP RULE 2.4.4**

The principal must identify significant hazards specific to each work area which are caused by operations over which they have control and then:

- supply the employer with documentation on the hazards
- jointly with the employer, determine measures to control the hazards

» **ACOP RULE 2.8.1**

All employees must identify and regularly review hazards in the place of work (existing, new and potential) to determine whether they are "significant hazards" and require further action.

MAINTAIN HEALTH AND FITNESS

Fallers are responsible for their own personal well-being and fitness for the job.

PHYSICAL FITNESS

Fallers need to:

- maintain the high level of fitness required for the job
- take regular micro breaks to help their bodies recover
- start slowly and gradually increase their work effort, especially if they haven't been tree felling for a while
- eat a balanced diet of nutritional foods and
- have regular snacks to keep their energy levels up

SOFT TISSUE INJURIES

Soft tissue injuries e.g. sprains, strains and tears, account for many injuries to fallers. Walking on logs, uneven terrain, carrying a chainsaw and equipment, and working in awkward positions for extended periods all contribute to personal injuries. Warm up exercises, regular stretching and using ergonomically correct felling techniques will reduce the potential for injury.

APPROVED CODE OF PRACTICE

» **ACOP RULE 2.9.2**

The employer shall ensure that employee training includes nutrition and hydration, and negative impacts of stress, fatigue, and substance abuse to the level of an appropriate unit standard. (For example – Unit standard 22994 Demonstrate knowledge of factors that affect the performance of forestry workers, and any subsequent amendments or previous equivalents)

See: Stretching exercises to help prevent soft tissue injuries in Appendix One on page 69.

STRESS AND FATIGUE

Stress and fatigue can result in: poor decision making, apathy, lack of motivation, lack of concentration and a feeling of being constantly tired or on auto pilot.

To manage stress and fatigue fallers should:

- make sure they are well rested and getting a good night's sleep
- discuss fatigue symptoms with their crew manager who may be able to help implement a job rotation plan or possibly a reduced or shared workload
- let their crew manager know if they have things on their minds that are preventing them from focusing on the job

ALCOHOL AND DRUGS

Alcohol and drugs impair performance and must be avoided.

Fallers must:

- ensure they are not under the influence of drugs or alcohol
- inform their crew manager if they are taking prescribed medication, and know about any side effects

HYDRATION

Hard physical work causes a fluid loss of between 0.5 and 1.0 litres per hour and dehydration reduces mental and physical performance. To maintain performance fallers should drink small amounts of liquids regularly throughout the day. This is especially important in very hot and humid conditions.

For hydration to be most effective, fluids should be drunk at body temperature.

The symptoms of dehydration are:

- feeling thirsty
- dry mouth, not enough spit in mouth
- not going to the toilet very often
- dark, strong-smelling urine
- cramp pains - e.g. in arm muscles, leg muscles, feet

Fallers might also experience headaches and feeling light-headed or dizzy. These are also the early symptoms of mild hyperthermia.

HYPERTHERMIA (HEAT ILLNESS)

Hyperthermia is a very serious condition caused by an increase in the body's core temperature.

The body normally cools itself by radiating heat into the air and by sweating. When sweat evaporates off the skin it cools the body. When working hard in very hot or humid conditions this process may fail, causing the body to overheat. Other factors that can limit the body's ability to regulate temperature include: illness, dehydration, sunburn, drug use and alcohol use.

Clothing slows the transfer of heat between the body and the surrounding environment. To protect against hyperthermia, fallers should wear breathable clothing that draws moisture away from the skin to maximise cooling. Clothing that prevents the evaporation of sweat should be avoided. Even in cool conditions wearing inappropriate clothing reduces the body's ability to lose heat into the air and can cause overheating.

Fallers should also use the shade to keep cool during felling and rest breaks, and have regular drinks to prevent dehydration. If possible crews can also use job rotation to help reduce the effects of heat stress.

Symptoms of mild heat illness (heat exhaustion) include:

- heavy sweating
- rapid breathing
- fast, weak pulse
- tiredness, weakness or fainting
- nausea or vomiting
- headache

If a faller has these symptoms they should immediately:

- sit down in a cool place
- take off clothing and wet their body to reduce body heat
- drink lots of water

Severe heat illness can be serious, quickly leading to convulsions and collapse. Even a healthy fit person can become ill very quickly, so people with these symptoms must get help. Anyone with hyperthermia needs to be cooled rapidly, watched closely, and sent for urgent medical attention if the symptoms are severe.

Symptoms of severe heat illness (heat stroke) include:

- an extremely high body temperature (above 103°F)
- red, hot, and dry skin with little sweating
- rapid, strong pulse
- throbbing headache
- dizziness
- nausea
- confusion
- unconsciousness

HYPOTHERMIA (WIND CHILL)

Hypothermia is a very serious condition caused by a drop in the body's core temperature. To protect against hypothermia, fallers should wear appropriate clothing such as a thermal layer against their skin and protect exposed areas of their face, hands and ears.

Initial symptoms of hypothermia include:

- shivering
- grogginess
- muddled thinking

Symptoms of moderate hypothermia include:

- violent shivering or intermittent shivering
- an inability to think and pay attention
- slow, shallow breathing
- slow, weak pulse

Symptoms of severe hypothermia include:

- shivering stopped
- unconsciousness
- little or no breathing
- weak, irregular or non-existent pulse

If anyone experiences any of the above symptoms, they should:

- stop work immediately
- seek shelter from the wind, or get in a vehicle for warmth
- consume warm food and drink to increase their body temperature

The crew manager must be informed of their condition.

OPERATIONAL PLANNING AND POLICIES

APPROVED CODE OF PRACTICE

» **ACOP RULE 2.94.1**

The principal shall verify that the employer has in place a documented safety management system before commencing operations and must periodically audit the effectiveness of this system.

TREE FELLING POLICY DOCUMENTS

A policy is a statement by the company or crew detailing particular processes and practices they commit to follow.

The principal and contractor must verify, with evidence, that the forest harvesting contractor has a documented health and safety system in place before any tree felling work begins. This includes but is not limited to evidence that:

- fallers hold the appropriate qualifications and are deemed competent, or evidence that they are working towards achieving the qualifications and are currently under a documented training plan and close supervision.
- a system is in place to audit competence on a regular basis (i.e. Safe Behavioural Audits by another qualified faller) plus tree felling audits, including equipment checks and stump audits.
- a dedicated on-site observer is available to the faller when complex dangerous tree felling situations arise

They must also demonstrate there is a documented process for:

- dealing with hung-up trees
- dealing with tree driving, including a process to deal with unsuccessful drives
- checking in with the contact person and providing constant monitoring of the fallers location and proximity to others
- establishing the two length zone and communicating this clearly to everyone involved
- stopping tree felling during high winds or extreme weather
- changing tree felling plans when upset conditions arise

The faller must understand and follow the tree felling policy document. There should be regular checks that they understand and are applying the policy.

An example of a tree felling policy document is in Appendix Two page 71.

FACTORS TO INCLUDE IN OPERATIONAL PLANNING

Thorough planning of the felling operation will ensure it is productive, safe, and profitable. If it is not adequately planned, problems may arise that are difficult to fix.

Before the start of a new operation the whole crew must be familiar with:

- The operational area map that shows the tree felling boundaries, environmental restrictions (historical/cultural sites, riparian areas), terrain, roads/railways/utilities (powerlines, fences, gas lines), site hazards, felling and extraction direction, extraction method and backline setup.
- The prescription and planning notes that explain the features of the operation, as well as boundaries, resource consent conditions, known site hazards, and authorised requirements e.g. traffic management plans.
- The production requirements i.e. the piece size and number of stems or pieces that need to be felled per day to achieve the production targets. If this target is unrealistic or can't be achieved safely, this should be discussed with the crew manager and an alternative plan agreed to. The changes may need to be discussed with the principal or their representative.
- Areas with a mix of manual and mechanised felling operations to ensure mechanised operations do not create additional hazards for manual fallers.

The principal and contractor will initially plan most of the block long before the crew arrives. The crew manager and the fallers will pre-plan when they first walk the block to complete the site assessment.

They will decide where to start felling and identify hazards. It's important to document this information and ensure that everyone involved is clear about what is required.

The crew manager must exercise control and supervision of the work to ensure that faller safety precautions are being followed.

Note: never compromise safety for production.

FELLING AREA ASSESSMENT

The area to be felled must be thoroughly checked and assessed before commencing any tree felling. To fully understand the hazards, it is recommended that the crew manager and fallers walk the block, harvest area, compartment, stand, setting, area or zone.

The stand assessment must also include a review of the harvesting prescription with the crew manager and fallers.

During the assessment everyone involved must:

- clearly identify the tree felling boundaries
- discuss environmental issues and constraints – i.e. what is to be back pulled or directionally felled
- develop a tree felling plan
- decide on a tree felling pattern
- establish the extraction method and direction
- plan for the placement of fallers
- understand the principals traffic management plan
- ensure all signage requirements are available
- document the discussions held
- identify entry and exit points for emergencies

WALKING THROUGH THE FELLING AREA

Walking through the felling area, the crew manager and fallers must make assessments on:

- the general condition and predominate lean of the stand
- hindrances to access and visibility
- the location of roads, fences, powerlines, people, machinery or any other potential hazards.
- terrain constraints including soil conditions, type and stability, bluffs, rocks, gulleys, hills, banks, tracks
- sensitive features – archaeological sites including pits, house sites and urupa or burial sites.
- environmental considerations as identified in the harvest prescription
- the best place to open a felling face which allows felling into a clear area
- locations where an observer or machine assistance will be required

HAZARD IDENTIFICATION AND RISK ASSESSMENT

Planning must include hazard identification and assessment of the significant risks in the felling area, including:

- overhead hazards i.e. hung-up trees, sailors, interlocking branches, dead or broken tops
- tree condition i.e. split, dead, unstable, windthrown, or diseased trees
- the predominant wind direction, including safer and more protected zones a faller could move to if the wind gets up (e.g. behind a hill or in a gulley bottom)
- trees that have had their roots disturbed by tracking, wind damage, water erosion, etc

Suitable control measures must be put in place to manage significant hazards identified within the tree felling area in order to complete the site assessment.

All hazards and control measures must be clearly communicated to the harvesting crew.

BOUNDARIES

Felling boundaries may be indicated by:

- painted or marked trees
- streams
- ridges
- roads
- age classes
- fences

Some boundaries have more sensitivity or risk than others, e.g. fences defining land ownership or sensitive sites. The boundaries of the block need to be checked during the planning phase to ensure that the different issues relating to each boundary can be managed properly. Neighbours may need to be consulted before harvesting commences.

TERRAIN

Knowing the topography of the land is critical for good felling. The physical features of an area often dictate the extraction direction and, therefore, the felling direction. Topography is also a key factor in determining where roads and landings are located.

During planning and felling, consider the following:

- as trees tend to lean downhill, fallers must typically fell from the bottom of the hill to the top
- where possible, avoid felling across gullies and ridges as this increases breakage
- be prepared to change the felling direction to suit changes in topography but try to avoid sudden changes in felling pattern as crossing over already felled stems and stumps tends to increase tree damage
- trees should be felled to avoid damage to environmentally sensitive areas

EXTRACTION METHOD AND FELLING DIRECTION

The felling plan takes into account the extraction method to be used.

All extraction methods work best if the felled stems can be extracted butt first (butt pull). The location of the landing dictates felling direction. Butts should be angled towards the landing where possible.

PIECE SIZE AND STOCKING

The piece size can vary between and within stands. It's important to have equipment that's correctly sized for the task at hand. To safely fell larger trees, larger saws, longer cutter bars, and other equipment such as additional wedges may be required.

The soil conditions, the direction a slope is facing (aspect), previous silviculture and age are all things that affect piece size. At thinning to waste, tree volume may be 0.01m^3 to 0.2m^3 per tree. At production thinning, it may be 0.2m^3 to 0.5m^3 per tree. Clearfell trees may range from 0.7m^3 to 8m^3 per tree.

As piece size increases, so does tree height. This will increase the size of the safety zones, the amount of breakage, and possibly the amount of trimming needed.

TREE LEAN AND FORM

Tree lean affects the direction in which a tree can be easily felled. Predominant lean is established by natural influences.

These are:

- topography
- prevailing wind
- aspect

Another factor is the size and shape of the crown. Some trees may have more branches on one side. Typically, these are trees growing on the edge of a stand or in exposed positions. The weight of these branches can affect the direction in which the tree will naturally fall.

UNDERGROWTH

Heavy undergrowth is common in plantation forests and can hinder movement and reduce visibility, both of which are safety critical.

Clearing undergrowth will allow:

- access to trees and the workspace
- visibility of tree crowns
- safe escape routes for fallers

The daily target may need to be adjusted to allow extra time for clearing heavy undergrowth from around the trees.

ENVIRONMENTAL CONSTRAINTS

Felling trees can damage other vegetation and leave tree tops in gullies and watercourses. Resource consent requirements may limit certain felling and trimming activities within an area. Directional felling to avoid streams, protected flora and fauna may be specified.

OTHER WORKERS AND OPERATIONS

Tree felling must not take place within two tree-lengths of other workers. It's also important to be aware of other workers and machines working in the surrounding areas, as they may be at risk from felling or machine operations. It is important to remember that as felling progresses, the hazard zone moves. An area that was safe in the morning may not be safe in the afternoon.

OPENING A FELLING FACE

Before commencing felling, fallers should have a sound knowledge of the stand and the procedures to be used in the harvesting operation. It's up to the crew manager to discuss how the stand will be opened up with fallers.

Generally, the best position to begin will be somewhere trees can be felled with the prevailing lean and into a clear area. If the terrain is difficult, fell into gullies first. Felling with the contour rather than across narrow gullies is preferable because it reduces breakage.

CONTROLLING ACCESS TO THE FELLING AREA

Falling signage and temporary traffic control.

On a private forestry road with restricted public access, fallers must ensure signage complies with the following requirements:

- signs warning of work in progress must be displayed when work is on or near public or private roads or adjacent to boundaries
- planning of appropriate warning methods must be prepared as part of hazard management
- temporary traffic control signs and barriers must comply with the Best Practice Guide for Temporary Traffic Control
- temporary signs must be removed or covered when no longer valid or when work has ceased

APPROVED CODE OF PRACTICE

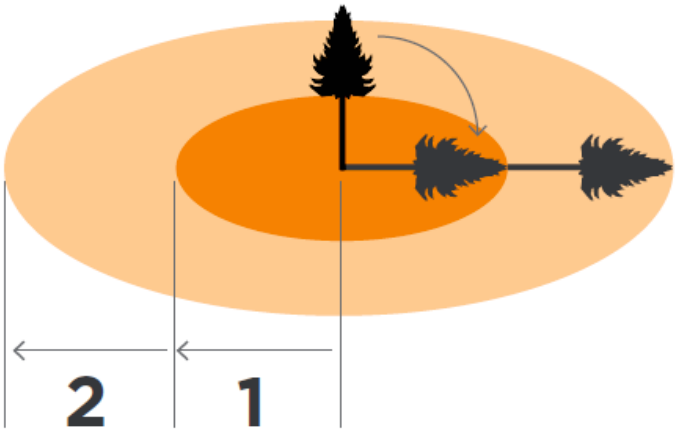
» **RULE 11.4.5**

No tree must be felled within two tree lengths of any road, railway or public access until provisions of section 2.12: Signage and temporary traffic control have been complied with.

On a public road where there is a road control authority, formal authorisation must be obtained and any conditions set by the authority complied with before any signs warning of operations are placed and work commences.

TWO TREE-LENGTH RULE

Anything within two tree-lengths of the tree being felled is in the danger zone. This rule takes into account the chance that a falling tree may bring down another standing tree.



The ACOP lists who can be closer than two tree-lengths from a faller while a tree is being felled.

In addition, those people must:

- communicate with the faller using clear, prearranged instructions via an RT or other established means of communication
- use the communication system to advise the faller when they approach the danger zone
- position themselves on the safe side of the tree where the faller can see them
- be able to see the top of the tree being felled

If it is necessary for another person to be at the tree with the faller:

- only one person must be making felling cuts
- only one chainsaw must be working while felling cuts are made
- the person not making the felling cuts must be able to see the top of the tree and be positioned safely, clear of the faller's escape route, and in full view of the faller

Note: Buddy cutting is not permitted.

ENTERING THE TREE FELLING AREA

When entering a tree felling area, everyone must:

- notify the crew manager before entering the area
- exercise care when approaching the two tree-length zone and attract the attention of the faller before entering the zone
- be under the supervision and direct control of the faller until they leave the two tree-lengths zone

No one should enter the tree felling area until the faller has acknowledged them and signalled to them to enter.

APPROVED CODE OF PRACTICE

» **RULE 11.4.1**

All fallers and harvester operators shall ensure that, within two tree lengths of the tree being felled, there are no:

- mobile plant without appropriate structures
- working ropes – exception: cable yarder assisted felling or ropes that have been lowered to the ground and are not operating
- live powerlines – exception: where a felling plan has been authorised and agreed
- other operations

» **RULE 11.4.3**

No person shall be closer than two tree lengths to a tree being felled, unless that person is:

- the faller
- assisting the faller
- supervising
- training others or being trained
- observing or auditing

Any person within two tree lengths of a tree being felled must be under direct control of the tree faller.

Exception: The tree faller is under direct control of a trainer.

» **RULE 11.4.4**

Aside from the tree faller no person must operate a chainsaw within two tree lengths of a tree being felled Buddy cutting is not permitted.

» **RULE 11.4.4**

No tree shall be felled within two tree lengths of any road, railway, or public access until the provisions of section 2.12: Signage and temporary traffic control have been complied with.

MANAGING ADVERSE WEATHER

Fallers must recognise hazards created by adverse weather conditions. They must adjust their work to suit the conditions and ensure their call-in procedures are working properly.

APPROVED CODE OF PRACTICE

» **ACOP RULE 2.8.2**

Operations that are affected by adverse weather or other events shall be suspended if hazardous conditions cannot be satisfactorily controlled.

WIND

Wind speed can be assessed using the Beaufort scale (see the chart below). This scale can help fallers decide when to stop felling or relocate to an area less affected by wind. Wind speed at ground level can be significantly different to that affecting the top of the tree.

Hazardous trees can be brought down by wind, and overhead hazards may dislodge and fall unexpectedly. A strong gust of wind can also cause a partially cut tree to fall prematurely or sit back.

To manage strong winds fallers should:

- stop felling, or move to a protected area until conditions improve
- move away from the stand before trees blow down or tops break off

Force	Wind Speed		Descriptive Term	Effects Observed on Land
	Km/h	Knots		
0	Less than 1	Less than 1	Calm	Smoke rises vertically.
1	1 - 5	1 - 3	Light air	Direction of wind is shown by smoke drift, but not wind vanes.
2	6 - 11	4 - 6	Light breeze	Wind felt on face. Leaves rustle. Ordinary vane moved by wind.
3	12 - 19	7 - 10	Gentle breeze	Leaves and small twigs in constant motion. Wind extends light flag.
4	20 - 28	11 - 16	Moderate breeze	Raises dust and loose paper. Small branches are moved.
5	29 - 38	17 - 21	Fresh breeze	Small trees with leaves begin to sway. Crested wavelets form on inland waters.
6	39 - 49	22 - 27	Strong breeze	Large branches in motion. Whistling heard in telephone wires. Umbrellas used with difficulty.
7	50 - 61	28 - 33	Near gale	Whole trees in motion. Inconvenience felt in walking against wind.
8	62 - 74	34 - 40	Gale	Breaks twigs off trees. Generally impedes progress. Walking into wind almost impossible.
9	75 - 88	41 - 47	Strong gale	Slight structural damage occurs, e.g. roofing shingles may become loose or blow off.
10	89 - 102	48 - 55	Storm	Trees uprooted. Considerable structural damage occurs.
11	103 - 117	56 - 63	Violent storm	Widespread damage.
12	118 - 133	64 - 71	Hurricane	Rare. Severe widespread damage to vegetation and significant structural damage possible.

VISIBILITY

Fog, heavy rain, drizzle and snow all reduce visibility and muffle sounds during felling and while moving in the tree felling zone. Fallers must ensure the two tree-length rule is maintained through clear communication with their contact person and use their observer if necessary. If poor visibility does not allow fallers or observers to see and accurately assess trees and surrounding work zones, tree felling should stop until conditions improve.

LIGHTNING

If lightning occurs over the felling site the crew should stop felling and:

- squat down in an open area, away from wire ropes, machinery, and other conductors
- stay away from bodies of water and metal objects, i.e. tools and chainsaws
- turn off their RT and other communication equipment (ensure communications are re-established before falling starts again)
- stay away from other personnel. They should spread out, not stand in a group, and stay at least 10m away from the highest potential conductor

RAIN AND UNSTABLE TERRAIN

The weather forecast can help to determine what work the faller can safely undertake and where they can operate. Terrain stability, assessment and warning indicators should be discussed at the tailgate meeting, where any shutdown and evacuation plan should also be decided.

The faller should use the hazard management process to identify how heavy rain may impact on access to the work zone, e.g. swollen creeks, road washouts, debris torrents, landslides in and above the tree felling zones, and flooding.

Rain can:

- make it difficult to judge the lean, see overhead hazards, and hear nearby workers and equipment
- affect faller's ability to look up
- make the felling site slippery

SNOW AND EXTREME COLD

Snow loading on trees can potentially cause overhead hazards, such as broken branches and tops or snow dumps. Tree felling zones and the escape route could be compromised. Deep snow can cover terrain hazards making walking between trees potentially hazardous. Even a light snow fall can make roads dangerous or impassable without the correct type of vehicle or equipment.

Extreme cold can also lead to hypothermia, reducing physical and mental performance and leading to poor decision making. If snow or low temperatures create unmanageable hazards on the site, tree felling must stop until conditions improve.

EXTREME HEAT

Extreme heat can rapidly cause dehydration, sun burn, and fatigue. This can reduce physical and mental performance.

Management strategies include:

- wearing lightweight breathable hi-viz clothing
- protecting exposed skin with sun block
- taking regular rest breaks
- making use of shade during tree felling
- regular fluid intake
- rotating jobs

DAILY TREE FALLER MEETINGS

A plan for the day's tree felling must be made each morning during the tailgate meeting. Attendees should be: the crew manager, fallers, observer and contact person. It is not necessary to discuss items already covered in the felling plan for the block unless there's been a change in the plan.

Agenda items could include:

- the falling plan for the day including: area, tree lean, felling direction
- extraction requirements, if different from the original plan
- two tree-length zone determinations i.e. road locations, skid locations
- signage requirements
- environmental considerations
- new hazards
- training requirements and opportunities
- supervision requirements
- the identified observer
- the contact person
- wind and weather effects
- changes likely to come up e.g. finishing a strip and moving to another one

Everyone at the meeting must be clear on how the crew will work together to manage the day's felling operation and production requirements. If any changes to the felling plan arise during the day, the crew manager must be notified and the changes noted in the plan. Any significant departure from the plan must be authorised by the crew manager before being implemented.

Tree faller meetings

TREE FELLING PROCEDURES

FIVE-STEP TREE FELLING PROCEDURE

No two trees are the same. Variations in tree size and features, terrain and the operational conditions create a variety of tree felling situations. There is some level of hazard to deal with for every tree.

Fallers must follow five critical steps to minimise the risk of injury to themselves or others:

1. Site Assessment
2. Individual tree assessment
3. Preparation of the work area and escape route
4. Fell the tree using safe tree felling practices
5. Retreat and observe

STEP 1 – SITE ASSESSMENT

A site assessment happens after each chainsaw tank refill. It involves checking the felling area or zone before starting tree felling again. This allows the faller to refresh their knowledge of the potential hazards and identify new hazards they may encounter when they start felling again.

Fallers should check their position in relation to landings, roads, other workers, and any hazards and ensure they have: implemented the traffic management plan and ensured all signage requirements are in place.

Fallers must be aware of the following factors within two tree-lengths of the felling area:

- the general condition and predominant lean of the surrounding trees
- hindrances to visibility
- boundaries
- the location of roads, fences, powerlines, people, machinery or any other potential hazards
- terrain constraints including soil conditions, type and stability, bluffs, rocks, gulleys, hills, banks, tracks
- historical features – archaeological sites including pits, house sites, burial sites
- environmental constraints

Fallers must actively assess the significant hazards within two tree-lengths of the felling area.

See also: Hazard identification on page 17 and seven causes of harm on page 7.

Fallers must ensure all hazards and controls measures are clearly communicated to the harvesting crew.

Site assessment

STEP 2 – INDIVIDUAL TREE ASSESSMENT

It is essential that fallers take the time to thoroughly assess each tree before felling.

They should assess the whole tree from the crown to the stump. Where possible they should view the tree from a distance first, and then from the tree base, using different angles to make sure nothing is missed.

Each tree must be correctly assessed to:

- identify hazards
- plan the felling cuts, and the sequence they are to be put in
- determine if the faller is capable of felling it safely

This assessment is a very important step as a hazard missed may cause harm. If, at any time, the faller doesn't think they can fell the tree safely, they must call for assistance from their observer, a more experienced faller or a machine.

Assess the general condition of the tree by:

- looking for malformation, defects, double or multi leaders
- checking for predominant and side lean
- assessing crown size and shape
- identifying the heaviest branches
- checking ground conditions and stability of the tree
- checking for rot around the base that may affect tree felling

Identify overhead hazards in the tree by looking for:

- dead or broken branches or debris that may be dislodged during felling
- branches interlocking with branches of other trees
- vines that may affect the direction of fall
- checking the wind direction and strength relative to the proposed felling direction

Having assessed the tree, the faller must decide:

- if they're capable of felling the tree
- whether wind strength is presenting a hazard
- the preferred felling direction
- the felling cuts to be used
- the safest position to complete the felling cuts from
- what wedges or other felling aids like machine assistance may be required

Before finalising the felling direction, the faller must consider any hazards in the intended line of fall which may cause the tree to kick backwards or sideways on impact e.g. spars, rocks, banks, slopes, stumps. They must also identify any physical obstructions, environmental constraints or archaeological sites which require the tree to be felled away from the preferred direction.

COMPLETING THE ASSESSMENT

After completing the individual tree assessment, the faller can then choose the appropriate felling method to safely fell the tree.

The tree felling method includes:

- felling cuts to be used
- felling aids needed, i.e. wedge size and number
- location of the planned escape route
- identification of the safest side from which to complete the back cut

STEP 3 – PREPARATION OF THE WORK AREA AND ESCAPE ROUTE

The faller must make sure they have enough clear area around the tree to move freely AND ensure they have a clear escape route, before starting to fell the tree.

PREPARING THE WORK AREA

Clear the tree and surrounding area to allow good visibility of the tree crown and allow free movement around the tree

PREPARING THE ESCAPE ROUTE

The faller must prepare an escape route on the same side as their final back cut.

The escape route must be angled as close to 45° from the centre of the back of the tree as practical. On steeper slopes, this angle may be increased so that the faller is walking across the slope rather than climbing uphill.

APPROVED CODE OF PRACTICE

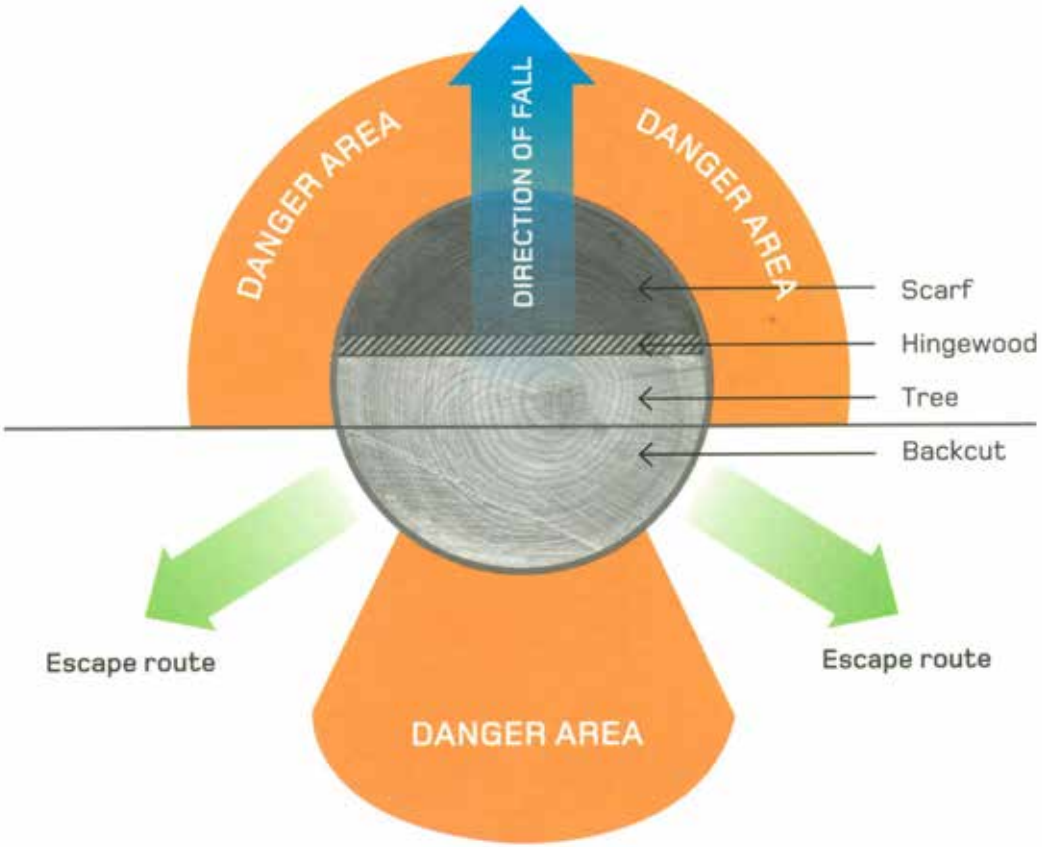
» **RULE 11.2.1**

For each tree being felled an escape route shall be cleared on the safest side.

All escape routes must be cleared to allow unrestricted access to the safe position. A minimum distance of 3m from the stump is recommended for normal conditions. This distance may need to be extended if other hazards are present.

On very steep slopes attempting to walk away from the falling tree may be more hazardous than staying closer to the stump. If this situation exists, the faller may need to step back and brace themselves to avoid sliding down the slope with the tree. These departures from normal practice must be documented in the daily felling plan at the tailgate meeting.

The faller must always complete the preparation work of their work area and escape route **before** beginning any felling cuts.



STEP 4 – FELL THE TREE USING SAFE TREE FELLING PRACTICES

For the tree felling cuts to be effective, they must be precise.

The relationship between the backcut and the scarf is critical for the establishment of the hinge wood.

The function of the scarf is to:

- determine the direction in which the tree will fall
- allow the tree to fall freely in the desired direction
- minimise stem splitting or slabbing

The purpose of the hinge wood is to:

- control the tree's direction during its early stages of fall until the scarf closes
- prevent the tree from slipping, twisting, or breaking sideways or backwards.

The backcut releases the tree, allowing it to fall. The backcut step prevents the butt of the tree from moving back off the stump as the tree falls to the ground.

Fallers must:

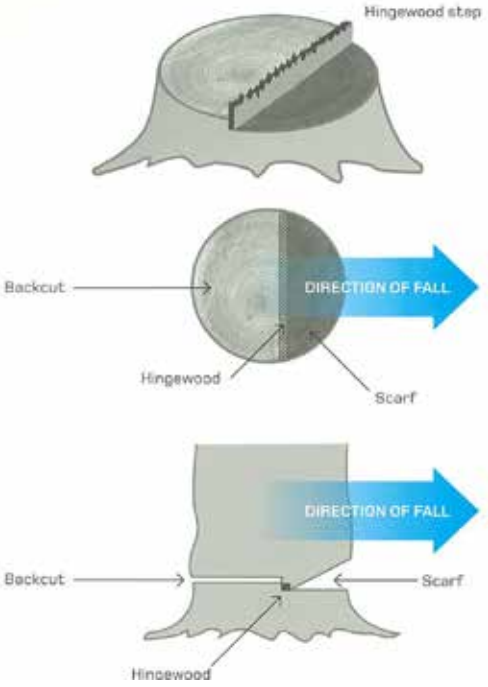
- create the correct amount of hinge wood and step when making the backcut
- insert a wedge into the backcut as soon as practicable if there is any chance that the tree may sit back
- finish the back cut on the safest side of the tree
- not move in front of the tree once the backcut has commenced
- re-check for overhead hazards between cuts

Fallers should continually monitor and assess the hazards. Many fallers have been hurt because they did not see the hazards, and were hit by a falling object.

APPROVED CODE OF PRACTICE

» **RULE 11.2.1**

The scarf and backcut of the tree being felled must be completed before starting on the next tree



LOOK UP AND LIVE

STEP 5 – RETREAT AND OBSERVE

Retreating along the escape route and observing as the tree starts to fall is critical to faller safety. Many fallers have been injured because they failed to complete this step.

Once the back cut is completed, and the tree is beginning to fall the faller must:

- move immediately along the planned and cleared escape route
- watch for overhead hazards or tree movement while retreating to a safe position
- remain in the safe position until the canopy stops moving
- assess the stand and the surrounding area, making sure it is safe before returning to gather wedges and any other gear
- self-assess the tree felling cuts and stump heights

Note: Watch the tree while retreating

MANDATORY STEPS FOR ALL TREE FELLING:

This is a set of step by step instructions to guide fallers when felling trees.

1. Approach the tree and assesses the surrounding area for: overhead hazards, adverse weather conditions, obstructions in the direction that the tree will fall in and the shape of the ground where the tree will land. Use this information to decide the direction of fall.

2. Assess the tree for: overhead hazards such as vines, sailors, dead tops or branches, the lean of the tree, the weight of the branches and any defects that may affect the tree's stability as it falls. This information influences the cuts used to fell the tree.

3. Check the chainsaw bar is long enough for the planned cuts (e.g. for a conventional backcut, the bar must be long enough to cut right through the tree in one cut). This may require a change to the planned cuts.

4. Clear around the base of the tree to provide access to make the cuts, and visibility to the top of the tree. If the top of the tree is not visible, an observer may be required.

5. Clears an escape route, at a 45o angle from directly opposite the intended direction of fall. Note that this direction and distance may vary according to the shape of the terrain and the undergrowth conditions.

6. Re-check the top of the tree for any hazards that may not have been visible before the undergrowth was cleared and re-evaluate the planned felling direction.

7. Depending on ground conditions, kneel, crouch or step into position to make the first cut of the scarf. The top cut of the scarf always goes in first unless using a Humboldt scarf on large trees, (see types of scarf below).

8. Using a pulling chain, (i.e. the bottom of the chainsaw bar), insert the top cut of the scarf on an angle of about 45°, at right angles to the intended direction of fall. The depth of this cut should be ¼ to ⅓ of the tree diameter, unless cutting a heavy forward leaner or a spar, (see bore and release cut and cutting a spar below).

9. Put the bottom cut of the scarf in next, making sure that it meets cleanly with the lowest part of the top cut, using either a pulling chain or a pushing chain (i.e. the topside of the chainsaw bar) to make this cut. Remove the resulting wedge of wood to create the scarf opening.

10. If using wing cuts, move to the front of the tree, face the scarf and cut them down on a 60 – 90° angle to about 10cm deep, (the width of the chainsaw bar). Make sure wing cuts go into solid wood and cover the full width of the proposed hinge. If access to the front of the tree is restricted, wing cuts can be put in from the back of the tree, but take care to ensure the strength of the hinge is not compromised by cutting in too deep.

11. Once a tree has a scarf and wing cuts inserted, it becomes a hazard and must have the backcut put in before any other trees are cut. This includes during tree driving where another tree may be driven on to it.

12. Move into position to start the back cutting procedure. Whatever backcut procedure is used, the final cut of the backcut should be inserted from the escape route side to avoid walking behind the tree as it falls. If the top of the tree is under tension, the stem can split up from the stump, (barber chair), and spear backwards, opposite the direction of fall.

13. As soon as the tree starts to move, withdraw the saw from the backcut and retreat along the escape route, looking up for falling debris or undetected hazards that may dislodge as the tree gathers momentum. Wait in the safe position until all tree movement has ceased.

SCARFS

There are four types of scarf used to fell trees.

A **Conventional** scarf, which is a sloping top cut and flat bottom cut and is the most common type used to fell most trees. The activities described in all the mandatory steps are for a conventional scarf unless otherwise specified.

The **Vee** scarf has a sloping top cut and bottom cut which allows the tree to fall through a wider arc before it closes and breaks the hinge off. It is used to maintain control of the falling tree for longer on sloping ground, (see contour cutting).

A **Swedfor** scarf has a very steep top cut angle and flat bottom cut. It is used when felling smaller diameter trees, particularly on steeper terrain where the faller wants the tree to be held in position on the slope. The steep face of the top cut allows the tree to fall to the ground without completely breaking the hinge.

The **Humboldt** scarf is not commonly used in New Zealand. Sometimes called the 'upside down scarf', the Humboldt has a flat top cut and a sloping bottom cut, the purpose being to minimise the value loss to the butt log by placing the sloping cut on the underside of the scarf. On big trees, the sloping cut has to be done first to avoid the wedge of scarf wood jamming the bar when it drops down.

BACKCUTS

There are five different back cutting techniques that can be used to fell trees.

1. CONVENTIONAL

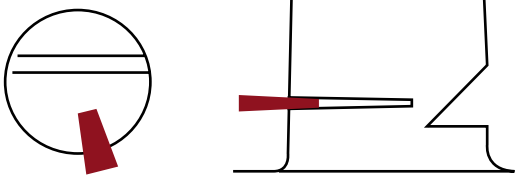
The Conventional backcut is the most common technique because it's quick and easy to use. It is best suited to medium to large sized trees, both forward and backward leaning.

Using either a pushing or pulling chain, the faller starts the backcut on the same plane as the bottom cut of the scarf, but at least 10% of the tree diameter above the junction of the two scarf cuts.

Continue cutting along that plane until either the tree starts to fall, or 10% of the tree diameter remains uncut. This forms the hinge wood, which controls the tree's direction of fall.

If the tree has a slight lean backwards, or there is any doubt about its lean, a wedge can be inserted in the backcut as soon as there is room for it. Tapping the wedge in as the cut progresses will help tip the tree forwards in the intended direction of fall.

Fallers should pause periodically and look up during the backcut to check for hazards and signs of tree movement.



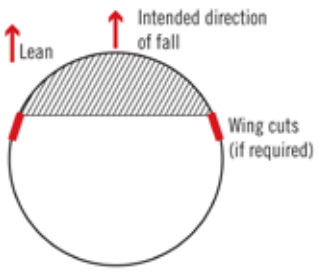
2. QUARTERCUT

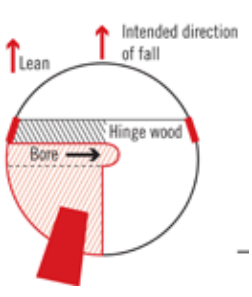
A quartercut backcut is used when either the chainsaw bar is too short to cut through the tree in one cut, or the tree is leaning backwards and the faller wants to insert a wedge or wedges in the backcut to stop it from sitting back.

Before starting this backcut, fallers should remove their hammer and wedge from their belt and place them on the ground at the back of the tree. It's recommended at this point, that they also shave the bark off the tree trunk where the wedge is going to be inserted so it can be driven right home.

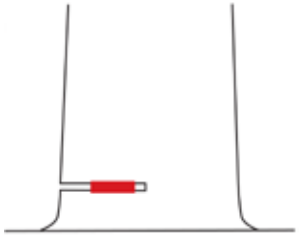
The faller inserts the first part of the backcut at a minimum of 10% of the tree diameter above the bottom cut of the scarf, about half of the tree diameter wide and leaving the required 10% hingewood. They can use either a pushing or pulling chain to do these cuts, which can be done by boring in behind the scarf and cutting towards the back of the tree, or starting at the back of the tree and cutting in towards the scarf.

Here's a tip, once a faller establishes their hinge, they can bore in as far as the bar will reach to reduce the amount of cutting they have to do when finishing off the second stage of the backcut.

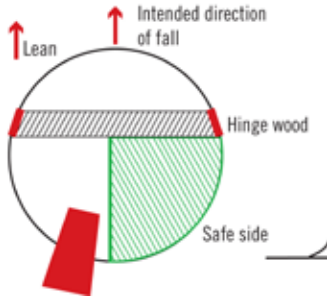




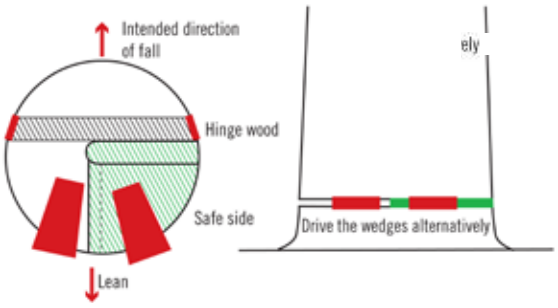
If a wedge is required, the faller should insert it into the first part of the backcut with the barbs down and tap it in until it is firm. They must ensure there is enough space for the tip of the bar when the second part of the backcut is made. Then the faller can line the saw up with the first stage of the backcut and continue cutting the second stage of the backcut until they reach the 10% of the tree diameter required to form the hinge. The faller must then remove the saw from the cut and place it to the side of the escape route, not on it.



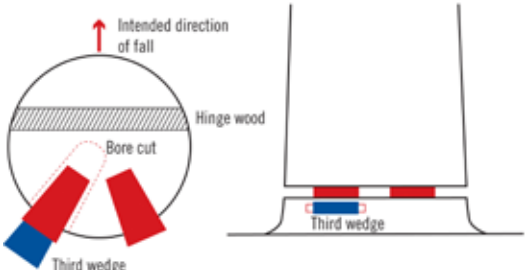
If the faller is using a quartercut because the tree is too big for their bar, they can cut around to the back of the tree and leave the saw in the cut while they put their wedge in. Once the wedge is inserted, they can continue cutting around to the other side of the tree to complete the final cut of the backcut.



The faller taps the wedge with rhythmic blows until the top of the tree starts to move in the intended direction, regularly looking up every two or three blows. They can add in another wedge if the first one becomes tight, hitting each wedge two or three times alternately until both have been driven home, or the tree begins to fall.



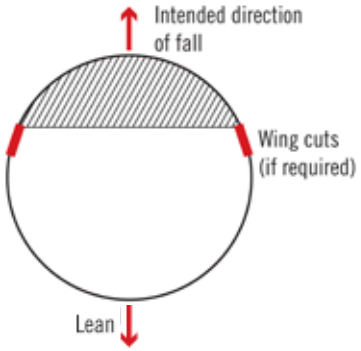
Double wedging. If the tree still doesn't fall, the faller can insert a parallel bore cut about 3 – 4cm below one of the wedges and at least the length of a wedge deep. Then they can drive a third wedge into the bore cut, which effectively doubles the lift of that wedge. They must move along the escape route when the tree begins to fall.



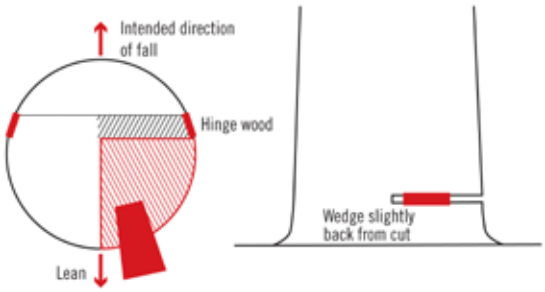
3. SPLIT LEVEL BACKCUTS

The split-level backcut is used in smaller back leaning trees where there is not enough room to insert both wedges and the chainsaw bar. It can also be used to minimise the damage to wedges when training novice tree fellers to use different types of backcut. The split-level backcut is commonly used in conjunction with the Swedfor scarfing method.

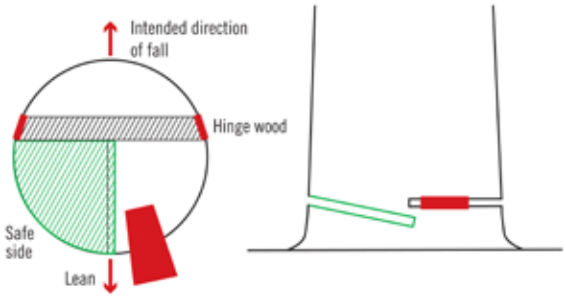
The faller should place their hammer and wedge on the ground at the back of the tree. Starting on the side opposite their escape route and at 10% of tree diameter or more above the bottom cut of the scarf, they cut half of the width of the tree from the back, towards the scarf leaving a hinge 10% of the tree diameter. Then they bore in with the tip of the bar when the correct hinge width has been established, as this ensures that the two backcuts overlap.



The faller taps a wedge into the backcut, leaving a gap between it and the edge of the cut, hitting it in until it is firm.



Moving to the safe side of the tree, the faller inserts the second backcut starting from the back with a 10% step on the outer edge of the stem and sloping down towards the bottom cut of the scarf in the centre of the tree, again leaving the 10% hingewood required. They must make sure they don't cut under the wedge because the weight of the tree could jam the tip of their bar.

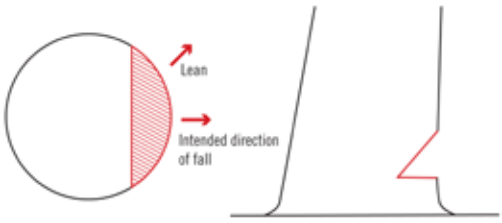


Once the cuts are completed, the faller removes the saw from the cut and places it to the side of the escape route. They must avoid placing the saw on the escape route as it becomes a tripping hazard if they have to retreat quickly from the falling tree.

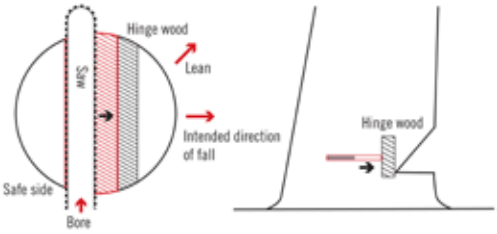
The faller drives the wedge by striking it with three or four blows, then looking up to check for movement and falling hazards. They continue until the wedge is driven home or until the tree starts to fall. They must retreat along their escape route once the tree begins to fall. They should only return to the stump to collect their saw and wedges once all movement has stopped.

4. BORE AND RELEASE CUTS

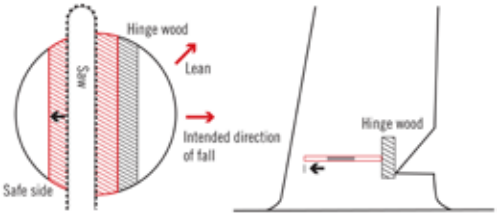
Bore and release cuts are used on heavy forward leaning trees that could split or let go suddenly if conventional cutting methods were used. Bore and release cuts should only be performed by experienced fallers who have training in using the technique.



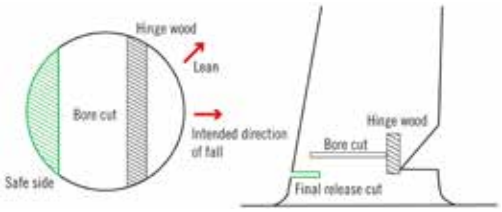
Fallers should be extra vigilant with their tree assessment when considering a bore and release cut, because the risk of making an error is high. They need to check that their bar will cut right through the diameter of the tree. This is important because the technique used will be different if they have to cut from both sides of the tree.



If the tree has a very heavy forward lean, the faller inserts a shallower scarf, closer to ¼ of the tree diameter. Once the scarf is in, they move to the escape route side of the tree and at 10 – 15% of the diameter above the bottom cut of the scarf, bore in through the centre of the trunk and cut towards the scarf to establish the hinge. They can use either a pushing or pulling chain to insert these cuts.



Fallers must be very careful not to overcut the borecut, the hinge should be no less than 10% of the tree diameter. Once the hinge is established, they cut back towards the rear of the stem, leaving a strap of sapwood in place to hold the tree in position until the release cut is made. Once again, careful judgment is required to get the width of this strap correct.



If the faller's bar is too short to go right through the tree in one cut, they will have to make two borecuts in the stem before doing the release cut. Extreme care is needed when using this method because the faller has to walk around behind the tree to the safe side after doing the first borecut. At this point the tree is like a loaded gun because, with the first borecut in, the remaining fibres in the stem will be under significant tension. Therefore, the first borecut must be carefully judged to ensure it is just deep enough to allow the second borecut to overlap it.

Split level backcut

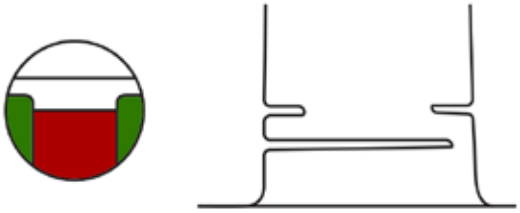
The faller removes the saw from the borecut and, standing on the escape route side of the tree, inserts the release cut below the borecut, cutting in from the rear of the tree. The separation between the height of the borecut and the release cut can be adjusted to control the speed that the tree is released. The greater the separation, the slower the tree will release. The release cut should be less than ½ the diameter of the tree below the bore cut. Fallers need to be aware that the tree will fall very quickly once it's been released.

5. BOX CUT

The box cut is another method used to slow down the sudden release of a heavy forward leaning tree. The technique is commonly used when the tree diameter is greater than the length of the chainsaw bar. It can result in increased damage to the butt log if the tree has a very heavy forward lean.

The box cut should only be used by skilled fallers who have been trained in how to insert the cuts correctly.

On heavy leaning trees, the scarf may need to be shallower to avoid getting jammed as the cuts are inserted. Once the scarf cuts have been made, the faller moves to the side of the tree, opposite the escape route and prepares to insert the first part of the backcut. It is recommended that wing cuts are left out when using the box cut method.



The faller stands out to the side of the tree and inserts the first part of the box cut using either a pushing or pulling chain. They cut in a quarter of the tree diameter from the back of the tree towards the scarf to establish the hinge. This cut should be at least 10% of tree diameter above the bottom cut of the scarf.

The faller removes the saw from the cut and walks around the back of the tree to the escape route side. The uncut fibres in the tree will be under increasing tension so they must not linger behind it once the box cut has been started.

The faller cuts a second backcut, ¼ of the tree diameter wide and at a similar height to the first cut, to establish the 10% hinge on the escape route side of the tree. They need to stand out to the side of the tree when making this cut. Remaining on the safe side of the tree, the faller inserts the final backcut below the two side cuts and using the full length of the bar. The release cut should be less than 1/3 the diameter of the tree below the backcuts.

Note that the tree will start to fall well before the 10% of diameter hinge width can be established. This leaves a box shaped square on the butt log, hence the name, “box cut”.

SPECIALISED FELLING TECHNIQUES

CONTOUR CUTTING

This advanced technique is used on steeper terrain to minimise the amount of extra work a faller has to do to prepare for extraction. It involves making the felling cuts on the same plane as the contour of the ground so that stump height is kept as low as practical. Only experienced fallers should attempt this technique.

The advantages of contour cutting are:

- the stump doesn't have to be chamfered off after the tree has fallen
- the saw motor doesn't get jammed between the tree and the ground
- it's easier to insert wedges if they are required
- it maximises the value recovered from the tree

The disadvantages are:

- it takes a little bit longer to fell the trees
- the faller may need a longer bar for efficient tree felling
- it's harder to make accurate felling cuts when they are sloping with the contour
- there may be an increase in butt damage from the contour cutting method

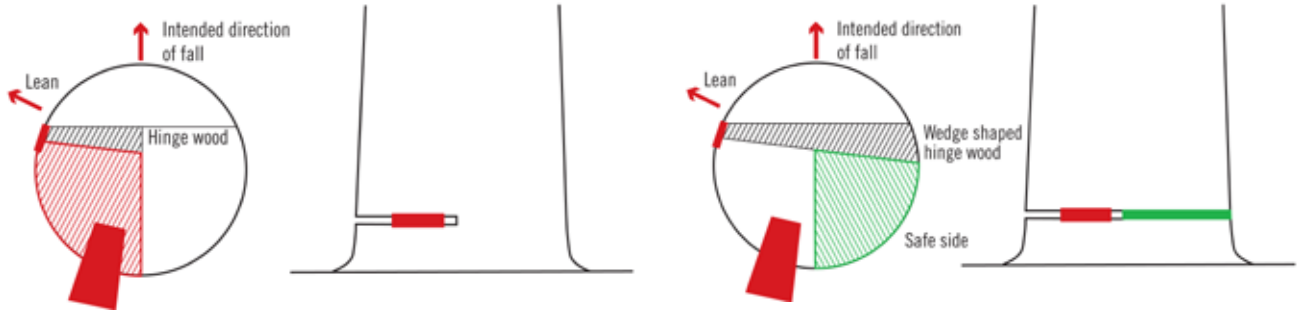
Fallers should use a Vee scarf to determine the direction of fall. When cross-slope felling, they should take extra care to ensure the cuts are done on the same plane. Fallers should also insert wing cuts with caution, because they weaken the hinge if not put in correctly. All other tree felling criteria such as top cut angle, hinge width and step height remains the same.

TAPERED HINGEWOOD

Using tapered hingewood on side-leaning trees helps maintain a consistent felling direction. This technique can be used with either conventional or quartercut backcuts. The faller inserts a conventional scarf facing the desired direction of fall. A wing cut may be put in on the side of the lean, but fallers must exercise caution if wing cutting on the other side of the tree.

The faller cuts from the escape route side of the tree if they're using a conventional backcut. If using a quartercut backcut, they should start on the leaning side of the tree, but should beware of cutting too deep and jamming the saw bar. The faller inserts a wedge in the first part of the backcut as soon as there is enough room to do so. This wedge can be close to the hinge on the leaning side of the tree.

The faller then finishes the backcut on the escape route side of the tree, leaving it thicker on that side. This extra hinge width should hold the tree on its intended fall path, but it is likely to increase the amount of draw wood on that side of the hinge.

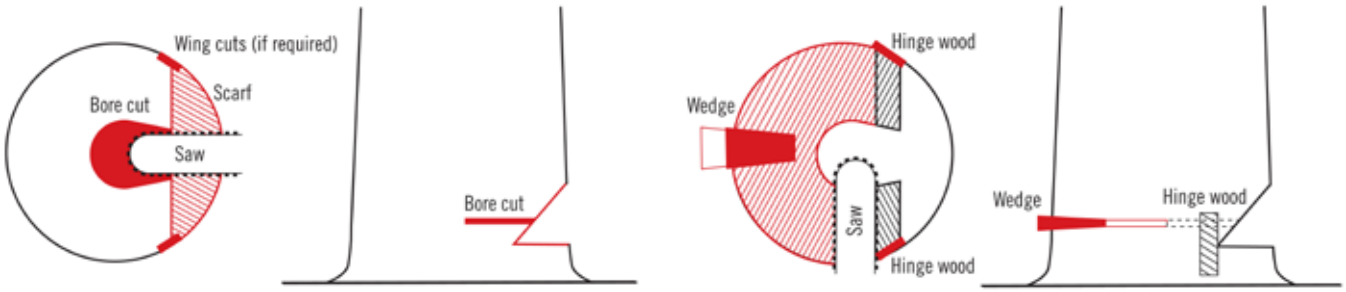


BORE CUTTING THE SCARF

Sometimes called "key holing", this technique is used when the tree diameter is greater than twice the length of the guide bar. The faller makes the bore cut into the front of the scarf to ensure that the wood which the bar is unable to reach in the centre of the tree is cut, before the backcut is inserted.

To do this cut, the faller inserts a Swedfor scarf, as it will allow them to get the saw motor further in to the front of the scarf. They bore in to the middle of the scarf face and work the saw to the right and left in a fan-shaped pattern, leaving as much hinge wood as possible.

The faller removes the saw from the borecut and starts the quartercut backcut from the side opposite the escape route. They then bore in to establish the hinge on that side, and then cut around the tree, keeping the full length of the bar in the tree. If a wedge is required, the faller stops half way around the tree and inserts it. They then continue cutting, periodically looking up as they progress and tapping the wedge in behind the backcut. They stop when the required 10% of the tree diameter remains as the hinge wood and if required, drive the wedge home. Extra wedges can be added if necessary.



STACKING WEDGES

This technique is used by some fallers to increase the lift available from their wedges. It involves a conventional scarf and a quartercut backcut with at least one wedge in the backcut. Once the first wedge has been driven in and the cut has opened up, the stacked wedges can be inserted.

Great care is needed when using this method, because if both wedges are not firmly lodged in the cut, one of them can spit out when struck causing a serious injury. It is recommended that the barbs of the upper wedge are facing the top of the cut and the barbs of the lower wedge are facing the bottom of the cut. This will help to prevent the wedges from spitting out. Fallers should place some fresh sawdust between the two surfaces of the wedges to provide some adhesion between them. They should also make sure their eye protection is in place when driving these wedges.

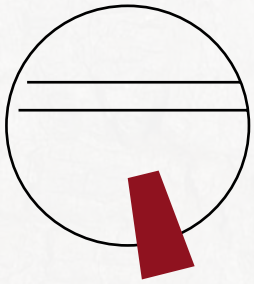
Stacking wedges

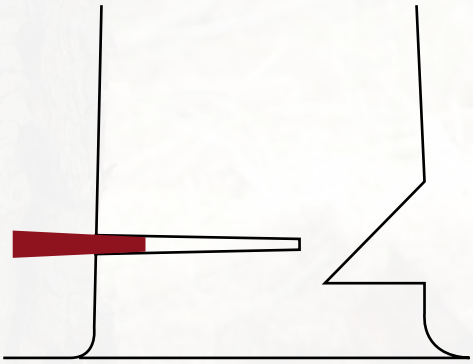
FELLING A SPAR

Felling a spar is sometimes a difficult task. Without the top of the tree in place, it's hard to judge the lean and where the weight is distributed. It's also a challenge to determine what the spar is going to do when it hits the ground, because there's no crown to cushion the landing. Fallers must make sure they clear a good escape route.

Fallers can use a conventional scarf when felling a spar, but increase the depth of it up to ½ of the tree diameter to help shift the point of balance in the direction of fall. They should be prepared to use a wedge or wedges to tip it forward

Fallers will also have to make the backcut deeper and leave a narrow hinge because without the weight above to give the tree momentum, it will be harder to move with a wedge.





TREE JACKING

Tree jacking can be used where access for ground based machinery is impossible and aligning hauler ropes to back pull trees is impracticable.

The jacks to be used must be purpose built and have the following features:

- pivoting plates on the ram ends to prevent spear damage and ensure the lifting force remains on the tree as it tilts forwards.
- wider than usual top plates to minimise fibre compression in the wood.
- if the jacks have a separate pump unit connected by hoses, they must have non-return valves on the jacks in case the hoses are cut
- single jacks with self contained pumps can be used if they are certified by an engineer as suitable for jacking trees over against their lean

APPROVED CODE OF PRACTICE

» **RULE 11.10.1**

There shall be two competent persons engaged in operations where tree jacks are used to fell trees against their lean

» **RULE 11.10.2**

Only tree jacks designed for tree felling shall be used

Most purpose built jacks usually have two cylinders which can be used either individually, or together, depending on the size of lift required. For convenience, the term “Jacks” applies to both double and single use for the rest of this section. Where the text refers to “cuts” or “blocks”, they should be read as “cut” or “block” if a single jack is used.

Typically each jack can lift between 25 and 35 tonne at 10,000 psi, (68900 kPa). Under normal conditions, trees up to 60cm can be safely lifted over with a single jack. Trees greater than 60cm in diameter may need two jacks. If two jacks are used, the plumbing of the pressure hoses must equalise the pressure in the lifting cylinders.

Generally, trees with a back lean of up to 4° can be safely felled with tree jacks, provided there is no excessive side lean and there are no defects in the base of the tree. Where practicable, the jacks should be placed directly opposite the intended direction of fall.

A smaller than usual scarf depth is acceptable when tree jacking because the further away the hinge is from the from the jacking point, the better the purchase the jacks have to lift the tree over.

The base plate of the jacks should be positioned approximately 50mm above the normal back cut height. This allows the borecuts to be inserted at the correct backcut height, (see diagram).

Two people are required to carry out a tree jacking operation, one to put in the felling cuts and the other to operate the jacks and observe tree movement while the cuts are being made. The assistant must be a competent tree faller, familiar with the operation of tree jacks.

The faller must be highly skilled and able to insert accurate cuts to carry out this operation. It requires precise judgement to get the cuts for the jack opening parallel and extreme care when doing the borecuts once the jacks are in position.

The procedure to use tree jacks to tip backward leaning trees against their lean is:

1. Ensure all of the necessary equipment is on site and in working condition before starting the tree jacking operation.

2. Ensure there is an experienced faller, familiar with using tree jacks, on site to act as an assistant.

3. Carefully assess the tree lean and crown weight to confirm that tree jacking is a viable option to fell the tree in the desired direction.

4. Remove undergrowth from around the tree to be jacked so that both the faller and their assistant have a clear view of the top of the tree.

5. Clear the escape route away from the tree, making provision for the person operating the jacks to be clear of the faller’s escape path if using a remote pump. If using a jack with a self contained pump, follow the same procedures as outlined here, except the tree faller will operate the jack and the assistant will be the observer.

6. Call-in the proposed tree jacking operation to the contact person.

7. Decide where the jacks are going to be positioned and insert a shallow scarf in the tree, facing the desired direction of fall. Scarf depth should be ⅕ to ¼ of tree diameter.

8. Measure and mark where the blocks are to be removed to make space for the jacks. If using a single jack, a quarter cut backcut can be used and the jack positioned behind the first part of the backcut.

9. Insert horizontal cuts where the base plates of the jacks are going to be positioned, making sure they are just deep enough to allow the plates to sit on solid wood. On larger trees, a single cut across the back of the tree can be made if there is sufficient room for both jacks to sit side by side.

10. Insert the second horizontal cuts, at the top plate height, deep enough to enable the jacks to fit in and contact solid wood once the blocks have been removed. Make sure these cuts are parallel with the first cuts.

11. Use vertical cuts to remove the block of wood between the top and bottom cuts, (see diagram). Note: A single vertical cut can be used if seating the jacks side by side. Take care to avoid kickback when inserting the vertical cuts.

12. Place the jacks in the slots created by removing the blocks, making sure they are in deep enough to make contact with solid wood when raised.

13. Pump the jacks up to about one third pressure, (approximately 3 - 4,000 psi for most jacks). This is done by the assistant if using jacks with a remote pump, or by the faller if using a jack with a self contained pump.

14. Insert a borecut approximately 30mm below and in between the base plates of the two jacks. Make this cut deep enough that it extends beyond the base plate of the jack, into the tree. Do not cut under the base plates of the jacks and take extra care to avoid cutting the jack hoses. If possible, have the assistant lift them clear when doing these cuts. Note: This borecut will not be necessary if using a single jack.

15. From the side opposite the escape route, place a borecut about half of the tree diameter deep, in front of and about 30mm below the base plate of the jack and cut towards the scarf, leaving a wider than normal hinge to avoid overcutting and the possibility of the hinge failing.

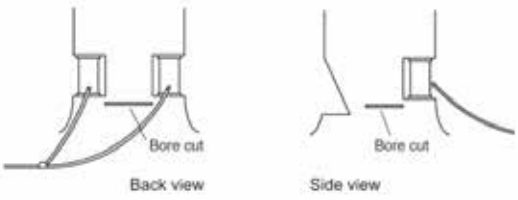
16. Move to the escape route side of the tree and insert the second borecut, in front of and below the base plate of the jack, again ensuring it overlaps the other borecut and leaves a wider than usual hinge. If using single jack with a quarter cut, cut in from the back of the tree, making sure to avoid cutting underneath the base plate of the jack.

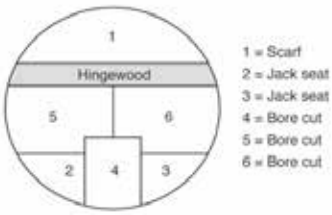
17. Remove the saw from the borecut and retreat along the escape route to the safe position, avoiding stepping on or tripping over the jack hoses.

18. Instruct the assistant to continue pumping the jacks up until the tree falls over Watch closely for any signs of the hinge failing. If using a single jack with a self contained pump, place the saw to the side, out of the way and continue pumping the jack until the tree starts to fall.

19. If the top of the tree is affected by wind, pause pumping when the tree is being blown back against the intended direction of fall, and pump rapidly when the tree swings forward.

20. Call in to the contact person when the tree has been jacked over.





MACHINE ASSISTED FELLING

Machine assisted felling is used to manage hazards wherever possible. Machine assistance involves holding a tree in position while the felling cuts are made, then either pushing or pulling the tree over on the command of the faller. The faller is in control of the operation at all times and no machine movement should take place without their explicit instructions. For safety reasons, there must be clear and effective communication between the faller and the machine operator. Radio communication and the use of ear pieces is strongly recommended.

The following rules from the Approved Code of Practice for Forestry Operations apply to all ground based machine assisted felling:

- the machine must be of sufficient size, (capacity) and traction
- knuckle boom loaders should have a minimum weight of 20 tonnes
- a wedge must be inserted in the backcut of any tree to be felled using machine assistance
- the faller must move to an agreed safe position before signalling for the machine to push or pull the tree over

Recommendation for Operator Protective Structures in the Forestry Industry:

Excavators High-risk	Machines used for log extraction, mechanical harvesting, shovel logging, mobile/tail holds, land preparation, including road construction and maintenance.	COPS designed to Grade 3 including OPS and FOPS
All other plant High-risk	Machines used for log extraction, tree felling, mechanical harvesting, shovel logging, mobile/tail holds, construction of forestry roads/ maintenance tracks, fire breaks and landings where there is danger from falling debris and trees. Machines used for land preparation.	ROPS, FOPS, OPS
Medium-risk	Machines including excavators, used on landings, log yards, and shetter belt maintenance.	FOPS OPS
Low-risk	Cable haulers (all areas), purpose-built log stackers, i.e. wagners (log yards).	FOPS, OPS

All of the above structures must meet minimum design standards according to international specifications for machine operator protection.

There are two types of ground based machine assisted felling:

1. Using a machine to push the tree over
2. Using the winch on a machine to pull the tree over, commonly called “back-pulling trees”.

USING MACHINE ASSISTANCE TO PUSH A TREE OVER

This is the most common form of machine assisted felling and uses a bulldozer, excavator loader or skidder to get in behind the tree and push it in the desired direction.

The following rules apply to pushing the tree over:

1. The faller must not work directly underneath any raised blade or mobile plant accessory.
2. The implement used to push the tree over must have the facility to stop the tree from sliding sideways.

The sequence to push trees over with a machine is:

3. Make sure the machine can get access to the rear of the tree and has a stable place to work from.

4. Make sure the chainsaw bar is long enough to complete the cuts in from the safest side.

5. Check that the communication system between the faller and the machine operator is working correctly.

6. Instruct the operator to move the machine into position, avoiding any contact with the tree.

7. Insert the scarf in the tree, leaving wing cuts out if there is any doubt about hinge strength.

8. If the tree is too big for the backcut to be put in from one side, the first part of the quartercut backcut should be done at this point and a wedge inserted in it.

9. Move to a safe position and instruct the machine operator to position the blade or implement on to the tree.

10. Ask the operator to apply only enough pressure to stop the tree from moving backwards.

11. Insert the backcut from the safest side, avoiding working under the raised implement.

12. If cutting from one side, stop and tap a wedge into the backcut as it is being inserted. Leave a slightly wider than normal hinge.

13. Once the backcut is completed, remove the saw and move to the pre-determined safe position.

14. Instruct the machine operator to push the tree over and stop the machine once the tree is falling in the desired direction.

MACHINES WITH FRONT MOUNTED BLADES

A machine with a front mounted blade must have a sharp point on the corner of the blade to spear into the tree. If it doesn't have this, the blade shouldn't be used to push the tree over. Using the blade of a machine also means that the faller is obstructed from the operator's view when the backcut is being inserted, so exercise extreme caution when using this technique. The machine operator must not apply any additional pressure to the tree until the faller has moved clear and given the instruction to push.

EXTRACTION MACHINES

Some extraction machines have a serrated edge on the fairlead on the arch and this can be used to push against the tree by reversing up to it. The same sequence as above is followed with this technique and once again, because the faller can be obscured from the machine operator's view as the backcut is being inserted, a similar precaution applies. Machine alignment is particularly important when using this method because the machine could slew sideways if it isn't directly behind the tree.

EXCAVATORS

An excavator type loader can be used to machine assist felling trees by pushing them with the boom. This method can only be used if the end of the stick has purpose built horns fitted to stop the tree from sliding sideways. The serrated edge on a live heel can also be used for this purpose if the grapple is clamped to the outside edges of the heel and the heel is the only part of the machine that is in contact with the tree.

GRAPPLES

The most common method of machine assisting with excavator type loaders is to hold the tree with the grapple. The process of swinging the grapple horizontal and grabbing the tree can put extra pressure on the tree if the scarf has already been put in, so it's safer for the machine to grab the tree before the scarf is inserted.

Hydraulic hoses controlling grapple functions can be exposed to damage from branches when the grapple is swung horizontal to grab the tree, so it may be necessary to strip the branches off the stem before it is grappled. These branches should also be removed if there is a risk of them dropping on the faller as the felling cuts are being made.

Fallers must be in the predetermined safe position when the grapple is positioned.

Once the scarf is cut the faller can pass underneath the boom to complete the backcuts if necessary, but they must not work directly underneath the raised boom. As with the other methods, the machine operator must follow the faller's instructions.

The excavator operator should not rely entirely on the slew of the machine to push the tree in the intended direction. Using the boom and stick movement applies a greater force to the tree.

Once the tree is falling in the desired direction, the excavator operator should release it from the grapple. The machine operator should also take care not to twist the tree as it is being pushed, because that could break the hinge, and control of the tree may be lost.

USING MACHINE ASSISTANCE TO PULL TREES OVER

A skidder or bulldozer fitted with a winch can be used to back-pull trees. In addition to the requirements stated above in terms of machine size and traction, protective structures and communication, the machine must also have a winch rope and strop of sufficient length and strength to safely pull the tree over.

Additional equipment needed to safely back-pull trees include a ladder or climbing equipment to get the strop as high as possible, a safety harness if the person attaching the strop is climbing above 3m, and at least one extra person to assist with getting the rope up the tree. This person can also act as an observer and having another experienced faller on site is desirable in these situations.

The sequence to back pull trees with a machine is:

1. Ensure all of the necessary equipment is on site and fit for purpose.
2. Make sure the machine can be positioned in front of, but to the side of the tree to be felled and that its winch rope is long enough (the machine must be at least 3/4 of the height of the tree away from it).
3. Check that the communication system between the faller and the machine operator is working correctly.
4. Select a safe position, then clear around the tree and clear an escape route to the safe position.
5. Back the machine up to the tree.
6. Attach the strop at least two metres above where the felling cuts are going to be inserted, higher up if the tree has a particularly heavy lean or is very big with heavy branches.
7. Remove the climbing equipment, retreat to the safe position and instruct the machine operator to drive the machine forwards to the pre-determined winching position without applying any tension to the winch rope. From this point on, the assistant should remain in the safe position.
8. Get the operator to secure the machine by lowering the blade and digging it in, or positioning it behind a stump.
9. Remaining in the safe position, instruct the machine operator to tension the winchrope enough to pull the tree slightly forwards (bark popping off the stem is usually a good indicator of sufficient tension).
10. Instruct the machine operator to hold that tension and move from the safe position to put the scarf and backcut in the tree. Insert at least one wedge in the backcut. The split level or quartercut is the best backcut option for back-pulling trees.
11. Move back to the safe position and instruct the machine operator to pull the tree over, releasing the tension when the tree is falling in the desired direction.

Note: Sometimes the tree may start to fall before the faller has moved clear and instructed the machine operator to pull the tree over. When this happens, it should be treated as a normal felling situation and the faller should stop cutting and retreat along the escape route, watching for overhead hazards, as soon as the tree begins to fall.

APPROVED CODE OF PRACTICE

» **RULE 11.8.4**

When pulling trees over, the winch rope shall be attached at least two metres above the felling cuts.

» **RULE 11.8.5**

The winching mobile plant shall be positioned between 30 and 60 degrees from the intended direction of fall on the side opposite the lean.

» **RULE 11.8.8**

No tree shall be felled in a direction or manner that will cause “shock loading” on the pulling ropes.

Using machine assistance to pull trees over

USING A CABLE HAULER TO PULL TREES OVER

A cable hauler can also be used to back-pull trees. Unless the hauler has the facility to mechanically feed slack, a separate extension strop, of sufficient length and strength to safely pull the trees over, needs to be added to the hauler rigging. As with ground based machine-assisted felling, effective communication between the faller and the hauler operator is essential.

Crew members should use a ladder or climbing equipment to get the pulling strop as high as possible up the tree. A safety harness may also be required if the person attaching the strop is climbing above 3m, and at least one extra person is needed to assist with getting the rope up the tree. This person can also act as an observer, so having another experienced faller on site is desirable in these situations.

The sequence to back pull trees with a cable hauler is:

1. Ensure all of the necessary equipment is on site and fit for purpose.
2. Make sure the trees can be directionally felled away from the ropes.
3. Ensure the extension strop, (if used), is of sufficient length to prevent the tree from falling on the carriage or rigging.
4. Check that the communication system between the faller and the hauler operator is working correctly.
5. Select a safe position, then clear around the tree and clear an escape route to the safe position.
6. Outhaul the carriage or rigging to a position forward of the tree, but close enough for the pulling strop to be connected.
7. Attach the strop as high as possible above where the felling cuts are going to be inserted, higher up if the tree has a particularly heavy lean or is very big with heavy branches.
8. Remove the climbing equipment and retreat to the safe position, ensuring that the person assisting also retreats to the safe position.
9. Remaining in the safe position, instruct the hauler operator to tension the pulling rope until it takes the weight of the tree, pulling it slightly forwards (bark popping off the stem is usually a good indicator of sufficient tension).
10. Instruct the hauler operator to hold that tension and move from the safe position to put the scarf and backcut in the tree. Insert at least one wedge in the backcut. The split level cut or quartercut is the best backcut option for back pulling trees.
11. Move back to the safe position and instruct the hauler operator to pull the tree over, releasing the tension when the tree is falling in the desired direction.

Getting the right tension in the pulling rope is critical to safe hauler-assisted felling. The faller should be in the safe position before the tree begins to fall, but if too much tension is applied, the tree could fall before the faller has retreated.

If the communication system in use is not effective, machine-assisted tree felling operations should not be conducted.

The faller is in control of the machine assisted falling operation.

APPROVED CODE OF PRACTICE

» **RULE 11.9.1**

Cable harvesting assisted felling shall be planned to ensure:

- only one tree at a time shall be felled using this method
- an effective communication system is established between the tree faller and the yarder operator
- trees shall be directionally felled to avoid falling over working ropes
- no tree shall be felled in a way that will cause “shock loading” on the pulling rope.

» **RULE 11.9.2**

When winching trees over, the winch rope shall be attached to the tree as high as practicable above the felling cuts

TREE DRIVING

Tree driving is the process of knocking a tree, (or trees) to the ground, by felling another tree on to them. It can also be used to knock a hazard out of a standing tree by brushing past the hazard and dislodging it. Driving is considered one of the most hazardous practices used in manual tree felling and has been identified as a primary factor in tree felling fatalities.

There are two types of tree drive: planned and unplanned.

A planned drive is where a target tree, or a hazard is identified as unsafe and a decision is made to use a drive. This happens in advance, before any cuts are made in any trees. Planned drives can be used as a tool to help remove a hazard from the felling area, or to maintain the desired felling pattern by deliberately pushing a backward leaning tree over with one that is leaning in the right direction. Planned drives can sometimes involve more than one tree, but Rule 11.7.2 in the Approved Code of Practice for Forest Operations states that tree driving must not exceed one onto two trees.

An unplanned drive is where the tree to be felled has either lodged in another standing tree, or it has sat back as the cuts were being put in (and because of this the tree is leaning back, away from the intended direction of fall). When one tree is hung-up in another, the direction of fall has been determined. So using a driver tree to brush past it can often be enough to dislodge it from the standing tree.

The unplanned drive of a cut up tree is hazardous because the direction of fall has not been determined. It could fall in any direction, particularly if the felling cuts have not been put in accurately, or the wind strength or direction has changed. The hazard is even greater if the faller has to spend time clearing around the driver tree and cutting an escape route instead of watching what the cut up tree is doing.

Whether planned or not, driving one tree onto another tree hung-up in a standing tree, could cause the following hazards:

- the butt of the driver tree pivoting upwards and sliding back towards the faller
- the hung-up tree could break and fall back towards the faller

The key difference between the two types of drive is that the planned drive can be properly prepared for, whereas options are limited when doing an unplanned drive.

APPROVED CODE OF PRACTICE

» **RULE 11.7.1**

Tree driving shall only be used to fell trees that either:

- are leaning against the intended direction of fall and cannot be safely felled using wedges.
- present additional hazards that could dislodge as the tree begins to fall, e.g. trees with a broken top.
- are hung up or cut up.

» **RULE 11.7.2**

Tree driving shall not exceed one onto two trees.

» **RULE 11.7.4**

The faller shall notify the person available to them that they intend to undertake a tree drive:

- the faller shall notify the person available to them that the drive has been completed successfully
- if a one onto two tree drive is unsuccessful, falling shall cease until an observer is present to help plan management of that hazard

» **RULE 11.7.5**

A holding wedge shall be inserted in the backcut of each tree to be driven

» **RULE 11.7.6**

A minimum of two wedges shall be available to insert in the backcut of the driver tree.

TREE DRIVE PROCEDURE

The procedure to set up a tree drive is:

1. Carefully assess the tree or trees to be driven and check that the driver tree is big enough to do the job and is leaning in the right direction.

2. Call up the contact person and advise them of the intended tree drive, it's good practice to state whether the drive is one onto one or one onto two.

3. If the drive is more than one onto two, call up an observer and wait for their arrival before starting any felling cuts.

4. Clear any undergrowth or slash from around the tree(s) to be driven, in the access routes to all the trees in the drive, around the driver tree and along the escape route. This can be done while waiting for the observer.

5. Re-check the lean and crown distribution of all trees in the drive.

6. Ensure there are no obstacles or other standing trees in the path of the drive.

7. Determine the felling cuts to be used.

8. If there is an observer on site, ensure they are in a safe position where they have an unobstructed view of the tops of the trees, and make sure they have an effective means of communicating with the faller.

9. Insert the felling cuts in the tree(s) to be driven, placing a wedge in each tree as the backcut is being made.

10. Carefully aim the driver tree to fall in a direction that will bring all trees down.

11. If the driver tree is big enough and in the right location, aim to brush it against the top of the tree(s) to be driven.

12. If the driver is smaller than the tree(s) to be driven, or there is doubt that it will have enough momentum to knock the drive down by just brushing it, aim the driver to hit the centre of the tree(s) to be driven.

13. Move clear along the escape route as soon as the driver tree starts to fall, looking up to watch for any falling hazards.

14. In particular, watch out for breaking tops or extra leaders that could snap off and fall back towards the faller as the drive goes down.

If there is any doubt about the proposed drive, the faller must call up for an observer to come and provide a second opinion on how to get the hazard down and to watch out for falling hazards that could be dislodged as the drive proceeds. Observers must have an effective means of communicating with the faller. A two way RT with an earpiece receiver in the earmuffs is recommended.

FELLING TREES IN UPSET CONDITIONS

The term ‘upset conditions’ can refer to hazardous trees, or situations where things have gone wrong, and the unexpected has happened. In these cases, the faller may need to do more planning, and may require assistance or alternative methods to fall the tree safely.

Upset conditions could include:

- hazardous trees
- multileader trees
- hung-up and cut-up trees
- windthrow
- trees that have sat back, (because no wedges were used, or all wedges were in use and the tree still sat back)
- a chainsaw jammed in the tree
- a broken wedge

These cases can require a different approach to cuts, direction, or tools used, or a higher level of competence.

HAZARDOUS TREES

Felling a hazardous tree requires an accurate and thorough tree assessment and planning.

The faller must consider the following factors before deciding if the tree can be felled safely:

- their personal capability and competence
- the possibility of using machine assistance (machine size, rope strength, competence of operator)
- the use of tree felling aids, wedges, hammer size
- the suitability of the chainsaw, (size and bar length)
- the prevailing weather conditions, e.g. wind, rain, etc
- the availability of the faller’s observer
- the method of felling the tree safely – (machines, manually felling or tree driving)

Felling hazardous trees requires specialist skills and may require additional equipment. Some hazardous trees may need to be left standing until assistance can be obtained to fell them safely.

If there is uncertainty about how to deal with a hazardous tree, fallers must seek advice from the observer and develop a management plan.

INDICATORS OF A HAZARDOUS TREE

Hazard	Controls (additional to 5-step felling process)
Hazardous tops Dead or broken crown, overhead vines, multi leader top prone to decay and structural weakness or with leaders prone to breakage in windy conditions.	• anticipate the fall direction of the overhead hazard • ensure make sure the escape route is clear of the danger area • use caution when wedging, as vibrations can cause dead or broken limbs/tops to break off • consider other techniques, such as tree driving or machine assistance
Dead or broken limbs Limbs suspended in the tree tops, generally caused by wind, snow or tree felling damage.	
Split Trunks Split trunks that show advanced decay indicate serious weakness which could affect tree felling. Rot can affect the soundness of the tree which could make it unsafe to fell.	• identify decay (from black stain, weeping, epiphyte growth, fungal growth) • insert a vertical test cut to confirm the condition of the stem (i.e. Dark, soft or crumbly sawdust or water indicates rot). • fell in the direction of the lean • increase the height of the felling cuts • consider leaving the tree standing • consider tree driving or machine assistance
Stem Damage Caused by fire, machine, weather, or animal damage.	
Heavy forward lean Generally caused by high winds, poor root plate structure and soil conditions.	• fell in the direction of the lean • use recommended tree felling techniques to slow down the release when the backcut is made • consider other techniques, like tree driving or machine assistance
Unstable root conditions Trees can uproot unexpectedly, the root ball can lift out of the ground.	• look for indications of saturated soil conditions • look for any ground cracks or soil disturbance from tracking around the base of the tree, which indicate that the tree may be unstable • consider other techniques like tree driving or machine assistance • consider getting an observer
Large Trees	• use a longer bar • use advanced techniques such as: bore cutting the scarf, split level or quartercut backcut • consider using an observer
Alternative Species	Alternate species require knowledge and skills specific to the species.

MULTI-LEADER TREES

A multi leader tree is a tree where there is more than one single leader. This dividing point can occur close to the ground or high up in the canopy. As a result, trees with multi leaders can create additional hazards for the faller and the rest of the crew.

Whenever possible, each leader on a multi leader tree should be felled separately in the direction of its lean.

The assessment must consider:

- the number and size of each leader
- the lean of each leader
- splitting or damage to the base of the tree
- evidence of decay (e.g. Water coming out from tree)
- interlocked branches.

The cutting sequence can commence after the felling area and the individual leaders have been thoroughly assessed, and the work area and escape routes are prepared.

DIVIDING POINT CLOSE TO THE GROUND

Use the following procedure when the dividing point of the leader is close enough to the ground to be reached safely:

1. Work with the lean.
2. Cut a conventional scarf, ¼ tree diameter, facing the direction the first leader is leaning towards.
3. Use a back cut technique that is appropriate to the lean and hazards associated with tree.
4. Periodically stop and assess the top of the tree for movement and overhead hazards.
5. Continue making the backcut and slow down the cutting action near completion to reduce the risk of cutting the other leader.
6. As the leader starts to fall, follow the planned escape route procedures (when released, the leader can fall very quickly).
7. With the first leader safely felled, the remaining leader can be felled normally.
8. After the second leader is felled and it is safe to do so, return to the stump and cut it off at ground level.

DIVIDING POINT ABOVE SHOULDER HEIGHT

If the dividing point is above shoulder height the leaders cannot be felled individually.

There are additional hazards when there are joins or fault lines running through the stem where the tree felling cuts are to be made. Fallers must thoroughly assess the leaders and consider all tree felling options available before attempting to fell such trees.

The procedure is:

1. Look for dark stains below where the two leaders join in the trunk of the tree.

2. Insert a vertical bore cut below the join to see if any water comes out.

3. Assess the two leaders and determine which one has the dominant lean.

4. If the trunk below the leaders is sound, fell the tree as one in the direction of the leader with the dominant lean.

5. If the trunk of the tree appears to be decayed or unstable, arrange for machine assistance if access is possible.

6. If machine access is not possible, leave tree unfelled and refer the issue back to the forest owner.

7. Do not attempt to fell the tree using conventional methods.

Any tree with these characteristics should be treated as hazardous and called-in as a hazardous situation.

DEAD TREES

Dead, broken or rotted trees are unpredictable and very hazardous. They can fall in any direction at any time without warning, and may break up as they are falling. Driving dead trees can also pose a danger as they may break with the upper part of the stem falling backward towards the faller.

The only work carried out in the two tree-length zone around the dead tree should be to make the danger area safe. Dead trees should not be left standing while other trees are felled around them.

Fallers must notify their contact person that they intend to fell a dead tree, and where possible, dead trees should be removed by machine before work begins in that area.

Using wedges to tip a dead tree in the desired direction is not recommended because:

- the amount of decay in the branches and the top of the tree is difficult to assess and unstable pieces could fall down at any time.
- the shockwaves from driving the wedge in could cause the tree to collapse into multiple pieces and drop on the faller
- the wood where the wedge is being driven in could be soft and not provide any lift to the rest of the tree

When driving a dead tree the ACOP requires that a wedge be inserted in the backcut.

The options to deal with this situation are:

- place a deeper scarf in the tree (up to a ½ tree diameter)
- avoid trying to fell it against its lean
- stop cutting and look up at frequent intervals
- get an observer on site if there is any doubt about the stability of the tree
- insert a wedge in the backcut as soon as it is deep enough. Tap it in gently with the ball of a fist, rather than a hammer, to minimise the shockwaves going up through the tree

It may also be possible to smash the dead tree down without putting any cuts in it. The risk in this method is that part of the dead tree could remain standing and still be a hazard to anyone working around it.

Whatever method is used to bring dead trees to the ground, fallers must exercise extreme caution and call-in the situation to their contact person, before and after felling.

Dead trees

HUNG-UP AND CUT-UP TREES

A **hung-up** tree has been cut, windthrown or pushed and is caught in or lodged against another tree, preventing it from falling to the ground. In most cases, the direction a hung-up tree will fall in has been determined. In this situation, the danger zone may not be out in front of the tree. At any stage, the tree could dislodge and fall or it could twist sideways and pivot to either side, or twist and pivot to the rear of the stump. So in this case, the danger zone is all around the tree.

Many fallers have been fatally or seriously injured by working under a hung-up tree. Under no circumstances should the tree in which the hang-up is lodged be felled manually while the other tree is still hung-up in it.

A **cut-up tree** has been scarfed and backcut and but has not fallen to the ground. Cut-up trees are often caused by poor tree assessment, and poor tree felling or wedging techniques.

Depending on the quality of the cuts, the tree could fall in any direction.

There are two types of cut up tree:

1. Trees with a wedge or wedges in the back cut, (safest situation)
2. Trees with no wedges in the back cut, (most hazardous situation)

If the faller is not sure how to deal with a hung-up or cut- up tree, they must seek advice from a competent person.

PROCEDURES FOR FELLING HUNG-UP TREES

Hung-up trees must be brought to the ground immediately or isolated from the forest harvesting operation. No-one should work or be standing within two tree-lengths of the likely direction of fall.

With a hung-up tree the felling direction has basically been decided.

The faller must not leave the area before the tree has been brought to the ground, unless the situation has been notified to the contact person and a plan is in place to manage the hazard.

Fallers must assess hung-up trees carefully before taking any further action.

Issues to consider are:

- how long the hang-up has been lodged in the tree
- which side of the standing tree the hang-up is on
- the stability of the root plate if the tree is windblown
- the size of the branches on the standing tree that appear to be supporting the hung-up tree
- which part of the hung-up tree is in contact with the standing tree, i.e. how far up the stem

Where practical, a machine should be used to pull the hung-up tree away from the stump and bring it down safely. This machine may work within two tree-lengths, providing it is to the rear of the tree and the operator does not leave the cab. No other person or machine should be within two tree-lengths of the intended or likely direction of fall.

If machine access is not possible, the faller can attempt to drive the hung- up down with another tree. Extreme caution must be exercised when using this method.

APPROVED CODE OF PRACTICE

» **RULE 11.6.1**

A hung-up or cut-up tree shall be brought to the ground immediately or the hazard managed until such time as it can be brought to the ground.

If the cut-up tree is to be brought down, refer to section 11.7: Tree driving.

» **RULE 11.4.2**

Mobile plant with the appropriate protective structures may work closer than two tree lengths but not closer than one tree length of felling operations unless they are directly assisting in the tree felling operation.

» **RULE 11.4.3**

No person shall be closer than two tree lengths to a tree being felled, unless that person is assisting the faller.

Any person within two tree lengths of a tree being felled shall be under direct control of the faller.

The procedure is:

1. Notify the contact person of the proposed drive.

2. If there is any doubt in the faller's mind, an observer must be called in.

3. The driver tree must be selected and the area around it cleared so the top of the tree can be seen.

4. If there is any possibility that the first driver won't take the hung-up down, a back-up driver must be selected and cleared around

5. Clear a longer than usual escape route. It must be well away from the anticipated movement of the butt of the driver, which might pivot on the hung-up tree.

APPROVED CODE OF PRACTICE

» **RULE 11.6.2**

Where a cut-up tree has sat back and needs to be recut, the scarf and backcut shall be a minimum of the tree diameter above the initial backcut.

6. The escape route should be created to reach the protection of other standing trees, if practical.

7. Where more than one driver tree might be used, escape routes must be cleared away from each tree in the drive.

8. Depending on the location of the driver, it should be aimed so it strikes the hung-up tree immediately below the point where it is lodged in the standing tree.

9. If the driver is to the side of the hung-up tree and can bypass the standing tree, the driver should be aimed so it strikes the hung-up tree above the point where it's lodged in the standing tree.

10. Care should be taken to avoid breaking the hung-up tree off above the point where it is lodged in the standing tree.

11. As soon as the driver tree starts to move, the faller must immediately retreat immediately along the prepared escape route, leaving the chainsaw and felling aids behind.

12. Once the drive is completed, the faller informs their contact person of the successful outcome.

If the hang-up can't be brought safely to the ground, fallers must:

- call up the contact person and advise that the hazard cannot be eliminated
- ask the contact person to warn everyone else in the operation about the hang-up
- ensure that the hazard is reported to the crew manager as soon as it is practical to do so
- if the area has public access, the hazard must be cordoned off with warning tape to restrict access to the site
- the cordoned off area must extend at least two tree-lengths away from the hung-up tree

On larger trees, make a bore cut into the closed up backcut and drive in a wedge to re-open it.

PROCEDURES FOR FELLING CUT-UP TREES

A cut-up tree might fail to fall or might sit back if the faller has not assessed the tree correctly and has misjudged the lean, or the wind has come up unexpectedly.

Cut-up trees must be thoroughly assessed to determine the safest way to deal with them. If the tree is sitting back on a wedge, it's safer than if there is no wedge in it. There are several options for bringing a cut-up tree down.

If the felling cuts are completed and the tree is not sitting back too far, the faller can use wedges to lift it back in the intended direction of fall. The correct method is to drive a wedge into the backcut immediately behind the hinge and tap in until there's enough of a gap to get a second wedge in the backcut. Take care to ensure that the hinge doesn't fail with this technique.

If the tree is sitting back heavily, or all the wedges have been used, the options are:

- use a machine to push the tree down (this should be the first choice wherever possible)
- drive the cut-up tree down (refer to the section on tree driving)
- fell the tree with the lean (which is now in the opposite direction to the original cuts)

Use this sequence to fell the tree in the opposite direction:

1. Re-assess the path the tree is going to fall in for obstacles that it could hit on its way down.
2. Check the ground where the tree is going to land to make sure it won't kick back or rebound.
3. Check whether the escape route taken to move away from the revised fall path is likely to place the faller in amongst already felled trees that could move if struck by the falling tree.
4. Call-in to the contact person advising them that a hazardous tree is being felled.
5. Lift the new felling cuts up at least one diameter of the tree above the original felling cuts.
6. Aim the new scarf so the tree will fall directly opposite to the intended direction of the original scarf.
7. Watch for the hingewood in the first felling cuts in case it fails and allows the falling tree to kick back off the stump.
8. Move clear along the escape route as soon as the tree starts to fall.
9. Advise the contact person when the tree has been successfully felled.

CHAINSAW JAMMED IN TREE

The two main reasons for this happening are the same as for the tree sitting back without wedges.

To overcome this problem, the faller will need to:

- use a machine to push the tree over, if possible
- call-in the hazard and ask for an observer if the wind strength is increasing or the faller is uncertain about how to deal with the problem
- remove the powerhead from the bar, leaving the chain and bar in the cut
- get a replacement bar and chain and fit it to the chainsaw powerhead
- use the technique described to fell cut up trees to get the tree down

See the Procedure for felling cutup trees on page 78.

BROKEN WEDGE

Fallers should carry extra wedges to use as a backup if one is lost or broken. If the faller only has four wedges on site and one gets broken, felling should cease until the wedge is replaced.

WINDTHROW

Windthrow is a result of high winds blowing down an exposed stand of trees.

Areas prone to windthrow include stands that have been:

- exposed to extreme wind conditions, often from a different direction to the predominant wind
- opened up through other harvesting operations
- subjected to wet weather conditions prior to strong winds
- planted on exposed ridge lines
- located in naturally wet areas
- planted in poor ground conditions resulting in trees with shallow root plates

Manually felling windthrown trees is very hazardous and should only be attempted by competent fallers or those under close supervision. Where possible, a machine should be used to complete or assist the tree felling operation.

ADDITIONAL HAZARDS CAUSED BY WINDTHROW

Windthrown trees cause additional hazards during tree felling and extraction and can have extreme and complex tension and compression forces within them. This makes the job of identifying safe positions and correct cutting techniques more difficult and more important.

Some of the common hazards associated with windthrown areas are:

- unstable trees
- spars
- heavy leaners
- overhead hazards: shattered tops, sailors, loose debris
- uprooted trees under tension
- multiple hang-ups
- extreme and complex tension and forces
- confined work areas
- changing weather conditions – (further rain and wind can affect the stability of the standing trees)

To minimise these hazards, the following precautions should be taken:

- only competent fallers (or those under close supervision) should work in windthrown areas
- use machines to isolate the tension in stems before they are cut
- work from the butt end of the windthrown trees wherever possible
- carefully assess each stem to be cut, and always finish on the safe side of the tree
- if cutting a stem in the middle, the final cut should be made from the compression side so it springs away from the faller
- if cutting next to a rootball, the cuts should be moved up the stem so it can't roll onto the faller.
- off-set the final cut towards the rootball with the faller standing on the rootball side in case the stem splits as it is being cut
- angle the final cut if necessary to enable the faller to stand in a safe position

These are just a few of the techniques used to handle the hazards created by windthrow events. There are many more techniques that can be applied. Any faller needing to fell windthrown trees must be professionally trained and assessed as competent before attempting to work in these conditions.

APPROVED CODE OF PRACTICE

» **RULE 11.1.1**

In areas of windthrown salvage, machine assisted felling shall be the first choice of felling mechanism.

Machines must be used if practicable to breakout windthrown trees to a safe positon where tension is released and the tree can be safely worked on

» **RULE 11.11.3**

No person must work directly under wind wrenched trees.

No person must work within two tree lengths forward of wind wrenched or damaged trees.

» **RULE 11.11.2**

Any manual faller required to work in wind throw must have their competency assessed against NZQA Unit Standard 1270

INDIVIDUAL WINDTHROWN TREES

Individual windthrown trees are often tangled in amongst other standing trees and as such, they can temporarily increase the hazards a faller may face when dealing with them manually.

The following basic procedures should be used when felling individually windthrown trees:

1. Thoroughly assess the site.
2. Develop a felling plan and ask the contact person to document significant hazards.
3. Assess the individual tree to identify the amount of tension and the direction of any anticipated movement.
4. Prepare an adequate work area and escape route.
5. Use appropriate cutting techniques for the situation (i.e. uproots, heavy leaner, spar).
6. Finish on the safe side, away from any likely stem or root plate movement.
7. Move well clear up the escape route and observe from the safe position.
8. Do not work below unstable root plates that have been cut.

If in any doubt, the faller must seek assistance from a machine or another competent faller.

Windthrown trees

APPENDICES

APPENDIX ONE: PREVENTING SOFT TISSUE INJURIES

Soft tissue injuries (e.g. sprains, strains and tears) account for numerous injuries to fallers. Walking on logs and uneven terrain, carrying a chainsaw and felling equipment, working in awkward positions for extended periods all contribute to personal injuries.

Warm-up exercises, regular stretching and using ergonomically correct felling techniques will reduce the potential for injury.

STRETCHES

Warm up muscles before stretching – this usually happens when you walk into your work area.

- stretch larger muscles first
- stretch only until there is a gentle pull in the muscles
- hold stretches for at least 20–30 seconds

If you have very inflexible muscles and cannot complete the full movement, do what you can without pain.

QUADS

Hold tree for balance (or look straight ahead); grasp ankle from behind; keep knees together and pointed towards the ground; hold body upright; pull gently until you feel a stretch at the front of the thigh. This stretch reduces tightness from walking downhill or holding one position for long periods.

HAMSTRING

Place one leg on object no higher than knee; both legs straight; stand tall with back straight; shoulders back; bend body forward at hip. This stretch lengthens hamstring muscles in back of thigh.

CALF

Put your foot against a tree, toes pointed upward. Keeping your back and leg straight, slowly pull your body towards the tree to stretch the lower leg and ankle.

ACHILLES

Put your foot against a tree toes pointed upward, heel planted. Move your full body towards tree while bending your knee, keeping your torso straight. This stretches the Achilles tendon.

SHOULDERS

Place your straight arm against a tree at shoulder height. Slowly turn your body away from the arm. This keeps your chest muscles flexible and maintains a balanced posture.

Raise your arm to shoulder height and grasp it above elbow with your opposite hand. Pull your arm gently across your chest. This keeps your shoulders and upper arms flexible.

CHEST AND UPPER BACK

Clasp your hands behind your back. Roll your shoulders back and down, pushing your chest out and raising your arms with your hands clasped. This stretch maintains shoulder flexibility.

LOWER BACK

Place your hands on your hips, thumbs facing forwards, elbows pulled towards each other. Push your hips forward. This stretches the muscles in the lower back.

HIPS

Holding a tree for balance, grasp one knee with your opposite hand. Pull your knee up and across your body. Do not twist your lower back.

FOREARM

Place your palms together, forearms parallel to the ground. Rotate your hands forward and down. This stretch maintains flexibility in grasping and manoeuvring the chainsaw.

NECK

Face forward and tip your head to one side, slowly lowering one ear to your shoulder until a stretch is felt on the opposite side. This stretch increases flexibility for tree assessment. Stop if dizziness occurs.

HAND

Lock one wrist in a straight position. Grasp the four outstretched fingers with your other hand. Gently stretch them backwards. This counteracts the tightness caused by gripping your chainsaw.

APPENDIX TWO: DRAFT POLICIES

These draft policy documents have been supplied as a guide to companies wishing to develop or update their own policies.

They provide the minimum content required and must be carefully reviewed, amended and extended to fully match the circumstances of individual companies.

TREE FALLER HEALTH POLICY

PURPOSE

The company working hours must be agreed to, so as to provide all fallers adequate opportunity to manage fatigue, including:

- regular rest breaks
- clearly defined meal breaks
- opportunities to manage hazards
- training on fatigue, substance abuse, stress, noise, strains and sprains, nutrition and hydration

SCOPE

The policy applies to all fallers employed by the company.

AIMS

The aim of this policy is to:

- ensure fallers are allocated sufficient rest breaks to complete the task of tree felling
- set realistic production targets for the faller
- allow fallers to manage their own health risks

PROCEDURE

- the company is to provide training on managing health risks
- crew foreman is to monitor health risks through communication or observation
- fallers have the right to refuse to undertake work they consider likely to result in serious harm.
- fallers must stop work and inform the contractor or crew foreman when they feel stressed or fatigued.
- the company must ensure that fatigue and stress is managed effectively through reduced working hours, increasing rest breaks and job rotation
- the company must allow each faller time to identify all hazards in their current work setting.
- significant hazards identified must be communicated and further action planned
- effective controls must be implemented and documented for all hazards identified
- the company must complete Safe Behavioural Observations on fallers that include indicators of stress and fatigue

» THIS POLICY MEETS THE REQUIREMENTS OF ACOP RULE 2.9

SAFE AND PRODUCTIVE TREE FELLING

<*Company Name*> Ltd (hereafter referred to 'the company') must ensure all employees and/or contractors understand the tree felling requirements under the Approved Code of Practice for Safety and Health in Forest Operations (Dec 2012).

AIMS

The aim of this policy is to:

- ensure that fallers take all practicable and legal steps to meet obligations under the Health and Safety at Work Act 2015 and the Approved Code of Practice for Safety and Health in Forest Operations (Dec 2012)
- provide clear responsibilities for the safety and health of employees and/or contractors undertaking tree felling on a worksite that is under the control of the company
- ensure hazards associated with tree felling are identified
- clearly define the requirements for safe and productive tree felling

SCOPE

The policy applies to all fallers employed by the company.

PROCEDURES

- fallers must be deemed competent for the task being undertaken. Fallers not deemed competent for the task being undertaken must be under close supervision
- all training must be documented
- fallers must be competent in risk identification and management
- fallers must work in a manner that does NOT harm themselves or others
- fallers must be audited twice a month by another competent faller to ensure that they are felling safely
- fallers must know and adhere to ACOP and company policies which require tree falling to stop until a competent person is in place to assist
- the person in charge of felling operations must be competent and fully experienced in the work undertaken
- fallers and the person in charge of the operation must identify hazards specific to the site
- all dead or defective trees that are a risk to persons using roads, skids, or tracks must be felled before extraction begins, this includes trees that have been disturbed by road or skid construction

Before starting a harvesting operation, all parties to the contract must agree on a harvest plan. All parties must share information on any potential hazards involved in the work or the site, as well as other health and safety management requirements. The harvest plan must include the forest company requirements for the felling operation.

The harvest plan must contain the following information:

- maps showing road and landing locations
- terrain
- all felling hazards
- stand characteristics including piece size, species, pruned/unpruned
- upset conditions such as windthrow, snow damage
- resource consent conditions

This harvest plan can help the contractor to develop a felling plan. This felling plan must include the identification of areas of wind throw or steep slopes and other hazards that they can communicate to their personnel before the harvest starts.

All parties have an obligation to do more than just provide information on the hazards.

Before any work begins, all parties are required to verify that the company has a documented felling plan in place.

» **THIS POLICY MEETS THE REQUIREMENTS OF ACOP RULE 2.4**

ADVERSE WEATHER POLICY

PURPOSE

The company operations that are affected by adverse weather or other events must be suspended if hazardous conditions cannot be satisfactorily controlled.

SCOPE

The policy applies to all affected personnel on the worksite of the company.

AIMS

The aim of this policy is to:

- ensure every person on the worksite can cease operations if they feel that adverse weather creates a hazardous condition that cannot be controlled
- ensure that every person can refuse work that they consider likely to cause harm

PROCEDURE

Employees and management of the company must continually assess the weather patterns through observations to determine a hazardous condition.

If adverse weather causes a hazardous condition work must cease until employees and management are satisfied work can continue.

Management options may include:

- suspend falling on the current face
- suspend all felling on site
- leaving the forest

Adverse weather may result in the crew collectively deciding to leave the forest.

All weather condition must be recorded in the daily hazard register and communicated to all personnel on the worksite.

» THIS POLICY MEETS THE REQUIREMENTS OF ACOP RULE 2.8.2

TREE FELLING COMMUNICATION POLICY

PURPOSE

The company fallers must be in constant radio contact with another person on site.

SCOPE

This policy applies to all fallers.

AIM

The aim if this policy is to establish clear communication process for the fallers of the company.

PROCEDURE

- a contact person must be designated to receive the fallers radio check ins
- all radio check ins by the faller must be recorded
- fallers must call-in at least every 30 minutes or every tank, whichever is the lessor
- fallers must cease tree felling if a radio is not working or lost
- if a replacement radio is not found then tree falling must not commence until communication is reinstated

» **THIS POLICY MEETS THE REQUIREMENTS OF ACOP RULE 11.1.1**

TWO TREE-LENGTH POLICY

PURPOSE

The company fallers must ensure that, within two tree-lengths of trees being felled, there are no:

- mobile plant without the appropriate structures
- working ropes
- live powerlines
- any other operations

SCOPE

This policy applies to all personnel on the worksite of the company.

AIM

The aim of this policy is to:

- ensure all personnel are aware of the two tree-length rule regarding tree felling operations
- ensure compliance with the two tree-length rule

PROCEDURE

The ACOP sets out clearly who, apart from the faller, can be within two tree-lengths of a tree being felled. Further to that, those people must be:

- positioned up the safe retreat escape route in full view of the faller
- able to see the top of the tree being felled from a the safe retreat escape route
- behind the tree being felled
- able to communicate with the faller, using clear, prearranged procedures, techniques, and signals that have been discussed and recorded
- the two tree-length distance may need to be increased on steep slopes

If falling around live powerlines a management plan must be in place. The plan must include the powerlines company, principal, harvesting contractor, faller mobile plant operator. The plan must be agreed and signed off by all parties before commencing operations.

If falling near roads, the principal, contractor, and fallers must agree to the level of control needed. An appropriate management plan must be put in place. There must be an effective means of communication between the faller and traffic control personnel.

» **THIS POLICY MEETS THE REQUIREMENTS OF ACOP RULES: 11.4.3, 11.4.4, 11.4.5, 2.14.3**

FIVE STEP TREE FALLING POLICY

PURPOSE

The company fallers must ensure they adhere to the five step tree felling process.

SCOPE

This policy applies to all fallers.

AIM

The aim of this policy is to:

- ensure the safety of the fallers

PROCEDURE

Faller's of the company must ensure that they follow the five step felling plan.

- **Site Assessment**

  Assess the stand for hazards relating to the trees, terrain, other operations, electrical conductors. Assess the strength and direction of the wind.

- **Individual tree assessment**

  Look for tree defects, decay, heavy lean, or any other characteristics of the tree that may affect the felling plan. Determine if they can fell it safety and plan the felling cuts. Decide on the felling direction. This often determines whether or not the hinge will hold and it also determines which side of the tree will be the safest for the escape route.

- **Preparation of the work area and escape route**

  Always think about their escape route before they begin the felling operation. Clear vegetation and obstacles from around the base of the tree and the escape route. The escape route must be at close to a 45° angle opposite the felling direction. Be sure their escape route is at least 3 metres in length

- **Fell the tree using safe felling techniques**

  Good felling technique is critical to safe, accurate, consistent results. Forward or back lean may determine whether the faller needs a bore cut. The degree of forward or back lean will determine how many wedges and/or whether a pull rope will be necessary and how much power may be required to pull the tree over.

- **Retreat and observe**

  Fallers must finish the felling cut on the safe side of the tree and use their escape route as soon as the tree begins to fall. Watch for falling material and be aware the tree can kick back or bounce when it hits the ground.

» **THIS POLICY COMPLIES WITH ACOP RULES: 11**

TREE DRIVING POLICY

PURPOSE

Tree driving is only used to fell trees that either:

- are leaning against the intended direction of fall and cannot be safely felled using wedges
- present additional hazards that could dislodge as the tree begins to fall
- are hung up or cut up

SCOPE

This policy only applies to competent fallers who have received the minimum unit standard qualification 17766.

AIM

The aim of this policy is to:

- ensure the safe management of tree driving
- ensure clear communication of the tree drive
- clearly understand the hazards of tree driving

PROCEDURE

Planning a tree drive must follow the five step felling plan, with some additional points:

- all trees in the drive must be assessed before any felling cut is made
- every tree being driven must be wedged
- there must be two wedges available for the driver tree
- it is a requirement of the company for the faller to carry two additional wedges in their lunch bag

The two tree-length rule applies to both the driving tree and the tree being driven.

The contact person must be advised when a tree drive is planned, and again when it's successfully completed.
A competent person must be available to answer questions about safety issues

If a one on to two tree drive is unsuccessful, a competent person must be called in to plan management of the hazard.,

A competent person must hold unit standard qualification 17765.

The drive must be recorded in the faller check-in book.

A competent person must be available at all times to assist the faller when required.

» **THIS POLICY MEETS THE REQUIREMENTS OF ACOP RULES: 11.7**

HUNG UP AND CUT UP TREES POLICY

PURPOSE

The company fallers will manage the hazards associated with hung up and cut up trees.

SCOPE

This policy only applies to competent fallers who have received the unit standard qualification 28561. A hung-up tree is a cut, wind-thrown, or pushed tree that is caught up or lodged against another tree, which prevents it from falling. Attempting to bring down a hung up tree is the leading cause of fatal injuries in tree falling.

AIM

The aim of this policy is to:

- ensure the safe felling of hung up and cut up trees
- ensure correct communication procedures are followed

PROCEDURE

- if a faller creates or identifies a hang-up, they must alert the assigned competent person and foreman within the operation immediately
- no one must work or be within two tree-lengths of the likely direction of fall
- no-one should ever work under a hang-up

The following rules apply to managing hung up or cut up trees:

- all hung-up and cut up trees must be immediately brought down or isolated from other activities and workers
- a management plan will be discussed and agreed with a competent faller and crew foreman and should be documented
- if possible, a machine will be used to pull down hung-up or cut up trees
- the observer and foreman must remain to assist the faller until hung up or cut up trees are brought to the ground

Further information and specific rules on tree driving can be found in the Tree Driving Policy and ACOP.

» **THIS POLICY MEETS THE REQUIREMENTS OF ACOP RULES: 11.6.1**

WINDTHROW TREE FELLING POLICY

PURPOSE

The company fallers to manage the hazards associated with windthrow trees

SCOPE

This policy only applies to competent fallers who have received the unit standard qualification 1270.

AIM

The aim of this policy is to:

- ensure the safe management of windthrow trees.
- ensure clear communication of the intention to prepare windthrown trees for extraction

PROCEDURE

The foreman and faller will complete a management plan. The plan is recorded before work is undertaken.

The following rules apply to working in windthrow:

- each wind-thrown tree needs to be assessed individually
- no person shall work directly under wind-wrenched trees
- wherever possible, wind-thrown trees must be felled by machine, rather than manually
- if a machine is used, the mobile plant operator must be competent in wind throw salvage operations
- fallers must ensure all possible movements of a standing tree or wind thrown stem following release of tension or compression are assessed and cuts planned beforehand
- faller fatigue and complacency must be closely monitored by the foreman
- fallers deemed competent to work in windthrow must receive refresher training if they have not felled windthrow trees within the last twelve months
- evidence of the competency of the fallers working in windthrow must be available on the worksite, including records of assessment and retraining

» **THIS POLICY MEETS THE REQUIREMENTS OF ACOP RULE: 11.11**

MACHINE ASSISTED FELLING POLICY

PURPOSE

The company fallers to understand the requirements for safe machine assisted tree felling.

SCOPE

This policy applies to competent fallers who have received the unit standard qualification 24569 pushing and 24570 pulling.

AIM

The aim of this policy is to:

- ensure the safe management of machine assisted tree felling
- ensure clear communication of the plan to fall trees using machine assistance

PROCEDURE

The foreman, faller and machine operator must discuss, agree to and record the plan for machine assisted tree felling (includes cable harvesting operations). The machine must be positioned between 30° and 60° from the intended direction of fall.

The faller controls the machine assisted felling operation.

The management plan must include:

- machine type, size and traction
- attachment capable of stopping the tree from sliding sideways
- length and strength of rigging (if required), height required for rigging above felling cuts.
- device to climb tree (if required)
- last time rigging and climbing device was checked for defects
- intended communication process
- competency of machine operator and faller
- where the faller must stand when working near raised accessories.
- the felling direction and process to get each tree to the ground.
- the direction and position of the mobile plant
- the agreed safe position of the faller before signalling for the tree to be pushed or pulled over

» **THIS POLICY MEETS THE REQUIREMENTS OF ACOP RULE: 11.8**

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BEST PRACTICE GUIDE

FOREST OWNERS ASSOCIATION