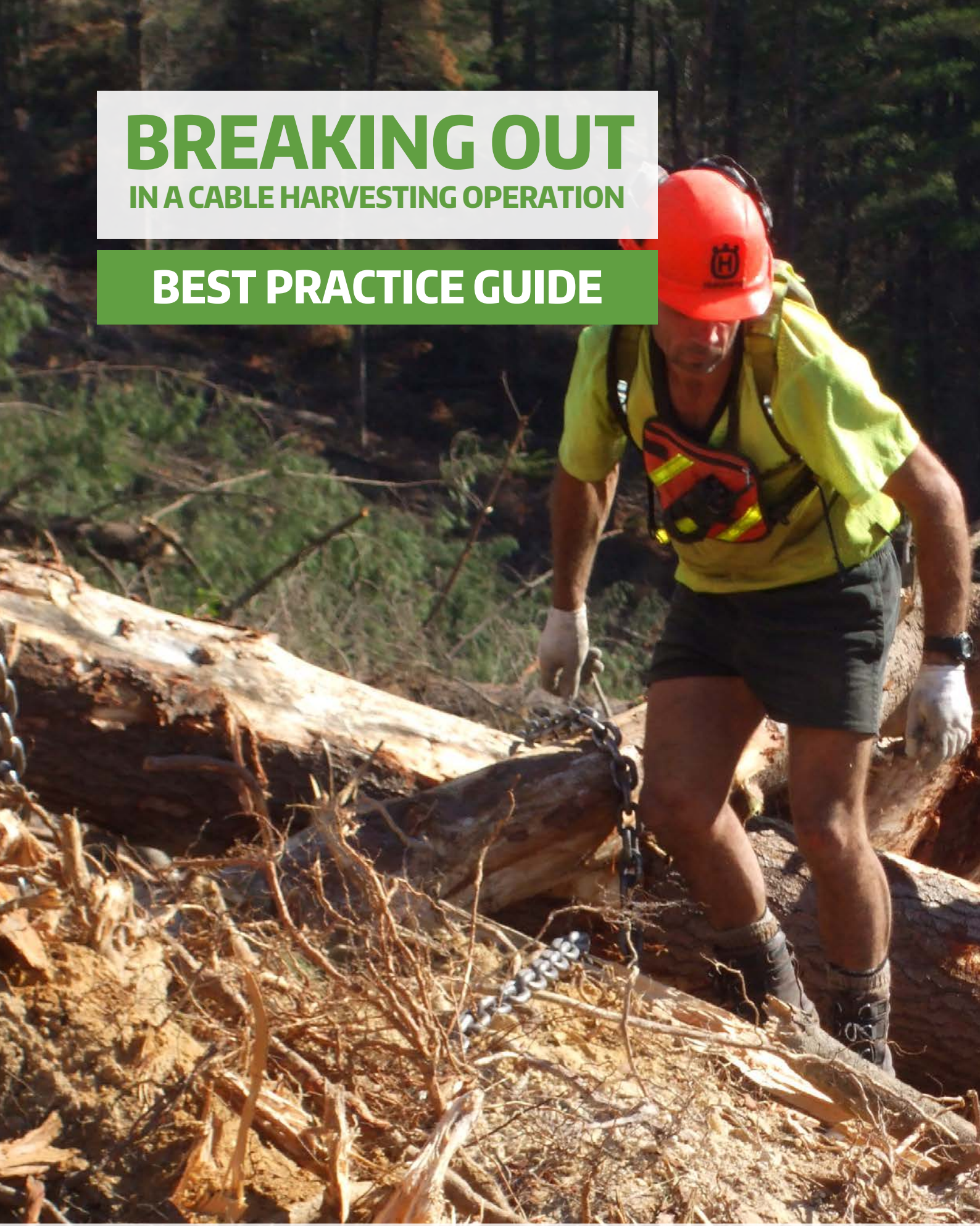
BREAKING OUT
IN A CABLE HARVESTING OPERATION

BEST PRACTICE GUIDE



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ABOUT THIS BEST PRACTICE GUIDELINE

Competenz has developed the material in this publication. It has been reviewed by representatives of the forest industry.

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

This best practice guideline (BPG) contains valuable information for cable harvesting contractors, crew managers, head breaker outs, cable yarder operators, breaker outs and polemen.

Breaking out is an important phase in any cable harvesting operation. This BPG includes information on planning the setting, hazard management, determining safe retreat positions and distances, health and safety for breaking out, breaking out process, backline anchors and line shifts.

Appropriate Approved Code of Practice (ACoP) rules have been included in each section. This BPG expands on these rules to describe how the rule is interpreted, implemented and actioned.

This material is reviewed and reprinted regularly by Competenz.

PURPOSE OF THIS GUIDE

This Best Practice Guideline has been designed by Competenz, in conjunction with the forest industry, to improve worker safety and performance. We have combined industry training standards, Approved Code of Practice rules, hazard management and best practice information to provide a reference manual for people involved in breaking out in a cable harvesting operation.

ACKNOWLEDGEMENTS

Competenz acknowledges the assistance 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.

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This Best Practice Guideline is to be used as a guide to breaking out in cable harvesting operations and processes. Nothing specified in this document supersedes legislation or the recommendations of equipment manufacturers.

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

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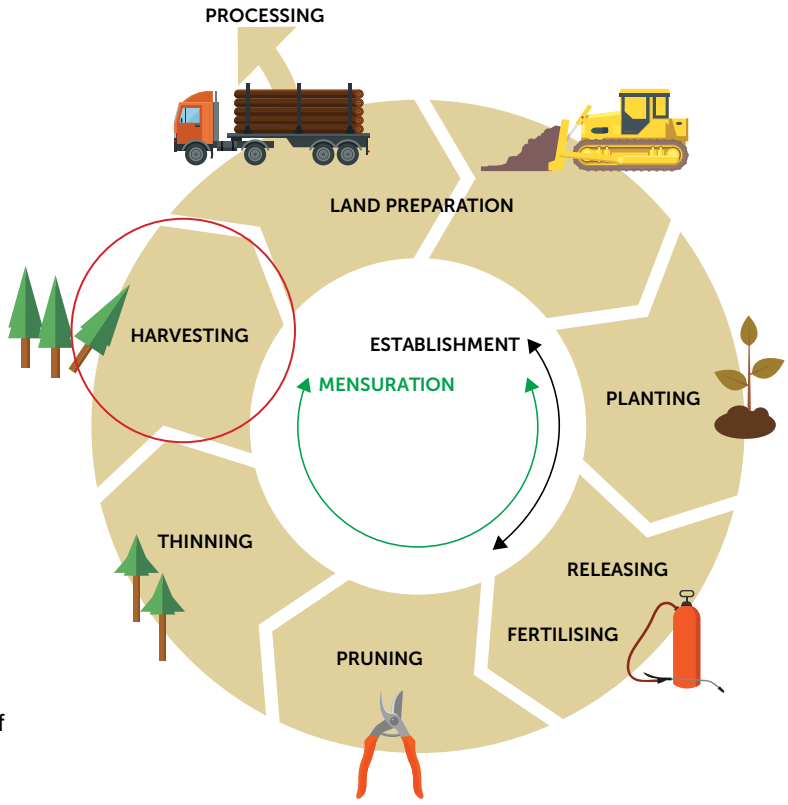
OVERVIEW OF FOREST HARVESTING OPERATIONS

The forest industry cycle includes all forestry operations from preparing the land to plant a tree to loading the harvested tree on a truck to transport out of the forest for further processing or export.

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

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



The extraction stage has two parts; breaking out and then extracting.

This BPG concentrates on the breaking out part of the extraction stage in a cable harvesting operation.

The primary objective of the break out phase is to maximise payload within the Safe Working Load (SWL) of the working ropes. This is more critical than speed, which often compromises optimum payloads and safety. The productivity of the whole operation is largely controlled by the break out phase.

Breaker out safety is an important factor in a cable harvesting operation. This BPG also includes details of how safety requirements affect breaker outs including Safe Retreat Position process and breaker out behavioural standards.

A job prescription or harvest plan, the set of written instructions from the forest owner to the cable harvesting contractor, sets out the requirements of the cable harvesting operation; specifying standards for quality e.g. stump heights and cut over waste. The job prescription also states the environmental requirements for the harvest area as well information about hazards and specific requirements for that site. It is important that breaker outs are aware of the contents of the job prescription and how it relates to their job.

A cable harvesting operation must consider all environmental standards, as defined by the forest owner, and local and regional authorities under the Resource Management Act (RMA).

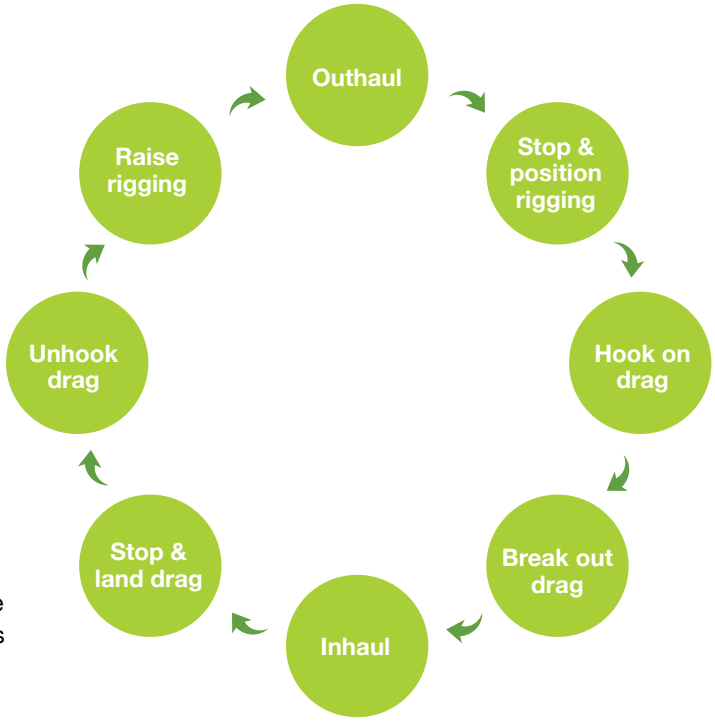
Throughout the cable harvesting operation, breaker outs need to be made aware of:

- Environmentally sensitive, cultural, and historical sites including how to act when working around sites or when new sites are found.
- Seasonal weather limitations.
- Visual impacts of the cut over yarding face.
- Soil disturbance and exposure of sites to erosion.
- Trees bordering sensitive areas, such as streams or cultural sites (including a plan on how to back pull trees away from the sites).
- The effects of the operation on neighbouring properties.
- Hazards specific to the site.

CABLE HARVESTING EXTRACTION CYCLE

Breaking out is the start of the extraction phase. It includes selecting the stems for each drag, positioning of the rigging above the drag, hooking up the stems using strops (wire rope or chain), retreating to a safe position and signalling the cable yarder to start extracting the stems.

Here is a typical cable harvesting extraction cycle:



Efficient cable logging operations often have to strike a balance between hooking on the maximum payload and keeping cycle times low. When faced with this decision, breaker outs have to weigh up which option will result in the best productivity, i.e. the biggest volume delivered for the lowest cost.

- Big payloads usually mean longer hooking on times, slower inhaul speeds and increased cycle times but a lot of wood is delivered each time a drag arrives at the landing.
- Big payloads can also mean increased diesel consumption, more wear and tear on the ropes and rigging and a greater chance of equipment damage.
- Hooking on a big payload is the best option if the system can provide plenty of lift and there is lots of room to land the drags in the chute, but big drags can also create bottlenecks and increase congestion on the landing if space is limited or the machine in the chute is struggling to keep up.
- If the stems are scattered or away from under the working ropes and the breaker outs are having to do a lot of lateral yarding, hooking on a big payload is always going to be the best option as long as the drag doesn't snag on obstacles or cause breakage to ropes and rigging.
- Risk is another factor that must be considered when deciding what the optimum payload should be. If loading up the rigging is going to increase the risk, smaller payloads should be selected.
- Small payloads usually mean faster cycle times because it takes less time to hook the drag on and the inhaul speed is higher, but less wood is delivered each time a drag is landed.
- Small payloads do not necessarily reduce diesel consumption because more cycles are done per day and less wood is pulled each drag.

Research has shown that piece size, stems per hectare and haul distance are the three main factors that influence hauler productivity. The table below summarises productivity figures for nine different hauler operations working in a range of piece sizes. All haul distances have been standardised to 200m and machine hours normalised to 7 per day. These figures do not take into account system or terrain variables.

Machine size & type	Average piece size, m3	Average drag size, m3	Cycles per 7hr day	Production per 7hr day, m3
20m (65 ft) vertical tower	1.19	2.24	90	201
15m (50 ft) leaning tower	1.05	3.87	74	286
17m (55 ft) swing yarder	1.05	4.08	64	260
16m (52 ft) swing yarder	0.71	4.09	65	266
21m (69 ft) leaning tower	0.84	3.22	75	242
26m (85 ft) vertical tower	1.01	2.48	60	149
21m (69 ft) leaning tower	1.85	3.47	62	215
27m (90 ft) vertical tower	2.18	7.35	55	404
27m (90 ft) vertical tower	2.11	7.10	54	383

The table above clearly shows that maximising payload generally results in greater production so taking the time to hook on that extra stem is usually worth it. The data also shows that in the same average piece size, a small 15m leaning tower could out-produce a larger 17m swing yarder by hooking on smaller drags but doing more cycles per day.

The breaking out phase of the extraction cycle involves stopping and positioning the rigging, hooking on the drag, retreating to a predetermined safe position, signalling for break out of the drag and monitoring the drag during inhaul.

During the extraction cycle, the breaker outs responsibilities will include:

- Planning the extraction
- Directing (signalling) the hauler operator to position the rigging
- Stropping stems to optimise drag size and minimise breakage
- Directing (signalling) the hauler operator to break out the drag and start inhaul
- Meeting the requirements of the Breaking Out Plan – in particular standing in the safe retreat position during break out and inhaul

The breaker out may also be involved in:

- Assisting in line shifts
- Moving rigging, anchors and blocks
- Moving a mobile tailhold
- Monitoring anchor stability.

Breaking out phases and activities are discussed in more detail later in this BPG.

BREAKING OUT TERMINOLOGY

There are a number of new or specific terms used throughout this BPG. The meanings of these are given below to assist in understanding.

Breaking out zone	The zone in which breaking out occurs. The breaking out zone stretches from the landing to the backline and is usually the same as the setting or line.
Hook on zone	The zone immediately under or beside the rigging where strops are being attached to stems.
Danger zone	The area below a landing where gravity will take stems, logs, or logging debris that is dislodged during inhaul or comes off the landing. The size and shape of the danger zone will be dependent of the terrain, slope, extraction system, chute size, and distance from landing to the backline.
Chute	The area on the landing where stems are dropped at the end of a haul.
Daily meetings	These may include toolbox meetings and tailgate meetings.
Safe retreat distance (SRD)	A minimum distance from the drag or ropes that has been determined to be safe.
Safe retreat position (SRP)	An identified position where breaker outs stand during outhaul or inhaul that has been determined to be safe from upending or swinging stems, dislodged material, or ropes or rigging. The safe retreat position can be determined by a physical feature (ridge), a distance (1.5 tree lengths) or a combination of both.
Hauler Operator	Refers to both cable haulers and swing yarders
Upset conditions	Any condition that requires the breaker outs to work outside of the breaking out plan. These may require a change in the safe retreat position, additional communication to the hauler operator, or in extreme cases stopping extraction until the issue is resolved. Examples of upset conditions include: ■ Fouled drags ■ Gut hooked stems ■ Head pulls ■ Communication failure ■ Anchor failure When upset conditions arise, the breaking out team must revisit the hazards and discuss / agree on controls to deal with them.

CABLE HARVESTING EXTRACTION ROLES

The cable harvesting extraction crew can vary according to the system or rigging equipment being used. There is usually a foreman or crew manager overseeing the operation and the extraction crew can include:

- the head breaker out,
- breaker outs, (normally 1 or 2 but can be up to 3)
- hauler operator
- poleman, (not required if electronic chokers are being used)
- the operator of the machine clearing the chute

Each member of the extraction team is responsible for their own area of work. It is essential that they work together to ensure production and quality requirements can be safely achieved.

CREW MANAGER

The crew manager's responsibility is to prepare an extraction plan that ensures the safe extraction of stems from the cut over to the landing. The crew manager's role includes the following responsibilities:

- Being familiar with the harvesting plan prepared by the forest owner and understanding how to implement that plan at an operational level.
- In consultation with the faller and HBO, determining the best felling pattern to suit the proposed extraction method.
- Instructing the faller on where to start and the direction in which the trees must be fallen.
- Managing the extraction process and ensuring compliance with all rules set down by the forest owner and contractor.
- Ensuring the safety of the extraction crew by setting safe procedures and enforcing compliance with the agreed safe retreat positions when the operation is underway.
- Ensuring the safety of any other person in the vicinity of the extraction process.
- Meeting environmental standards agreed to under the resource consent or the individual forest owner's requirements.
- Meeting the forest owners salvage requirements and following cut over clean up expectations.

ACOP RULE

» **RULE 2.5.1**

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

The crew manager should monitor the extraction process to ensure that:

1. All safety precautions and hazards have been identified for the breaker outs
2. The plan reflects the most efficient way to harvest the setting within the forest owner's specifications.

The head breaker out is in charge of the breaking out phase. Their responsibility is to supervise and coordinate activities of all workers involved in the extraction process. They must be on or in control of the breakout face at all times. They determine the location of the backline and backline anchors, and manage lineshifts.

The head breaker out's duties include:

- Ensuring the cable system being used is suitable for the setting being logged.
- Making sure all personnel in the extraction team are capable of doing the tasks they are assigned and are both physically and mentally prepared to do the work.
- In consultation with the principal and contractor, determining where the backline should be located.
- Ensuring all anchoring methods used on the backline are secure, safe, suitably positioned and correctly prepared.
- Checking that all manpower and equipment available are correctly allocated.
- Controlling the breaking out function and directing other breaker outs do the specific tasks as required.
- Checking that each drag attached is within the capacity of the hauler and system
- Ensure there is a way of measuring the safe retreat position if distance is the main factor determining the safe position.
- Making sure all breaker outs are in the safe retreat position before signals are given.
- Ensuring clear, correct signals are used.
- Monitoring each drag until it is out of sight or under the control of the hauler operator.
- Planning each new lineshift in advance and organising manpower and equipment to carry them out.
- Controlling lineshifts to make sure they are done safely and efficiently.
- Making sure the machine operator clearing the chute knows before the breaker outs go into the danger zone below the chute.
- Regularly inspecting ropes and rigging and organising repairs or maintenance as required.
- Ensuring the breaking out plan is onsite and understood by all of the extraction crew.
- Ensuring the morning tailgate/toolbox meetings identify and manage the daily changes that have to be made to the breaking out plan.

ACOP RULE

» **RULE 12.2.8**

One person shall be designated the head breaker- out and shall be on the break-out face and responsible for:

- controlling the break-out operation
- ensuring the safety of breaker-outs.

The head breaker out should continually check that the breaking out team are aware of the safe retreat position, especially after a line shift or where the safe retreat position has been changed to take into account additional hazards.

The head breaker out is in charge of the extraction process and is responsible for other breaker outs working with them.

BREAKER OUTS

Breaker outs should follow all lawful and reasonable instructions received from the head breaker out. They need to be fit, active, alert, properly trained or supervised and appropriately equipped. They are responsible for their own safety and the safety of others around them. They should have input into the breaking out plan and must know where the safe retreat position is for each drag. The breaking out crew must have some method to confirm the safe retreat distance is accurate e.g. a rangefinder or GPS receiver.

Breaker out duties are as follows:

- Have input into the breaking out plan when it is prepared.
- Participate in the daily tailgate meetings and raise any safety issues that may have occurred during the previous shift.
- Strop up stems as instructed by the head breaker out,
- Regularly check that they are retreating to the safe retreat position before any signals are given.
- Assist with line shifts and hauler setup as instructed by the head breaker out,
- Inspect rigging for defects or unsafe condition and
- report, repair or replace rigging equipment as required.

Breaker outs should refer to the head breaker out whenever they encounter a situation they are unfamiliar with or need further instruction.

HAULER OPERATOR

A hauler operator's function is to operate the extraction machine to extract stems safely from the cut over to the landing. The role of the operator will vary according to the type of hauler being used but common requirements are as follows:

- Oversee the positioning of the hauler to ensure there is sufficient room for the chute while maintaining correct guyline placement and angles for safe machine operation.
- Carry out daily maintenance on the hauler and advise the contractor when routine maintenance is required.
- Take instructions from the head breaker out, on where to position the rigging, and when to break out the drag and pull it in. Participate in the breaking out plan, the daily tailgate meetings and be aware of the safe retreat position for the day or setting.
- Ensure the breaker outs are in the safe retreat position before responding to any signals received
- Land the drags safely and ensure they are stable before signalling the poleman to unhook the strops.
- Make sure the operator of the machine in the chute knows when the breaker outs will be working in the hazard zone below the landing.
- Operate the machine smoothly to minimise the chances of shock loading or missed signals because the rigging is moving too quickly.
- Take additional care when moving ropes or during upset condition situations when sudden rope movement could put a person close to the rigging or attached stems at risk.

The hauler operator is responsible for the extraction machine, safety around the cable hauler on the landing and landing the drag. They must have knowledge on cable harvesting systems, cable hauler capabilities, guyline angles and tensions and tower forces.

POLEMAN

The main responsibility of the poleman is to unhook stems when they have been safely landed in the chute. They are also expected to carry out various landing related tasks around the hauler. A poleman's job entails the following activities:

- Participate in the tailgate meetings to ensure there is a clear understanding of roles and responsibilities.
- Communicate with the hauler operator for instructions on when it is safe to enter the unhook area.
- Unhook the strops but only when the hauler operator signals that it is safe to do so.
- Coil strawline in preparation for lineshifts.,
- Make up or repair strops if they are made out of old rope or chains,
- Carry out the landing end of the line shifts by attaching the strawline to the tailrope or changing the system according to instructions received from the HBO or hauler operator.
- If competent to do so, check guyline anchors as instructed by the hauler operator, generally guyline anchors should be checked under load.

LANDING MACHINE OPERATOR

Machine operators working on the landing have a responsibility to ensure the breaker outs are safe when they are working in the chute or on the landing above them. The activities that can impact on the breaker outs are:

- Dislodging stems causing then to slide off the landing and down into the break out zone
- Contacting wire ropes causing the rigging to move while the breaker outs are in the hook on zone
- When processing, causing material to roll off the landing and into the breaking out zone.

ACOP RULE

» **RULE 12.2.17**

No stems or logs shall be cleared from the chute area unless the breaker outs are in a safe position

The machine operator must be aware of when the breaker outs are working in the danger zone and not move stems or ropes until the breaker outs are clear. Their responsibilities include:

- Participating in the tailgate meetings to ensure there is a clear understanding of roles and responsibilities
- Listening to the signals and knowing when the breaker outs are in the danger zone below the chute
- Communicating with the HBO to ensure all breaker outs are well clear before carrying out any machine activity likely to dislodge stems or material
- Avoiding any unplanned contact with the hauler ropes when they are slackened for breaking out
- Advising the HBO if stems dropped in the chute are unstable and need to be moved.

Landing machine operators can have a significant effect on the productivity of an operation. They must be alert and follow safe work practices to ensure everyone around them and the hauler ropes are safe, and yet they still have to be able to clear the chute each cycle to enable the next drag to be landed safely. This is often a fine balance and requires a very skilled operator to achieve efficiency.

TRAINING AND SUPERVISION

Breaking out has been identified as a high risk operation with breaker outs being exposed to loaded ropes, moving stems, high physical exertion and adverse terrain. Workers need to be competent; skilled, experienced and qualified, or under training in the particular tasks they are doing.

The ACoP for Safety and Health in Forest Operations requires that a competent person 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 have demonstrated that they are unlikely to harm themselves or others. Records of supervision and training should be kept as well as evidence that a competency check has been done.

All experienced workers should be under a documented training programme. One way to achieve this is to be in training towards NZQA unit standards and qualifications. There should also be on-going checks of a workers competency through audits, safe behavioural observations or re-assessment. All of these checks should be documented.

For more information please refer to Competenz website **www.competenz.org.nz** or contact your local Account Manager.

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.

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.

ACOP RULE

» **RULE 2.3.1**

Every person undertaking forestry work shall be either under documented training and close supervision, or deemed competent.

BREAKING OUT QUALIFICATIONS

Breaking out has been identified as a high risk operation with breaker outs being exposed to loaded ropes, moving stems, high physical exertion and adverse terrain. Workers need to be competent; skilled, experienced and qualified, or under training in the particular tasks they are doing.

ACOP RULE

» **RULE 12.2.9**

Head breaker-out shall be competent to the requirements of, and hold, NZQA unit standard 1258.

Qualifications for breaking out
New Zealand Certificate in Forest Industry Foundation Skills (2325) with strand in Breaking Out Level 2
New Zealand Certificate in Forest Harvesting Operation (2326) with strands in Breaking Out - Cable and Breaking Out - Ground Based Level 3
New Zealand Certificate in Forest Harvesting Operations (2327) with a strand in Head Breaker-Out (Level 4)

PERSONAL PROTECTIVE EQUIPMENT

People working in cable harvesting breaking out operations are required to wear the following personal protective equipment (PPE):

- Hi-viz helmet
- Hi-viz shirt, vest, or jacket
- Safety footwear providing ankle support and suitable for the terrain and traction requirements.
- Hearing protection if noise exceeds 85 dB e.g. moving a mobile tailhold machine or using a chainsaw.
- Gloves are strongly recommended and required if there is a risk of hand injuries from the strops being used.

Other useful equipment for breaking out includes:

- Small First Aid kit
- Hydration system – e.g. camel pack or water bottle
- Sunscreen
- Raincoat and warm clothing for cold and wet days

PPE must be maintained by routinely checking its condition; dirty hi-viz garments should be washed, and any worn, damaged or expired PPE should be replaced.

Further information on PPE standards and care is described in the Best Practice Guidelines for Health and Safety Management.

Noise expose will vary with the machine, terrain, setting and proximity to machinery. If noise is excessive it must be managed (i.e: by the use of hearing protection).

The noise exposure to breaker outs for a day can reach 91dB

Peak noise exposure from rigging coming back or machine operation can be as high as 140dB

91dB for two hours is 100% of your daily noise levels and can result in hearing loss

Hearing protection should always worn by the breaker out when shifting a mobile tailhold machine or using a chainsaw.

Additional information for PPE

- Boots – spiked boots are recommended when breaking out (spikes may be inappropriate on rocky terrain)
- remember that the spikes will wear out and a boot with worn spikes may cause a slipping hazard
- carry out regular checks to ensure no spikes are missing
- caution must be taken when shifting a mobile tailhold if wearing spiked boots. Rubber mats or wooden pads can be used on the floor and pedals but extreme caution must be exercised when, climbing on and off the machine.

Identifying the head breaker out

- Helmets – a practice that is becoming more common is for the head breaker out to wear high viz garments or helmet of a different colour to other breaker outs. This not only identifies the head breaker out but gives a good visual guide as to where the breaker outs are standing during extraction. The breaker outs should always stand behind the head breaker out when the “go ahead” is signalled.

ACOP RULE

» **RULE 3.2.2**

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

» **RULE 3.4.1**

Workers engaged in forest operations shall wear footwear which provides foot and ankle support, traction and protection appropriate to the task they perform.

Footwear worn in all forest operations shall have protective toe caps.

» **RULE 3.4.2**

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

» **RULE 3.5.3**

Safety helmets shall be of high-visibility colours for daytime work.

» **RULE 3.5.4**

Helmets shall be inspected regularly for damage and deterioration.

» **RULE 3.5.5**

Helmets shall be replaced:

- immediately if damaged
- three years after the issue date (if recorded) or in accordance with the manufacturer’s specifications.

» **RULE 3.5.7**

Hoodies and peak caps shall not be worn under helmets. Some brands of balaclava may be worn under helmets if they have been specifically designed for that purpose.

» **RULE 3.6.1**

Class 5 hearing protection shall 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 shall not be worn or used while working.

» **RULE 3.8.1**

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

SAFE RETREAT POSITION

The safe retreat position is a position away from moving ropes, rigging or stems where a breaker out should stand, that is clear of any potential hazard that could arise as the drag is extracted.

A safe retreat position must be determined for every setting. Each line within a setting is different and there are many factors that need to be taken into account when determining the safe retreat position. The contractor, crew manager, head breaker out and breaker out(s) all need to be aware of the hazards associated with each line and use this information to determine the safe retreat position.

The contractor must have a process for determining the safe retreat position. This process needs to be documented and understood by all members of the extraction crew.

If the contractor does not have a documented process for determining the safe retreat position, a default distance will apply. The default distance will be a minimum of 1 1/2 tree lengths from the ropes, rigging and hooked up stems. This distance is based on the average height of the trees in the block and is measured on a horizontal plane, at right angles to the line of extraction. The default system also requires that the safe retreat position is marked by a flag or other visible marker.

By developing a process for determining the safe retreat position it may be possible to work closer than 1½ tree lengths when it is safe to do so. This has the potential to speed up the extraction cycle therefore making it more productive.

Safe retreat position locations are determined by the safe retreat position processes. The optimal safe position is always above and behind the drag.

SAFE RETREAT POSITION PROCESS

PRINCIPAL AND CONTRACTOR

Before any extraction begins the contractor and principal need to agree and document what system or process will be used by the contractor for determining the safe retreat position. Once this process is agreed, it can be used by the contractor for each block and setting.

At this stage of the process it is not a requirement for the principal and contractor to agree on the safe retreat position or distance for the block. The intention is for the principal to become more involved in understanding how the contractor will determine the safe retreat position.

The principal may want to set some guidance on minimum standards that could be applied across a range of operations. These may include minimum distances from ropes, rigging or stems during outhaul and inhaul.

The principal should consider breaking out safety during harvest planning and plan the block to minimise breaking out hazards.

The principal should supply the contractor with a detailed harvest plan and maps and include the identification of any significant hazards within the block.

The Outcome of this process should include:

1. A harvest plan / job prescription showing
   a. Significant hazards and their controls
   b. High risk areas (danger zones)
   c. Setting boundaries
2. The contractor and principal should sign-off on this plan which includes agreement on the harvesting system to be used.

ACOP RULE

» **RULE 12.2.21**

Before harvesting commences the principal and contractor shall agree on a system to determine the safe retreat position for each block and/or setting.

CONTRACTOR AND EXTRACTION TEAM

The process that the contractor uses to determine the safe retreat position must be documented. A copy of the documented process should be available on site. The process should have regular reviews to ensure it is robust and meeting the needs of the operation.

The process needs to be clearly understood, agreed and carried out by the extraction crew. A daily meeting should be held to discuss the breaking out plan and agree on the safe retreat positions for the setting or days work. This may include agreeing on distances from the ropes, rigging or drags or identifying physical features that help determine the safe retreat position e.g. a ridge line.

The breaking out plan and details of the safe retreat position for the day or setting must be documented. The form used to record these details should include:

- information about the block location
- information about the hauling system being used
- details about the breaking out team including relevant training and qualifications
- information about the hazards present in the block / setting
- the average tree height for the block (to calculate 1.5 tree length distance)
- the safe retreat position / distance for the setting or days work
- information about the danger zone (if there is one present)
- information about who is responsible for making changes to the safe retreat position location and breaking out plan.

Some details do not change often so they just need to be referred to, but others, such as; the safe retreat position, the danger zone or the details about the breaking out team, could change daily so they do need to be documented every day.

The safe retreat process should also include processes for reviewing and updating the safe retreat position during the day. Changes to the plan should be communicated to the hauler operator or crew manager and should be documented. While the head breaker out can decide that the safe retreat position needs to be moved further away from the ropes, agreement should be sought from the crew manager if the extraction team wants to move the safe retreat position closer to the ropes. The crew manager must approve any reduction in safe retreat position.
The head breaker out should increase the safe retreat position when required.

It is important that there is active management of the worksite. This includes ongoing hazard management and adjustments to the safe retreat position as hazards change.

ACOP RULE

» **RULE 12.2.22**

The contractor/employer shall have a documented process to determine and identify the safe retreat position for each line or days work, taking into account:

- any swinging or upending log or stem
- mean tree height
- obstacles that may restrict movement or obscure vision
- material likely to be dislodged during extraction
- overhead hazards that may fall into the work area
- any rope bight.

If the above process is not in place then the following default process shall apply:

- The safe retreat distance shall be a horizontal distance (not slope distance) a minimum of 1½ tree lengths based on the mean tree height for the block measured at right angles to the line of extraction.
- The safe retreat distance shall be clearly marked with flags or other visible markers.

IMPLEMENTING THE SAFE RETREAT POSITION PROCESS

The following guidance aims to outline what a breaking out plan should contain and how to implement the safe retreat position aspects of the plan into an operation.

The breaking out plan and associated safe retreat position content should cover the aspects of the extraction cycle that the breaker outs are involved in.

These include:

- Out haul / Position / reposition rigging
- Hook on
- Break out
- Extraction
- Dealing with upset conditions including fouled drags.

The breaking out plan requires input from all involved in the extraction phase. This includes crew manager, head breaker out, breaker outs, chute machine operator and yarder operator. Other resources and information that may also be used in developing the plan include:

- Instructions from the principal e.g. harvest plan and maps, hazard identification
- Hazards identified by the faller
- Information collected during pre harvest hazard id and block walk through processes
- Hauling system to be used
- Landing layout – especially information on the chute location and activity e.g. process for clearing the chute.

BREAKING OUT PLAN AND DAILY MEETING

A daily meeting should be held to ensure all in the extraction crew have input into and agree on the breaking out plan for the setting or days work. This will include determining the safe retreat position. The meeting must be attended by all members of the extraction crew and may include those working on the landing. The breaking out plan should be signed off by all involved.

The daily meeting is also a good opportunity to discuss any new hazards or changing conditions that may introduce new hazards to the operation.

If coloured zones are being used to identify different levels of breaking out risk within the block, these should be discussed and agreed during the daily meeting. Any changes to zones should be documented.

ACOP RULE

» **RULE 12.2.23**

The contractor/employer and head breaker out shall ensure the process is understood, agreed and carried out by the extraction crew.

Other aspects of the operation that should be discussed, agreed, and documented include:

- responsibilities during breaking out
- processes for making changes to the breaking out plan during the day
- communication systems to be used
- processes for dealing with landing activities when the breaker outs are working in the danger zone
- processes for reassessing the safe retreat position when a line shift is carried out.

It is recommended that the hauler operator has a copy of the breaking out plan and records changes to the safe retreat position as the breaker out team makes them.

ON THE BREAK OUT FACE

It is important to follow the breaking out plan during the extraction cycle. The head breaker out will have overall responsibility for the break out phase and the breaking out team. With input from the breaker outs, the head breaker out will review and ensure the safe retreat position is appropriate for each drag.

The head breaker out will ensure the correct communication system and signals as specified in the ACOP are used for rope and rigging movement. The “go ahead” signal must only be given once all of the breaking out team are in the safe retreat position and behind the Head Breaker Out.

The breaking out plan should specify the minimum distance that the breaker outs should stand from the ropes and rigging during outhaul.

Repositioning the rigging can be a hazardous activity, especially if the breaker outs have moved in to start hooking on. Processes must be established for repositioning the rigging when no stems are attached or if stems are attached. These processes must include information on where the breaker outs should stand during the repositioning of any rope or rigging.

Breaker outs should never stand directly under ropes or rigging when slack is being fed out or the ropes are being lowered. It **may** be acceptable for breaker outs to stand to the side of the rigging, holding onto their strop, as the rigging is lowered, provided they have been warned that it is happening and they are watching the process from a safe position.

In some situations it may be acceptable for the rigging to be lowered further, after one of the strops has been attached to a stem. This technique can be used to swing the rigging into position to pick up stems that may be out of reach of that particular line. When this is done, the following rules shall apply.

- If there is any chance of the attached stem moving, the breaker outs must let go of all strops and move to a safe position, out of reach of ropes, rigging and the stem.
- If the lowering of the rigging can be done without moving the stem, a breaker out **may** be permitted to hold onto the strop, provided they are not in-between stems or under any ropes or rigging.
- If any drum is engaged to move the rigging backwards or forwards to reach another stem, all breaker outs must let their strops go and move to a safe position, out of reach of ropes, rigging and the stem.

The safe retreat position will need to be adjusted as the work environment changes. Slope, terrain, yarding direction, cut over debris and weather are all factors that can impact on the safe retreat position. The head breaker out, with input from the breaker outs, must move the safe retreat position further from the ropes, rigging or drag if any of the following factors are likely to occur:

- a stem or log to upending or swinging around
- obstacles that could restrict movement or vision are present
- material on the edge of the landing that could dislodge and roll into the break out area or safe retreat position
- visibility is restricted
- the full length of the stem cannot be seen
- stems have been gut hooked because the strop can’t be attached anywhere else
- the terrain changes, i.e.(ground slope and shape).

FOULED DRAGS

Drags may become fouled during break out and extraction. The process for dealing with fouled drags should be included in the break out plan. If the drag is going to be moved to try to free it from being fouled, then the breaker outs must be in the safe retreat position.

Examples of Safe Retreat Position processes and forms are given in Appendix 1 and Appendix 2.

ACOP RULE

» **RULE 12.2.24**

Before signalling the yarder operator to break out, the breaker out(s) shall retreat to the predetermined safe position

» **RULE 12.2.19**

All breaker outs shall be facing the drag at the safe retreat position before the go-ahead signal is given

SAFE RETREAT DISTANCE TECHNOLOGY

New technology enables breaker outs to more accurately determine safe retreat position. It can also allow others to see where you are.

GPS

A GPS receiver calculates its position using signals sent by GPS satellites orbiting the Earth.

GPS units can be used as warning alarms and could be activated if a breaker out moves too close to the rigging during rope movement.

GPS technology is also being used for rigging positioning. Cable systems are set to slow the rigging as it approaches the position where the last drag was hooked on.

RANGEFINDERS

A rangefinder is a device that measures distance from the observer to a target.

A range finder can determine an accurate distance to safely retreat from the working ropes.

The range finder could be used regularly during the day to check on the distance being retreated.

CAMERA SYSTEMS

Cameras are being used to give the hauler operator a better view of the break out. These cameras can be set up around the extraction face (on the hauler tower, at the backline) or can be built into the rigging (carriage or fall block). The images are viewed on a screen in the hauler operators cab. The hauler operator can monitor the breaker outs position before any rope movements, but the operator must be aware that camera systems may not be accurate enough to measure breaking out distance reliably.

THE BREAKING OUT OPERATION

The breaking out process starts with planning the drag and ends with the breaker outs retreating to the safe retreat position before giving the go ahead signal to the cable yarder operator.

Here is an example of the breaking out process during an extraction cycle.

1. The breaker outs identify the location and make up of the next drag from a safe position. This happens while the drag is being unhooked at the landing and sometimes during outhaul.
2. The hauler operator is signalled to stop outhaul and lower the rigging to the correct position.
3. The hauler operator is signalled to stop lowering the rigging as the strops reach the required height, usually with the chokers or hooks just off the ground or just touching the ground
4. The breaker outs walk into the strops, maintaining their balance and moving safely and efficiently.
5. The head breaker out assigns the strops and the sequence that stems or pieces are to be stropped to each breaker out. (in some crews the strop allocated to a breaker out is pre-determined).
6. Each breaker out pulls their strop out to the stem to be attached
7. Once all breaker outs are standing clear of the rigging, the head breaker out may signal the hauler operator to lower the rigging further to provide more reach.
8. The breaker outs work as a team to complete stropping all stems.
9. The head breaker out plans the next drag and checks for additional hazards while the hooking up procedure is being undertaken
10. Once the stems have been stropped the breaker outs retreat to the agreed safe retreat position.
11. When everyone is standing in the safe position (breaker outs behind the head breaker out) and are facing the drag, the hauler operator is signalled to raise the rigging and take up the load. The hauler operator should do this slowly so as to avoid breakage and reduce shock loading.
12. The hauler operator is signalled to continue normal in-haul when the drag is clear.
13. The breaker outs watch the drag and extraction process until it is out of sight or they are sure that the hauler operator can see it. The head breaker out, (or any other breaker out assigned with the responsibility), must have the communicating device in position, ready to use during extraction in case an emergency situation arises.
14. During inhaul the breaker outs can start planning the next drag, while remaining in the safe retreat position.
15. The breaker outs must remain alert for any rope movement during the landing and unhooking of the drag.
16. During unhook or outhaul the breaker outs must watch out for movement of the ropes and rigging, but may move to a safe position no closer than 15 metres or two strop lengths from any moving rope.
17. A warning system may be put in place to show when breaker outs are in the danger zone. This may include ; flashing lights, flags, GPS monitoring.

ACOP RULE

» **RULE 12.2.12**

Breaker outs shall not be positioned underneath:

- any moving rope
- a mechanical slack pulling carriage feeding slack
- any carriage or butt rigging being raised or lowered during break-out
- a tensioned skyline during inhaul or outhaul
- operating ropes being shifted by a mobile tailhold.

PLANNING THE DRAG

Planning the drag is vital to ensure a safe and efficient operation. The next drag should be planned prior to the rigging being sent back. This minimises delays to production and allows breaker outs to build optimal drag sizes. Consider the following factors when planning the drag.

Consider	Reason
Ease of access	Providing ease of access for the breaker outs reduces the walk hindrance and allows for quicker and safer hook on.
Optimum drag size	The optimum drag size is the biggest drag that can be extracted without over-loading the rigging and cable yarder. ■ Piece size information will be required to determine optimum drag size. This may be the average piece size for the block or the actual piece size from previous days extraction ■ Drags that are too heavy will slow break out and inhaul. They may also overload the rigging ■ Drags that are too light will mean that the system is working under capacity - this is an inefficient use of labour and machines. It can be difficult to assess the optimum drag size without knowing something about the amount of lift available. ■ If a tension monitor is fitted the hauler operator can tell the breaker outs when the optimum drag size is achieved ■ If the skyline band brake is correctly calibrated, it can be set to slip when the optimum drag size is reached.
Minimising stem breakage	Select top stems first where possible. Optimum hook up is no less than one and no greater than 3 metres from the end for butt pulls and no more than 5 metres from the end for head pulls Stem breakage will reduce drag volume and requires more extraction cycles to pick up the broken pieces.
Balance of wood flow to landing	Maintaining a balanced (uniform) wood flow is not always easy. Surges in productivity are common. Some of the reasons for this include: ■ changing haul distance from the front to the back of the setting ■ the shape and steepness of the terrain affecting walking in and out time ■ more lateral pulling is done toward the back of the setting where the line is often wider ■ some drags are more difficult to strop and break out ■ variations in tree size and stocking ■ clean-up prior to a lineshift ■ lineshifts ■ amount of breakage from felling operations ■ other operational or mechanical delays.
Work face clean-up	The job prescription will have a minimum log specification that must be pulled and the allowable level of merchantable waste. The breaker outs should know this so that a costly re-work or penalty is not imposed on the contractor. The minimum log specification and cut over standard will vary between forest owners. The workplace should be cleaned up as it is worked. Mixing shorts with full stems will help maintain a consistent flow to the landing.
Minimising hazards	When planning a drag, the breaker outs must be aware of all hazards they may face and have control measures in place to manage the potential risk from these hazards.

POSITIONING THE RIGGING

Getting the butt-rigging or strops to land in the exact place requires skill. The benefit of landing the rigging in the right place in one go means shorter cycle times with the opportunity for increased production.

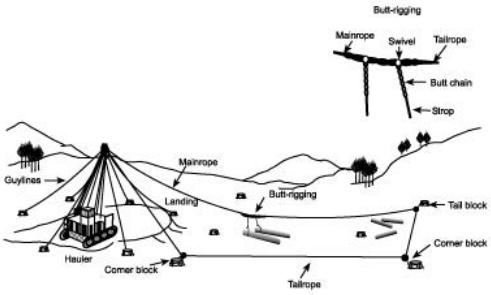
Each cable harvesting system has a particular way of positioning the rigging.

Consider the following:

- Anticipate line or rigging movement.
- Gauge the arc that the rigging or carriage is going to follow when slack is called for.
- Give the hauler operator early warning so the outhaul speed is decreasing when the stop instruction is given.
- Allow time for the hauler operator to react and to engage the controls smoothly.
- Ensure the rigging is stopped and any swinging strops can be controlled before the breaker outs arrive at the breakout site.
- Reaction to instructions and signals will not be instantaneous

HIGHLEAD SYSTEM

With this system tension is held on the mainrope during outhaul to prevent overspooling and keep the strops up off the ground. If the setting is over a convex slope, strops may be dragged along the ground and become tangled around the butt rigging. In some situations, tightlining may lift the butt-rigging up and make strops easier to untangle.



There is a need to hook on lighter drags on convex slopes because there is little lift. Applying brake pressure to the tailrope can provide some lift but it is not efficient use of the hauler's horsepower

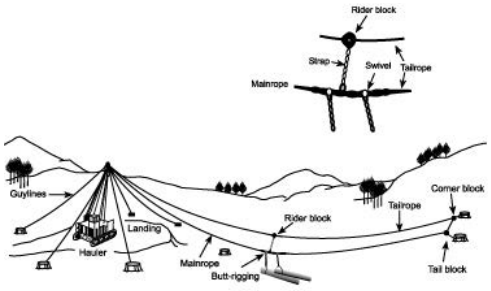
There is more risk of drags becoming caught behind obstacles during inhaul.

Standing within the tail rope circuit places the breaker out in the bight of the rope so regardless of how tempting it may be to avoid a whole lot of walking, keeping out of the bight is a critical rule.

There is more potential for equipment damage due to contact with the ground and shock loading from drags getting caught behind obstacles.

SCAB (RUNNING) SKYLINE SYSTEMS

As the name suggests, this is a skyline system which uses the tailrope as both the return line and the lifting line. It is technically a live skyline where the amount of lift provided can be increased by braking the outwinding drum, a bit like tightlining but in a dynamic situation.



This system creates lift on the drag so stems are less likely to get caught behind objects and payloads can usually be greater than those possible using the highlead system.

With the scab skyline system relying on tail rope tension to create lift, tail rope anchors must be closely monitored to avoid failure.

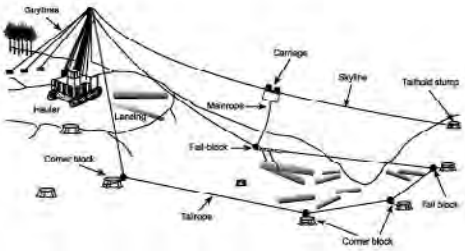
This system has a much smaller bight in the tail rope circuit because the tailrope blocks have to be close together, or, in some situations, a single block can be used.

Working ropes will usually stop with the rigging suspended. Strops will move away from the hauler when the mainrope is slackened. Strops will move towards the hauler when the tailrope is slackened.

There is limited lateral yarding ability with the scab skyline system. Basically the lateral reach is limited to the length of the strops.

STANDING SKYLINE SYSTEMS E.G. NORTHBEND

A standing skyline system has a larger rope suspended between two points which creates an overhead carraigeway that the rider block or carriage can run back and forth on.



The skyline will generally be rigged across a gully to provide lift. This provides a wider extraction corridor and greater load carrying capacity.

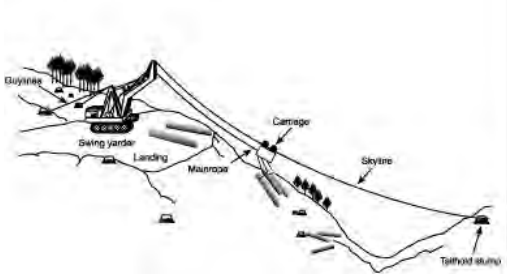
There is the potential for greater lateral movement (bridling) by repositioning the tailrope blocks to pull the fall block and butt rigging away from the skyline.

There are multiple bights which creates greater risk to be managed.

Control of the butt rigging during outhaul and positioning is more challenging than other systems because the fall block rides in the bight of the mainrope and hence, it has no direct link to a hauler drum. This means that the butt rigging will continue to move after the drum in use has stopped.

LIVE SKYLINE SYSTEMS E.G. SHOTGUN

With live skyline systems, the skyline is used to lift and lower the drags at each end of the extraction cycle. This means it has to be powerful enough to lift the drag up from where it is hooked on, and it has to have sufficient braking to control the lowering of the drag in the chute.



The most common live skyline, (apart from the scab skyline), is the gravity return system where the skyline runs downhill to an anchor at the bottom of the setting.

The system does not require the use of a tail rope so there is no bight.

If a slackline system is being used, there is a tailrope involved which means there is a tailrope bight to contend with. Slacklining is generally used to pull the carriage out beyond the belly, (lowest point), in the skyline when logging over a gully or up the backface of a setting.

Lift is created by raising the skyline.

Breaker outs must stand clear of carriage as the ropes are being lowered.

Lateral yarding is limited to the length of the strops being used.

MECHANICAL SLACK-PULLING CARRIAGES

Mechanical slack pulling, (MSP) carriages are used to increase the lateral yarding capability of a system by feeding a fixed length of dropline out to the breaker outs. This dropline can either be connected by shackle to the slackpulling line or wound onto a separate drum in the carriage.

MSP carriages require a hauler that has a slack pulling capacity, either with an extra drum on the hauler, or interlocking main and tailrope drums that enable the carriage to be used with a running skyline system.

With a good hauler operator, spotting the carriage can be very precise when using a MSP carriage, so cycle times can be quick

If working down a face, stop the carriage a short distance before the drag. It is easier to pull slack downhill than uphill.

If working up a face, stop the carriage a short distance past the drag for the same reasons.

The greater lateral yarding capabilities of this system can be physically demanding on the breaker outs so it is recommended that lateral yarding be kept to a realistic distance, (15 – 20m maximum).

Strops may require untangling. Breaker outs untangling strops must stand to one side of the carriage.

It is important to avoid overloading MSP carriages. This can cause excessive wear to the ropes and rigging and adversely affect production if the weight of the drag keeps pulling the dropline out of the carriage during inhaul.

CLAMPING CARRIAGES, MOTORISED OR MECHANICAL

Clamping carriages are designed for use on a skyline system and most used in New Zealand are motorised, that is they have a small diesel engine mounted in the carriage which feeds mainrope out through the carriage once it is clamped to the skyline.

The other type of clamping carriage is the mechanical type that either has a movable stopper which clamps to the skyline or operates on a cyclic pattern which activates a clamp when the direction the carriage is moving in, is changed.

Common practice in most situations is to use motorised clamping carriages with a shotgun, (gravity return) system. This eliminates the need for a tailrope and speeds up the outhaul time, provided there is sufficient slope on the skyline.

When a carriage is not clamped to the skyline, it will roll freely. Therefore, the skyline tension on either side of the carriage will remain the same.

When the carriage is clamped, the tension in the back portion of the skyline will increase as the mainrope is pulled in. If tension is excessive, the back portion of the skyline or the tailhold anchor could fail. Breaker outs should check tailhold anchors an a more regular basis.

As with the MSP systems, it is best to pull slack downhill so correctly positioning the carriage to feed slack is important.

If using a clamping carriage to log the back face of a setting, be aware that the clamping carriage may struggle to pull mainrope slack through the carriage if there could be too much mainrope weight between it and the hauler, i.e. if the carriage is a long way out, or the skyline is set up over a deep gully.

The greater lateral yarding capabilities of this system can be physically demanding on the breaker outs so again, lateral yarding distances need to be kept realistic.

NON-CLAMPING MOTORISED CARRIAGES

Motorised non-clamping carriages have their own independent dropline drum mounted within the carriage and powered by a reasonably powerful diesel engine, (up to 90hp in some carriages). This drum will have 60 – 90m of dropline and it can be operated by either the hauler operator or the breaker outs. It can be wound in or out at any stage during the extraction cycle.

This type of carriage can only be used on standing skyline systems where there is plenty of lift and the carriage can be suspended well above the ground.

Because of the size, weight and cost of non-clamping motorised carriages, extra care must be taken when selecting the skyline anchor. If there is any doubt as to the security of the anchor, additional measures must be taken to avoid failure, i.e. digging in a mobile tailhold properly, tying stump anchors back with twisters, etc. If this can't be done, the head breaker out should consider changing the system.

Raising and lowering of the drop line is controlled by the breaker outs. They can start lowering the drop line before the carriage is in place i.e. as it is moving out. This can speed up the extraction cycle.

Breaker outs should never stand directly under the carriage when it is feeding slack out.

Consideration must be given to the weight of the carriage when selecting the drag. These carriages can weigh between 1 and 2 tonne so that has to come off the maximum payload that can be attached.

Because of the extra lift usually associated with standing skyline systems, there is a greater chance of stem swing which must be taken into account when determining safe retreat distances for non clamping motorised carriages.

ACOP RULE

» **RULE 12.2.11**

During outhaul all breaker-outs shall be a minimum of 15 meters away from any moving rope.

» **RULE 12.2.13**

Breaker-outs shall not enter the hook-on area until:

- the "stop" signal has been given
- the carriage or rigging has stopped moving
- swinging strops can be safely controlled

SHIFTING THE LINE / RETRIEVING ROPES

When conducting a line shift or retrieving the hauler ropes the following controls should be implemented:

- Where any working rope becomes snagged during a line shift or winding in of the ropes, all weight is to be released (i.e no tension in the rope) by the Hauler Operator prior to any person moving in to inspect or clear the snag.
- Whenever a shackle is to be placed in the eye of the tail rope, a straw line is to be attached to the shackle (Straw to Tail) so the Hauler Operator has the ability to reverse the rope movement should the shackle become snagged. Care should be taken not to overload the straw line.

During line shifts or when retrieving the ropes, Breaker Outs must not stand or sit:

- within the bight of any ropes
- on or in front of a mobile tail hold machine
- immediately behind any stump anchor.

COMMUNICATION

Effective communication, or signalling, between the breaker out and the cable yarder operator is a critical part of a successful cable harvesting operation.

Communication between the breaker out and cable yarder operator ensures that:

- ropes and rigging are positioned correctly before the breaker outs move in to strop the stems
- break out does not occur until the breaker outs have moved to a safe retreat position
- the cable yarder operator is notified of any stropping issues (e.g. gut hooks)
- extraction to the landing can proceed safely
- other operators are aware of a drag approaching the landing.

Having one person responsible for signalling will avoid confusion and ensure signalling is consistent. Normally it is the responsibility of the head breaker out to do the signalling, however other breaker outs should also carry signalling equipment. By having two sets of communication equipment the breaking out team is covered in the event of an emergency or if the head breaker out is away from the hook on zone e.g. preparing for a line shift or checking anchors after a line shift. (The hook on zone is an area immediately around where the strops are being attached to the stems. This zone is usually determined by the length of the strops or the length of dropline that is pulled out from the carriage. Under normal circumstances, the hook on zone moves from the front of the setting to the backline as each drag is extracted. Sometimes the breaker outs may work from the backline forward towards the hauler if the slope is particularly steep or stems on the back face are likely to come off the strops and slide into the gully).

Anyone can give an emergency signal.

If instructions are not fully understood the breaker outs, cable yarder operator, and other landing workers face significant hazards associated with unexpected rope movement and rope or anchor failure.

ACOP RULE

» **RULE 12.2.1**
All cable harvesting operations shall use an effective and established communication system.

» **RULE 12.2.2**
All workers involved in the extraction operation shall be familiar with the communication used in their workplace.

» **RULE 12.2.3**
An audible or verbal signal shall precede each major rope movement.

» **RULE 12.2.4**
Responsibility for sending signals to the yarder operator shall rest with one designated person unless there is an emergency situation.

» **RULE 12.2.7**
Yarding shall cease if the communication system can not be clearly heard.

WAYS TO COMMUNICATE

There are different ways in which communications can be given between a breaker out and the cable yarder operator. **These include:**

- radio communication (verbal)
- audible signals (tooter signals)
- hand signals.

All signals must be used consistently and understood by all parties Hand signals are generally used around set up time and when logs are being dropped on the landing. They are not commonly used during extraction.

There are internationally recognised signals for an emergency.
They are as follows:

- **Audible:** One long continuous blast on the tooter or a horn
- **Verbal:** “Emergency, emergency, emergency”
- **Hand signals:** Both arms vertically above the head, waving from vertical to horizontal if it is necessary to attract attention.

ACOP RULE

» **RULE 12.2.5**
The following toots shall be used to signal the movement of ropes, carriage or rigging in all cable harvesting operations:

- one continuous long - emergency
- long short – inhaul, ahead on main
- short short – outhaul, ahead on tail
- short – stop any rope
- short short short – feed slack, lower rigging (slack on main).

AUDIBLE SIGNALS

A talkie tooter is often used in cable harvesting operations. It has a signalling device normally worn on the waist of the HBO and a receiver unit mounted in the hauler. When the bar on the talkie tooter is squeezed, it activates a tooter on the hauler. Each movement of the ropes has a specific audible signal.

Audible signals must be heard by all workers in the vicinity of any rope that is about to be moved. If the communication becomes inaudible or not clearly understood, all extraction must cease until the system is fully restored.

Talkie tooters must be tested daily before operations commence. A check should be made of other tooter frequencies working nearby to ensure there is no interference.

The ACoP rule states the set of industry recognised audible signals that are to be used. Refer to the ACoP signal rules in the margin.

It is recommended that an audible signal should always be sounded before any rope is moved:

- Only one breaker out should give the signal when strops are set.
- Hauler operators should not move working ropes if the signal is unclear. If in doubt, repeat the signals as understood and wait for confirmation.

ACOP RULE

» **RULE 12.2.6**

These rope movements may be signalled verbally or by the following toots:

- drag is clear - long, short (during inhaul)
- slack tail - short short, pause, short, short, short
- hold tail or clamp carriage and go ahead on main - short, short long
- raise skyline - short, short, short, short, short
- lower skyline - short, short, short, short
- send strawline - long, short, short, long
- drag approaching the landing - long.

RECOGNISED SIGNALS

Go ahead on Mainrope	▬ ● Long, short
	Ahead on main", or, "take it away"
Go ahead on Tailrope	●● Short, short
	"Ahead on tail", or "ho, ho"
Stop a moving rope	● Short
	"Stop" or "ho"
Slack mainrope or Feed dropline out	●●● Short, short, short
	"Slack main", or, "dropline out"
Slack tailrope	●● ●●● Short, short, pause, short, short, short
	"Slack tail"
Hold the tail or clamp the carriage and pull in on the mainrope	●● ▬ Short, short, long
	"Hold tail, ahead on main", or "dropline in"
Raise the skyline	●●●●● Five shorts
	"Raise sky"
Lower the skyline	●●●● Four shorts
	"Lower sky"
Send strawline out	▬ ●● ▬ Long, short, short, long
	"Straw to tail", or "send strawline out", and, either "coiled" or "strung out"
Drag is broken out and all clear for inhaul	▬ ● Long short again, once the drag is broken out and moving freely
Warn the landing of an approaching drag	▬▬ One long just as the drag comes over the edge of the landing

RADIO COMMUNICATION

An RT (radio transmitter) is used to communicate voice instructions between the breaker out and the hauler operator.

Clear voice communication between the breaker outs and the hauler operator is important when directing rope movements and when applying power during breakout and inhaul.

It is good practice for the breaker out to hold the RT during break out and in haul to allow quick communication in the event of a fouled drag or other issue. Otherwise there could be a critical time delay if the breaker out has to reach for the radio to give a signal.

Breaker outs must use approved crew commands e.g. ‘go ahead’, ‘stop’, ‘raise the rigging’.

It is important that new breaker outs are familiar with the approved commands used by the crew.

RTs must be tested daily before operations commence to ensure they are on the right channel and fully charged.

If using radios to communicate, the hauler operator must acknowledge the verbal signals from the HBO by tooting the correct audible signal before carrying out any instructions received. This applies to all signals listed in Rule 12.2.5 of the ACoP.

HAND SIGNALS

Hand signals may be used between a hauler operator and a breaker out or poleman. Only one person should be giving the hand signals. Time needs to be allowed for the hauler operator to react to each signal given.

Hand signals can also be used in breaking out operations but should not be the usual means of communication. They should only be used in specific situations i.e. when other forms of communication fail or when signals are relayed between workers.

Any worker can give the stop signal in an emergency situation which is one long continuous blast, or this hand signal.

A complete set of industry recognised hand signals is included in Appendix 3.

Hand signal for ‘emergency stop’

COMMUNICATIONS SYSTEM RESPONSIBILITIES

It is important that the communications system is well maintained to ensure it works when required. Someone in the crew should be given the responsibility to ensure the batteries are charged and there are spare batteries available.

COMMUNICATION ISSUES

If instructions are not fully understood, the breaker outs, hauler operator, and other landing workers face significant hazards associated with unexpected rope movement and rope or anchor failure.

Here are some hazards associated with communication and their possible control methods.

INCORRECT SIGNALS

Use industry recognised signals at all times.

If the wrong signal is given, signal stop immediately. Give correct signal.

Ensure that everyone in the crew is aware of the signals being used and that the signalling system is functioning correctly.

COMMUNICATION FAILURE

There should be at least two communication options that can be used by the breaker outs. This may include a talkie tooter with two hand pieces, two radios, a combination of talkie tooter and radios, or hand signals. Having two options allows for a back-up in case one fails.

If audible and verbal communications fail, move to a safe position and use hand signals. Use other workers to assist. This should be used only to get the existing drag to the landing. It is recommended that the operation is then stopped until two communication options are operational again

COMMUNICATION DEAD SPOTS

In some cases there may be a communication dead spot in the setting. This may be caused by deep gullies, steep slopes, rocky bluffs etc. The dead spot may affect the talkie tooter or the radio.

If a dead spot is identified the following options could be used:

- Move out of the dead spot before attempting to signal the hauler operator.
- Relay signals (by radio or hand) to another member of the breaking out team who can signal the hauler operator. In this case it is important to remember that there may be a delay in the communication process and the safe retreat position should take this into account.

STROPPING

Stropping up is the process of connecting stems or logs to strops. All strops have a connecting device that allows the wirerope or chain to slide through it, cinching a noose around the stem. This feature is important because it tightens the grip around the stem and will allow more than one stem to be attached.

STROPPING PROCESS

Strops may be wire rope or chain. For successful strop attachment and break out, the stropping sequence should be planned and these stropping practices followed:

1. Strop the top stems first. This will free up stems underneath for following drags. This will also reduce breakage and break out tensions.
2. When using a butt rigging, if possible Attach the heaviest stem to strop number one so that the bulk of its weight is in the chute when the drag is dropped at the landing.
3. If stems are being extracted by the butt, strops should be attached within 3m of the butt end of the stem. Any stem attached further back than this must be notified to the hauler operator.
4. When using butt rigging, attempt to strop the logs so all butts arrive on the landing together. This means the first strop may be attached close to the butt. The second strop may be 11/2 – 2m from the butt. The 3rd stem should be attached about 3m from the butt.
5. If stems are being extracted by the head, it is acceptable to attach the strop within 5m of the head end of the stem. All drags with head pull stems should be notified to the yarder operator.
6. If stems are attached near their balance point (gut-hooked), they could swing during inhaul and will make landing and unhooking more difficult. These stems should either be re hooked after break out or notified to the hauler operator.

All drags containing the following types of hook ups should be notified to the yarder operator:

- Gut hooks
- Head pulls
- Shorts
- Other unusual contents – blocks, chainsaws etc

ACOP RULE

» **RULE 12.2.14**

Where practicable, butt-pulled stems shall have their strops attached within three meters of the butt end of the stem.

» **RULE 12.2.15**

Where practicable, head-pulled stems shall have their strops attached within five meters from the top end of the stem.

» **RULE 12.2.15**

Any drag with a long stropped or gut-hooked stem shall be either:

- immediately communicated to the yarder operator so others can be warned of the hazard
- stopped after break out and the stem(s) re-hooked.

ELECTRONIC CHOKERS

Electronic chokers have two main advantages:

- Safety – Electronic chokers are released at the landing by the hauler operator and therefore there is no need to have a worker releasing stems in the chute
- Improved cycle time – The choker can be released as the stems are being lowered on the landing. The choker will complete release when slack occurs in the strop.

It is important that the hauler operator ensures the stems are landed properly before the chokers are released. If the stems are not fully on the landing, they may have a chance of sliding back off the landing. Features of electronic releasing chokers are:

- They need to be slack before they are released, they cannot be released under tension
- They can be released individually
- Batteries need to be properly charged
- Electronic releasing chokers can be manually released by using a stick to depress the spring loaded locking pin holding the folding arm. There must be no tension in the strop when manually releasing automatic chokers.

ADVANCED STROPPING TECHNIQUES

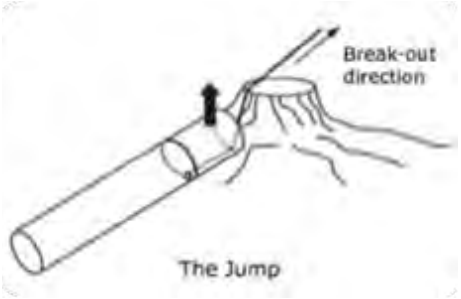
Obstacles on the yarding face may interrupt extraction, damage or break the rigging, and break the stems. It is desirable to move a stem around or over an obstacle by moving the rigging or carriage into a better position. In situations where fouled drags can't be avoided, special techniques can be employed to move the stem. The basic manoeuvres that can be used to work around an obstacle are the jump, kick and the roll.

THE JUMP

Set the strop in the usual way and then slip the choker bell or hook under the centre of the stem.

The leading end of the strop is forced under the stem and is laid over the top of the obstacle.

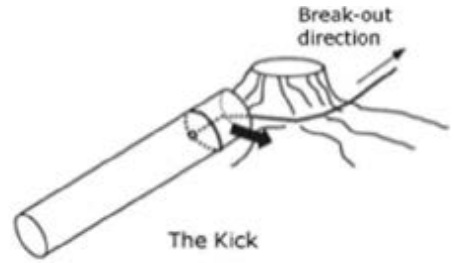
When the strop is tensioned, the bight of the strop over the obstacle will pull straight up on the end of the stem lifting it up and over the obstacle.



THE KICK

The choker bell or hook is placed opposite the direction of pull. The leading end of the strop is again led around the end of the stem, but around the obstacle instead of over it.

When tension is applied the stem will be pulled sideways away from the obstacle.

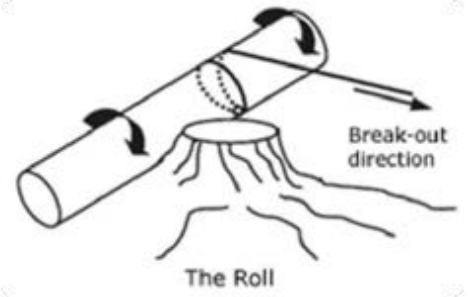


THE ROLL

The strop is set in the normal way.

Once set, the strop is rotated around the stem away from the desired direction of pull. The leading end of the strop will be wrapped around the stem.

Once the strop is set, tension is applied rolling the stem away from the obstacle.



UPSET CONDITIONS

A detailed analysis of serious harm incidents during breaking out has identified that many of these have occurred when the breaker out is dealing with an unusual situation. These have been termed upset conditions.

The process for dealing with upset conditions must be documented as part of the breaking out plan. This includes identifying who is responsible for what actions during an upset condition and any impacts this may have on the location of the safe retreat position.

Some of the more common upset conditions are listed below with guidance on how these should be managed.

FOULED DRAGS

Drags can become fouled during the break out phase. This may be due to the shape of the terrain, high stumps, or intertwined stems as a result of falling. Usually the first step is to haul back to reposition the stems and then try breaking out again. If this does not work, then the drag is deemed to be fouled and needs extra attention.

Fouled drags can result in lost production, equipment damage, increased safety concerns for the extraction team and could potentially affect the stability of the hauler. Breaker outs must not put themselves in unsafe positions to release a fouled drag.

If the drag becomes fouled:

- The first option may be to try and pull the drag backwards away from the obstacle by tensioning the tailrope, (if using a system that has a tailrope). This method is commonly referred to as “tailroping back”.
- Care must be taken when doing this because the tailrope is usually the smallest working rope and as such, can easily be overloaded.
- It must also be remembered that pulling in on the tailrope also creates a purchase on the tailrope anchors so caution must be exercised to avoid failure.
- Ensure that the breaking out crew are well clear in an extended safe retreat position before signalling the “ahead on tail”.
- Hold the signalling device in the transmit position and stop the attempt as soon as drag movement ceases and the ropes begin to sing.
- Watch for sudden movement, (recoil) of the drag if it comes free of the obstruction.

If tailroping back is unsuccessful, the following procedure is recommended:

1. Head breaker out directs actions to unfoul the drag.
2. Signal the cable yarder operator to stop the ropes
3. Investigate the situation
4. Release all tension from ropes
5. Approach fouled drag from above if possible
6. Identify cause of fouled drag and assess the options
7. Plan the operation and advise the rest of the extraction crew.
8. Call for assistance from other crew members if necessary, e.g. the faller.

Options to resolve the issue include:

- Release strop(s) from the fouled stem(s) and complete drag without it.
- Reposition strops to effect a desired stem movement (head pull, roll, jump, kick).
- Cut the stem(s) with a chainsaw, ensuring that all working ropes are slack and there is no tension in the stems being cut Pay extra attention to the escape route when making the cuts because there is often a build up of slash around the fouled stem.
- Cut the stem further back if there is any doubt about the tension in it or the possible movement of it when it is cut.

Consider doing only a partial cut in the stem and using the hauler to break it off if there is any risk of unexpected stem movement.

Breaker outs must retreat to safe position before recommencing drag.

STEMS COMING OFF THE LANDING

Good planning such as positioning of the hauler should ensure stems do not slide off the landing.

However, in some extraction operations landing stems in the chute area can be difficult due to the size of the landing, position of the hauler, yarding system being used, or machinery available to clear the chute. In some cases this may result in stems sliding off the landing back into the break out zone. If stems are likely to slide off the landing then the operation should be stopped until this can be managed. **Options may include:**

- Move the hauler to give more room to land the stems in the chute
- Ensure machinery is available to clear the chute
- Have a method to hold dropped stems in the chute
- Include information on the danger zone in the breaking plan and have an appropriate safe retreat position and ensure the crew understand
- Do not allow machines to clear the chute if breaker outs are working immediately below the landing of in the danger zone. Good communication between machine operators and breaker outs is essential.

DEBRIS FROM PROCESSING COMING OFF THE LANDING

In some situations, options to discard slash from the processing on the landing are limited. This means that slash is deposited around the edge of the landing and either incoming drags or the movement of stems in the chute could dislodge it, causing it to roll back down the hill.

Options to manage this are:

- No processing should take place if the breaker outs are in the danger zone beneath the chute.
- There must be clear well understood signals to advise when it is safe for any machine to operate in the chute.
- Where possible, any slash around the edge of a landing should be made safe before breaker outs work below it.

ACOP RULE

» **RULE 12.2.17**

No stems or logs shall be cleared from the chute area unless the breaker-outs are in a safe position.

Another potential risk is where a processor is being used to clear the chute or is working in close proximity to the chute. In these situations, unwanted heads are often propelled out of the processing head and the breaker outs could be in the firing line.

Careful consideration must be given to all processing options close to the chute and again, there must be good, reliable communication between breaker outs and the machine operators. **A critical rule is:**

- There must be no machine activity in or around the chute if breaker outs are working anywhere near the danger zone below the landing.

BACKLINE ANCHOR FAILURE

Backline anchor failure in a cable harvesting operation can result in the anchor, ropes and rigging falling into the hook on zone.

Backline Anchors must be inspected on a regular basis, especially after tight lining, during the first couple of drags after a line shift,or after:

- clearing a fouled drag,
- a shock loading,
- a heavy rain event if anchors are suspect.

When checking backline anchors, Breaker outs must not stand or sit:

- below any moving ropes or rigging
- within the bight of any ropes
- on or in front of a mobile tail hold machine
- immediately behind any stump anchor.

BREAKING OUT BUNCHED STEMS

SETUP

Bunching stems in the cut over prior to extraction can lead to improvements in cycle times, payloads and therefore increase productivity. It can also introduce a number of new hazards into the breaking out operation and additional planning may be required.

When planning the bunching of stems it is important to determine the breaking out and extraction method that will be used. Stems bunched for grapple extraction may be laid out differently than those bunched for manual breaking out – especially the height of the bunch.

Stems that have been bunched for grapple extraction may not be suitable for manual breaking out – based on the height and position of the bunch.

If the grapple system breaks down or is not available – do not break out manually until the additional hazards have been assessed and controls determined.

The location of the bunch needs to be well planned to minimise hazards to the breaker outs.
Bunches should be:

- Positioned on ground that is flat as possible
- Located to enable the drag to be lifted
- Positioned in areas that are free of logging slash and other obstacles
- Stacked to allow breaker outs to access the butt ends for strop placement without having to climb on stack
- Bunched stems, stock piles, - to be no more than three stems high
- Positioned with butts towards the direction of pull (towards the cable yarder).

BREAKING OUT

When developing the breakout plan and determining the safe retreat position for bunched stems, the planning process should be the same as normal breaking out. See appendices for more detail on the safe retreat position calculation process.

Additional requirements when breaking out from bunched stems include:

- Always break out the top logs first
- Always work from the top (up slope) side of the bunch.

ACOP RULE

» **RULE 2.3.5**

No person shall position themselves where there is danger of materials being dislodged and rolling or falling into their work area.

PRODUCTION MANAGEMENT

Production management is a function within a company which includes planning, target setting and measuring performance at each stage in the forest harvesting operation; tree felling, extraction, processing and loading. Production management is an essential tool as it ensures the viability (capability) of each cable harvesting operation.

PERFORMANCE MEASURES

The breaking out process is critical to the success of any cable harvesting operation. So the understanding of the following areas will be crucial to meeting production targets:

- hauler capabilities
- worker capability and numbers
- management of safety, time and efficiencies on the yarding face
- daily production requirements (stems pulled or tonnes extracted).

There are a number of factors that will affect breaker out performance. **Factors affecting performance can include:**

PIECE SIZE, STOCKING RATE, TERRAIN, HAUL DISTANCE, WEATHER

Piece size refers to the volume or weight of the stem to the first break. It dictates the ease of accumulating an optimum drag.

In smaller piece size timber It may be difficult to build an optimum drag. The number of strops used should be adjusted to match the piece size.

Smaller stems or broken pieces can be used to top up a drag if they are within reach of the strops.

STEM LENGTH

Stem length will affect the ease of landing the stems. Landing size and cable yarder position should enable this to happen by ensuring there is sufficient chute length in front of the hauler.

FELLING PATTERN

Tree lean, terrain, environmental constraints faller competency or weather conditions may affect the felling pattern.

This may result in Head pulls which may cause landing issues, breakages during extraction and also slow down the breaker outs as they would be required to strop stems in amongst branches.

Excessive Stump height compromises production and safety. It increases potential for shock loading, equipment failure and fouled drags.

WINDTHROW

Windthrown trees within a stand will affect extraction speed. Windthrown trees pose added hazards for fallers and breaker outs. More time is required to perform these tasks safely which will affect safety and production.

SHAPE OF THE TERRAIN

The shape of the terrain dictates the potential deflection and clearance, (the distance between the front end of the drag and the ground). Deflection and optimum drag sizes will be greater on concave slopes. Flat or convex slopes will reduce deflection and can mean the optimum drag size is smaller and the extraction speed is slower.
Roken or steep terrain will affect tree breakage and the ease with which the breaker outs can safely move over the cut over.

UNDERFOOT CONDITIONS

Underfoot condition such as soil composition and wetness, undergrowth and slash levels will affect breaker out efficiency.

BREAKING OUT PERFORMANCE

A production target is set for the block and will reflect the level of production required to ensure the operation is profitable. Production targets in harvesting are usually expressed as tonnes/day.

Production targets vary according to a wide range of variables including; the availability of trees and machinery, the terrain, weather, access, crew culture and worker capability

Maximising breaker out performance is achieved by eliminating factors that may reduce production within the cable harvesting operation.

Factors that affect performance need to be assessed and can be eliminated by:

- Allocating the right number of resources to remove or reduce bottlenecks
- Monitoring the job regularly and being ready to move people and equipment as factors change e.g. mechanical, operational, employee, forest and environmental.

Here is a list of factors that may slow production.

PRODUCTION FACTORS

WORKFLOW

Incorrect crew balance - not having the right number of people or machines matched to the productivity of each harvesting stage.

The cable yarder is too little or large for the extraction task. Failure to use the correct rigging configuration for the setting.

INTERFERENCE

Waiting time for machines and wood e.g. a cable yarder waiting for the processing machines to clear a deck.

No room for a surge deck, affects the continuity of the processing operation and causes unnecessary delays.

OPERATIONAL DELAYS

Delays between the cable yarder and on the landing e.g. the landing machinery cannot clear the chute before the next drag arrives.

This may be caused by the landing machinery:

- being too small or unsuitable to work in the chute
- caught by unscheduled truck arrivals
- engineering issues such as a small landing site or shape
- number of log grades cut
- worker numbers and capabilities
- mechanical breakdowns.

Cable yarder slowed from breaker outs struggling because:

- tree felled in the wrong direction
- uneven terrain or steep slopes
- heavy undergrowth or slash in the hook up zone
- longer hook on times due to a high number of shorts being extracted
- high stumps and other obstacles fouling drags during inhaul
- safe retreat position being a long way from the hook on area.

EMPLOYEE RELATIONS

Crews perform differently because of their skill level and motivation, influenced by the manager of the operation. Things to consider are:

- Inadequate planning or poor communication can result in unnecessary delays
- Recruiting the right people, good training and low staff turnover can all impact on productivity
- Top performing crews have clear concise goals, standards and expectations of productivity and equipment maintenance
- The crew management takes action to ensure that these goals are communicated and expectations are met
- Respect for the crew manager to inspire them and lead them to meet the goals. Creating good work planning, and allowing high job flexibility
- Clearly defining the roles and responsibilities of the crew and making and each member accountable for their preparedness to work, their individual safety and equipment
- All machinery and equipment is suitable for task and is well maintained
- The success of a crew is defined by their personal satisfaction when contractor goals are aligned with their own expectations.

FOREST AND ENVIRONMENTAL FACTORS

Natural forest factors such as slope, soil types, piece size, tree form and undergrowth affect daily production. Some of these can be made worse by changes in the weather e.g. rain.

Environmental factors that may hinder production include:

- Soils- clay soils can become slippery when it rains and granular soils are sometimes problematic in dry conditions.
- Hot conditions can overheat machines and men
- Wet cold conditions can inhibit man and machine performance
- Heavy undergrowth can slow down tree falling and extraction productivity
- Steep slopes can affect production if breaker outs have to retreat further away or have trouble negotiating the steep face
- Piece size and tree form can adversely affect productivity especially large trees, with heavy branching and multiple defects
- Tree defects can affect the tree faller's productivity and result in more pieces for the extraction team to pull.

SAFETY AND HEALTH

Everyone in the breaking out team is responsible for the safety of themselves and others. This section covers, responsibilities, behavioural standards, hazard identification, safety meetings and breaker out health.

1. The weight of the average Swing Yarder is 57 tonnes and the weight of the average tower is 49 tonnes including ropes and rigging.
2. The pulling power of a swing yarder or a tower is 42 tonnes.
3. The skyline drum can pull 62 tonnes.
4. The average log weight is 2 tonnes.
5. The average man is 80kg or 0.08 tonnes – the most fragile thing on site.

The employer has responsibility for the health and safety of everyone on site.

BEHAVIOURAL STANDARDS

Standards of behaviour are the ways employees are expected to act in the workplace to ensure high levels of safety are maintained. It is the way workers communicate, help out and respect each other and regardless of their position, each crew member has a responsibility to ensure they understand and follow the recognised safe operating procedures.

Here is a set of behavioural standards that have been established for a breaker out, a head breaker out and a crew manager. It shows an example of the way each employee should act for the six given behavioural themes.

Behaviour Standards for a Breaking out Team

Theme	Breaker Out	Head Breaker Out	Crew Manager
Standards	Follow rules	Ensure compliance	Set high standards
Communication	Speak up	Encourage	Communicate openly
Reporting/ Investigation	Report	Follow up	Feedback and action
Risk Management	Be mindful	Promote risk awareness	Confront risk
Involvement	Get involved	Involve the crew	Involve the workforce
Personal	Be accountable	Hold accountable	Set accountabilities

*A full example of these standards are in **Appendix 5: Behavioural Standards***

SAFETY MEETINGS

Safety meetings are an important part of the daily tasks of an extraction crew. They must also be part of the contractor's health and safety system. Safety meetings are an opportunity to participate and voice concerns or issues around the health and safety of the operation.

DAILY MEETINGS (AKA. TAILGATE OR TOOLBOX)

Daily meetings provide an opportunity for each member of the crew to raise any concerns, identify new hazards, or discuss the previous day's activities and production. Their input may result in achieving a safer, more productive and happier working environment.

This meeting is a good opportunity to identify and discuss anything that has changed in the operation i.e. weather conditions, staff changes, or changes in landing layout.

It is important to record these meetings making sure the following are included:

- the date of the meeting
- location,
- name of the person running the meeting, and
- signatures of each crew member that attended.

A record should also be kept of all the comments around each topic e.g.

- safety issues,
- quality issues,
- production from the previous day, and
- the current days work plan.

Daily meetings can involve the whole crew or sections of the crew. The extraction crew should have a daily meeting to discuss the breaking out plan and agree on the safe retreat position for the days work or lines to be worked during the day.

HAZARD IDENTIFICATION PROCESS

Daily hazard identification (hazard ID) is an essential process because breaker outs are exposed to a number of significant hazards every day. The main aim of the hazard ID process is to ensure that the contractor and members of their workforce know about existing, new and potential hazards that could affect the operation.

It is critical that the breaker outs and other crew members focus on what has changed in their work environment, what new or changed hazards are likely to be encountered and how they are going to be managed.

Consider anything in the operation which is:

- Dangerous,
- difficult or
- different

ACOP RULE

» **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

If a significant risk is identified, this may require a special meeting to develop a suitable management strategy.

For a full example of a hazard ID – ***see Appendix 6: Hazard ID Register***
For further information on the hazard ID process ***see the Best Practice Guidelines for Health and Safety Management***

BREAKING OUT HAZARDS

A breaker out is exposed to a number of hazards during their work day. It is important that all hazards are identified and suitable controls are in place to manage them. To ensure nothing is missed and to act as a reminder to those who have identified them, these hazards must be recorded.

BREAKER OUT HEALTH

Breaking out is a physically demanding job that can lead to injury, sickness and fatigue; a state of exhaustion which can result in hazardous situations arising. Fatigue can be caused by:

- long hours of physical activity,
- insufficient break time between shifts,
- inadequate rest,
- excessive stress,
- lack of sleep,
- poor nutrition or hydration, or
- a combination of these factors.

ACOP RULE

» **RULE 2.9.1**

Working hours shall be agreed so as to provide all workers adequate opportunity to manage fatigue, including:

- regular rest breaks
- a meal break
- a daily or nightly sleep period
- shared driver responsibilities.

FATIGUE

Fatigue is the state of feeling very tired, weary, or sleepy resulting from insufficient sleep, prolonged mental or physical work, or extended periods of stress or anxiety. Boring or repetitive tasks can also intensify feelings of fatigue.

Fatigue can be described as either acute or chronic.

Acute Fatigue	Acute fatigue results from short-term sleep loss or from short periods of heavy physical or mental work. The effects of acute fatigue are of short duration and usually can be reversed by sleep and relaxation. Short term fatigue affects safety and health mostly towards the end of the working day. Symptoms of acute fatigue include; forgetfulness, lack of motivation, making mistakes, getting careless, slower reactions and bad moods.
Chronic Fatigue	Chronic fatigue is a significantly debilitating medical disorder generally defined by persistent fatigue. It can be accompanied by other specific symptoms for a minimum of six months, not due to ongoing exertion, not relieved by rest, nor caused by other medical conditions. Symptoms of chronic fatigue include; unrefreshing sleep; widespread muscle and joint pain; sore throat; headaches of a type not previously experienced, cognitive difficulties, chronic, often severe, mental and physical exhaustion and other characteristic symptoms in a previously healthy and active person. People experiencing these symptoms should consult their doctor.

Breaker outs may show any of the following signs if they are fatigued.

Reduced	Increased
■ decision making ability ■ ability to do complex planning ■ communication skills ■ productivity or performance ■ attention and vigilance ■ ability to handle stress on the job ■ reaction time - both in speed and thought ■ ability to recall details – loss of memory ■ ability to stay awake.	■ tendency for risk-taking ■ forgetfulness ■ errors in judgement ■ sick time, absenteeism, staff turnover ■ medical costs ■ accident rates ■ inability to respond to changes in surroundings ■ inability to respond to changes in information provided.

FATIGUE AND SLEEP

Sleep varies, but studies say we need an average of at least 7.5 to 8.5 hours every day.

Lack of enough sleep at night can have an impact on fatigue levels at work and on work performance. Most accidents occur when people are more likely to want sleep; between midnight and 6 am and between 1pm and 3pm.

Fatigue levels are not easily measured as it is difficult to isolate the effect of sleepiness on accident and injury rates. A concern is that the effects of increased fatigue or sleepiness will contribute to accidents. While this concern seems logical, it is not clearly supported with evidence.

There is no single way to get a good sleep. What works for one person may not work for another.

Here are some suggestions on 'how to set up for a good nights sleep:

- Go to bed and get up at the same time every day
- Exercise regularly
- Use your bed primarily for sleeping e.g. do not read or complete office work in bed
- If you are not sleepy do not try to go to sleep; read or do something quietly instead
- Avoid caffeine, tobacco or alcohol, especially before bed time
- Turn off the telephone ringer and answering machine speaker
- Ask family members to be respectful if one person is sleeping
- Make the room as dark and quiet as possible; use heavy dark curtains, blinds, or an eye mask, soundproof the room or use ear plugs
- Most people sleep better when the room is cool; consider using an air conditioner in the summer months.

If you suspect you may have a medical condition that interferes with your sleep, go to your doctor and have any concerns investigated.

FATIGUE AND EATING HABITS

Our bodies need energy provided by food to be able to perform our daily activities. Here are some suggestions on how to avoid fatigue with good nutrition habits.

Establish Regular Eating Times:	Aim to have at least three meals a day, including a variety of foods. To function at your best, have meals at regular times. If you tend to skip meals or eat at irregular times you may experience fatigue, food cravings or increased eating at the next meal
Snack ideas for your Work Break(s):	To keep nourished and have the energy you need to complete our work shifts, have snacks in between meals At breaks, opt for healthy snacks that include combinations from a variety of foods. For example ■ crackers and cheese ■ fruit and yoghurt ■ small low fat muffin ■ nuts and seeds ■ baby carrots with low fat cream cheese dip.
Check your Caffeine Intake:	Excessive intake of caffeine can cause insomnia, headaches, irritability and nervousness. Do not consume foods that contain caffeine five hours before sleeping. Common caffeine sources are coffee, tea, cola drinks, chocolate and headache relievers.
Snacks for sleeping well:	Going to bed with an empty stomach or immediately after a heavy meal can interfere with sleep. If you get home hungry, have a snack that is low in fat and easy to digest. A light snack before going to bed helps in getting a good restful sleep. Light snack examples include cereal with milk, fresh fruit and yogurt, oatmeal with raisins, digestive cookies and milk, piece of toast with a small banana, or a multigrain bagel.

ACOP RULE

» **RULE 2.9.2**

The employer shall ensure that employee training includes nutrition and hydration and the negative impact of stress, fatigue, and substance abuse to the level of an appropriate NZQA unit standard. For example – Unit 22994

FATIGUE AND STAYING ALERT

Breaker out fatigue can be increased by:

- cloudy days,
- limited visibility (misty or hazy),
- high temperatures,
- low temperatures (frost / snow),
- wet weather,
- high noise,
- tasks which must be sustained for long periods of time, and
- work tasks which are long, repetitive, difficult, boring and monotonous,
- poor underfoot conditions (slippery ground or stems, high hindrance under story etc).

Where possible, work tasks should provide a variety of interest and should periodically change throughout the shift. This is not always easy when breaking out activities are generally repetitive and quite specific to the type of operation being undertaken.

If extended hours of travel are common, remember to consider the time required fit in other things like commuting home, meal preparation, eating, socializing with family etc…

Contractors may wish to consider minimising the length of a breaker outs' shift, rotating breaker out teams, increasing and extending breaker outs' rest periods.

FATIGUE HAZARDS

A breaker out is exposed to a number of fatigue hazards during their day. Hazard management processes can be used to ensure they are correctly identified and suitable controls are in place.

Here is a list of some of the common hazards associated with fatigue in breaker outs and possible control methods.

Hazard	Control
Lack of sleep/rest	Build short frequent rest breaks into your work routine. Take at least two evenly spaced 30-minute rest breaks during the working day.
Early starts	Ensure each night you replace the sleep you lose in the morning. If you get up earlier go to bed earlier. Allow your body to adjust to the new starting times.
Poor nutrition	Start each day with a high carbohydrate breakfast like porridge, cereal, toast, bananas, pasta, or potatoes. Eat high protein foods like lean meat, chicken, eggs, milk, and cheese at night. Eat at the start of a break and rest to allow digestion. Always eat a high-carbohydrate snack straight after work.
Drugs	Before receiving any medication, tell your doctor what you do for a living. If you are on long term medication for a serious health issue, inform the boss of your condition . Inform the boss if you are on any medication that may affect your work. Stay at home if necessary. Non-prescription drugs may affect your ability to work, if in doubt about any medication consult your doctor.
Lack of hygiene/ infections	Clean and dress any cuts or scratches received on the job as soon as possible and keep them covered. Make sure the first aid kit is kept fully stocked. Wash or steralise your hands before smokos. Bath or shower every night. Eat a balanced diet to keep your body healthy. Wear clean clothes against the skin every day.
Alcohol	Avoid drinking alcohol for at least 24 hours before carrying out any hard physical work.

DEHYDRATION

Dehydration is a condition where the body becomes depleted of water, which is an essential ingredient to life. Without water, our bodies cannot continue to operate.

What is dehydration?	There are three types of dehydration: 1. Loss of electrolytes, and sodium. 2. Loss of water. 3. Loss of water and electrolytes. The most commonly seen type of dehydration by far is loss of water and electrolytes dehydration.
Signs of Dehydration	Dehydration symptoms generally become noticeable after 2% of your bodies normal water volume has been lost. Dehydration involves headaches similar to what is experienced during a hangover. There can be a sudden episode of visual snow, decreased blood pressure (hypotension) and dizziness or fainting when standing up. Symptoms of mild dehydration include thirst, decreased urine volume, abnormally dark urine, unexplained tiredness, irritability, lack of tears when crying, headache, dry mouth, dizziness when standing, and in some cases insomnia. Untreated dehydration generally results in delirium, unconsciousness, swelling of the tongue and, in extreme cases, death. Breaker outs may suffer a loss of performance of up to 30% and experience flushing, low endurance, rapid heart rates, elevated body temperatures, and rapid onset of fatigue.
Prevention	Dehydration is best avoided by drinking sufficient water. The greater the amount of water lost through perspiration, the more water that must be consumed to replace it and avoid dehydration. Since the body cannot tolerate large deficits or excesses in total body water, consumption of water must be roughly concurrent with the loss. In other words, if one is perspiring, one should also be drinking some water frequently.
Control methods	Dehydration can be managed by: - Regularly drinking fluids at a rate of 0.5 litres per hour and up to 1 litre per hour in hot conditions. - Drinking before feeling thirsty. - Not drinking fluids that have more than 8% carbohydrate content, like soft drinks and cordials, during work. - Drinking high carbohydrate drinks after work to replace energy levels. - Drinking plenty of water at night to recharge the body. - Drinking a couple of glasses of water before leaving for work.

APPENDICES

APPENDIX ONE: SAFE RETREAT POSITION RESPONSABILITIES

This example has been developed for principals and contractors involved in cable harvesting operations. The example offers some recommendations to help meet the requirements of the new Approved Code of Practice for Safety and Health in Forest Operations (ACoP) with regards to safe retreat position in breaking out.

The guide has been split into two parts:

Part one is for principals and contractors and includes guidance on the process a principal and contractor may take before harvesting commences to communicate hazards and agree on safe retreat position zones within the harvest area.

Part two is for the contractor and crew members involved in breaking out and extraction. It provides guidance on what a process for determining the safe retreat position may involve. Also included is an example of a form that may be used on a daily basis to document the breaking out plan.

PART 1: SAFE RETREAT POSITION – PRINCIPAL AND CONTRACTOR

THE RULE

The key to this rule is that the principal and contractor are agreeing on a system to determine the safe retreat position. They are not agreeing on the safe retreat position for the block and/or setting.

The intention here is to get the principal more involved in understanding how the contractor will determine the safe retreat position.

The principal may want to set some guidance or minimum standards that could be applied across a number of contractors. For example – a minimum distance from the ropes at any time.

The principal should periodically audit the contractors system for determining the safe retreat position. This is specified in rule 2.4.1 of the ACoP.

ACOP RULE

» **RULE 12.2.21**

Before harvesting commences the principal and contractor shall agree on a system to determine the safe retreat position for each block and / or setting.

GUIDANCE

The following is one example of how the rule can be achieved.

The principal and contractor review the harvest plan before the operation is commenced. Based on the harvest plan and a block / setting inspection, safe retreat position zones can be agreed for the block. These may include:

- **Green zones –** safe retreat calculation process **can** be applied. Head breaker out can move the safe retreat distance up to the pre-set minimum distance (e.g. 20m) as long as the process is followed (process further defined in part 2 of these guides)
- **Orange zones –** additional hazard present, or potentially present (i.e. uncertain due to trees still standing). Default is a pre-set **minimum** distance (e.g. 30m) but **may** be adjusted once trees are down and extraction can be analysed. Any areas that change from orange to green should be documented at morning tailgate meetings or communicated to the cable yarder operator or crew manager and documented during the day.
- **Red zones –** additional hazards present that cannot be addressed. Default of a **minimum** 1.5 tree lengths (e.g. 45m) **must** apply.
  - At this stage of the process principals and contractors should review all red zone areas with a view to eliminating or minimising i.e. adjust harvest plan, consider different system, consider cable yarder location on landing, grapple extraction options, etc.

This process will also help meet rule 2.4.4 of the ACoP in which the principal has a responsibility for identifying significant hazards, supplying the contractor with documentation of these hazards and jointly determining control measures for these hazards.

PART 2: SAFE RETREAT POSITION – CONTRACTOR / EMPLOYER

THE RULE

- The process must be documented
- It is recommended that the contractor has a copy of the documented process kept on site
- There should be a regular review of the process and changes made if required.

Note – there are two types of documentation required:

1. The safe retreat position process needs to be documented. An example of a process is included in this resource
2. Documentation supporting the implementation of the process may include maps and forms used on a daily basis within the crew.

- The process needs to be clearly understood, agreed and carried out by the extraction crew
  - It is important that everyone in the extraction crew (head breaker out, breaker outs, cable yarder operator, person clearing the chute, crew manager, contractor) understands the process for determining the safe retreat position, when changes can be made and by who, what notification / documentation needs to support changes etc.

- The mean tree height for the block can be sourced before breaking out (should be in the harvest plan) and should be documented on the maps / forms.
  - If the mean tree height is not available through a pre harvest inventory process, then the principal and contractor shall estimate the average tree height for the block and include on harvest plan / map.

- It is important that there is active management of the worksite. This includes an ongoing hazard management process. Many hazards will not be able to be assessed until the breaker outs are down the hill. The process of continually assessing drags to determine the appropriate safe retreat position will apply through out the day.

- The process needs to be constantly reviewed and analysed by the head breaker out.

Note – the ACoP also includes a default process if a system is not in place and signed off by the principal. This default specifies:

- The safe retreat distance shall be a minimum 1.5 tree lengths based on the mean tree height for the block
- The distance is a horizontal distance measured at right angles to the line of extraction
- The safe retreat distance must be clearly marked with flags or other visible markers.

Safety Alert: The decision on the safe retreat position is made on a drag by drag basis and must be reviewed constantly by the head breaker out. The actual safe retreat position for each drag will be dependent on:

- What is hooked on e.g. length of stem, size of stem
- How is it hooked on e.g. butt hook, head hook, gut hook
- What system is being used e.g. skyline, scab
- The terrain e.g. uphill pull, downhill pull

ACOP RULE

» **RULE 12.2.22**

The contractor / employer shall have a documented process to determine and identify the safe retreat position for each line or day's work taking into account:

- Any swinging or upending log or stem
- Mean tree height
- Obstacles that may restrict movement or obscure vision
- Material likely to be dislodged during extraction
- Overhead hazards that may fall into the work area
- Any rope bight.

» **RULE 12.2.23**

The contractor / employer and head breaker-out shall ensure the process is understood, agreed and carried out by the extraction crew.

GUIDANCE

The following is an example of how a process may be applied for determining the safe retreat position in a scab skyline or northbend system. The process may need additional steps for different systems or use of carriages.

OPERATIONAL MEETING (E.G. TAILGATE, TOOLBOX ETC)

1. The meeting must be attended by the entire extraction crew – head breaker out, breaker out(s), cable yarder operator, crew manager. The landing machine operator and poleman should also be involved.
2. The map that the principal and contractor developed is reviewed. Red, orange and green zones are identified on the ground and confirmed. Any changes in zone colour are documented.
3. The breaking out plan for each zone is discussed and agreed e.g.

- We will be spending some time in a red zone this morning, therefore we will need to retreat out a minimum of 1.5 tree lengths (45m) – further if required.
- We will be working in the danger zone below the landing / chute. The head breaker out will radio the loader driver to confirm the breaking out team is in the safe position before any stem / logs in the chute are moved.
- There is a section of orange zone in this line / setting, a minimum distance of 30m will apply. The head breaker out will asses each drag to determine if the distance needs to be increased. These cases will be notified to the cable yarder operator and documented.
- All of this setting is green zone, minimum distance of 20m will apply. The head breaker out will asses each drag to determine if the distance needs to be increased. Changes in safe retreat position do not need to be notified to or documented by the cable yarder operator.

4. The cable yarder operator will have a copy of the map with them at all times.
5. The Breaking Out Form must be completed at the start of each day. Any major changes during the day must be added to the form. (Copy of example form attached)

ON THE BREAK OUT FACE

1. The head breaker out is in charge at all times during break out and extraction.
2. All breaker outs will follow the instructions of the head breaker out.
3. The breaking out team will constantly review the safe retreat position and zones. Final decision on movement of safe retreat positions may only be made by the head breaker out.
4. Only the agreed signals shall be used during breaking out and extraction (as per poster in smoko hut).
5. Breaking out and extraction will stop if the communication system is not working.
6. No one will be closer than 15m from the ropes and rigging during outhaul.
7. No one will enter the hook on area until the stop signal has been given and the ropes and rigging has stopped moving and strops can be controlled.

REPOSITIONING THE RIGGING

No stems attached:

1. Breaker-outs may stand in the hook-on zone while rigging is repositioned.
2. Breaker outs may not stand under any moving ropes or rigging.

One or more stems attached:

1. All breaker-outs will move out from between the stems and to one side of the ropes while tension is released in the working ropes.
2. If it is necessary for the hauler operator to engage a working drum to reposition the rigging, breaker outs must move a minimum of 20m from the ropes and / or rigging before any repositioning of the rigging is signalled.
3. All breaker-outs shall stop what they are doing and face the rigging when any rope repositioning occurs.

LEAVING A STROP OR STROPS EMPTY:

In some situations, the extra time taken to hook on a full payload does not make up for the interruption to the wood flow to the landing and the physical effort required to hook the stem(s) on. Leaving a strop, (or strops) empty and taking in a part drag could prove to be more efficient than struggling away trying to reach that extra stem outside the reach of the strops.

It comes down to a time vs payload equation. See earlier table on page 6 where cycle times and payloads are compared. Generally it is worth spending the time to pick up the extra piece but if cycle times are creeping up and landing machines are waiting for wood, a good head breaker out will do a couple of quick light drags to keep the landing operation ticking over.

AFTER HOOK ON

1. No breaking out signals will be given until the breaker outs are in the safe retreat position.
2. The breaker outs shall be behind the head breaker-out (further from the rigging) before any signals are given.
3. In red zones the breaking out team will retreat a minimum of 1.5 tree lengths. Where this distance needs to be greater, the head breaker out will communicate this to the breaking out team.
4. If the break out zone is green or orange, the head breaker out will determine the appropriate safe retreat position based on the hazards and factors present in the drag or that may become factors during break-out and / or extraction. **These may include:**
   - Potential for stems or logs to upend or swing
   - Any obstacles that may restrict movement or vision
   - Any material that may become dislodged and roll into the breakout area or safe retreat location
   - Any rope bight
   - The position the strop has been attached to the stem / log
   - The length of the stems in the drag
   - Any slash that may restrict visibility of what is in the drag
   - The terrain (ground slope and shape)
5. Any changes in the safe retreat position must be communicated to the breaking out team by the head breaker-out
6. Any changes to zones will be communicated to the cable yarder operator and documented e.g. changing a green zone to an orange zone, changing an orange zone to a green zone.
7. The head breaker out will watch the line and drag until the drag is out of sight or control of the drag is taken over by the hauler operator.

FOULED DRAGS

1. The head breaker out is the only member of the breaking out team that can approach a fouled drag.
2. Tension must be released in the main and tail rope (and skyline or slack pulling ropes if used) before the drag is approached.
3. The head breaker out will assess options and communicate requirements to the hauler operator. These may include:
   - Move drag using tailrope or lift to free the stem
   - Release strops from fouled stems
   - Attach strops to effect stem movement (roll, jump, kick)
   - Cut stem or stump with a chainsaw

Note – If the drag is going to be moved, the head breaker out must retreat to the safe position before giving any signal to the cable yarder operator.

CHECKS AND AUDITS

1. Daily checks will be carried out by the crew manager to ensure the safe retreat position process is being followed by the breaking out team. This check shall be documented.
2. When the breaking out team can be seen by the hauler, the hauler operator will continually check they are moving to the safe retreat position (agreed distance from the drag) before break-out signals are given.

A number of contractors and crews have a process for determining the safe retreat position. In some cases these have been running successfully for some time. Contractors are encouraged to learn from what others are doing. Develop a system that works for you, but also pick up ideas from others.

OTHER CONSIDERATIONS

Some of the additional things that are being used or trialled include:

- Flags or other visible markers in the cut over to mark the safe retreat position
- Range finders to check the distance from the ropes
- GPS to track the location of the breaker outs
- Flags or flashing lights on the landing / cable yarder to show the landing operators which zone the breaker outs are in
- Recording systems in the cable yarder to document changes in zone or safe retreat distances
- Ipads for taking daily photos of the setting and drawing on safe retreat zones

EXAMPLE OF A COMPLETED SAFE RETREAT PROCESS FORM

Safe Retreat Position Plan

Forest: T73	Compartment / Skid: 106 / 23	Date: 10·2·13

Breaking Out Team

Name:	Competent to 1258	Competent to 24567	Under training
Head Breaker Out: Fred T	✓		
Breaker out: John S		✓	
Breaker out: Billy C			✓
Breaker out:			

Copy of harvest plan available	✓
Copy of Principal / Contractor breaking out map attached	✓

Breaking out zones identified and agreed		Minimum distance
Red zones	✓	45m
Orange zones	✓	30m
Green zones	✓	20m
Outhaul		20m

Changes to zones discussed, agreed and documented	✓

Additional red zone identified SW of landing - rock bluffs present

Red zones:

Safe retreat position discussed and agreed	✓
Landing operations agree on processes for working in the danger triangle	✓
e.g. no log movement in the chute until breaker outs are in the safe position	

Orange zones:

safe retreat position discussed and agreed	✓
Plan for assessing safe retreat distance in orange zones agreed	✓
Notification and documentation requirements agreed	✓

Green zone:

Plan for assessing safe retreat position in green zone agreed	✓

Identified hazards are acknowledged	✓

Additional hazards identified during breaking out

Hazard	Control method
Rock bluff - SW of landing	change to red zone. 1.5 tree length minimum distance applied

Plan understood and agreed (signed by extraction team)

Head Breaker-out:	Fred T	Foreman:	Mark W
Breaker-out:	John S.	Hauler Operator:	Matt V
Breaker-out:	Billy C.	Landing Machine Operator:	Dave D
Breaker-out:			

APPENDIX 2: SAFE RETREAT PROCESS EXAMPLE – THE ZONE SYSTEM

THE ZONE SYSTEM FOR DETERMINING A SAFE RETREAT POSITION:

The Zone system relies on the breaker outs, the crew manager and the hauler operator looking at the setting, assessing its hazards and dividing it into zones taking into account the critical conditions outlined in the ACoP. The colours of the zones represent the degree of risk that the hazards in that zone present.

- Red means highly dangerous, extreme caution required and retreat distances should be 1.5 tree lengths or more.
- Orange means there is a significant hazard present but it can be managed by taking extra precautions and increasing the Safe Retreat Position if required, (not necessarily 1.5 tree lengths).
- The green zone indicates that the hazards are minimal and can be safely managed by following correct hooking up procedures and a minimum distance can be applied.

At the beginning of the shift or line, the extraction crew decides where the boundaries for the different zones are and agrees on a Safe Retreat Position for each zone. These zones are then marked on a map of the setting and any physical features that differentiate between them are identified on the ground.

A Safe Retreat Position can be a minimum distance that the breaker outs have to move away from the rigging, or it can be a physical barrier that will protect them from harm. Some Safe Retreat Positions could be a combination of both; a minimum distance, and a physical feature, e.g. Retreat to the ridge or 20m, whichever is greater. Other conditions may be included in the plan to keep breaker outs safe, e.g. If the Breaker Outs can't determine where both ends of a stem are, they must retreat to a minimum of 1.5 times the average tree height away from it.

When they are in each of the zones, the breaker outs apply these rules, unless an upset condition occurs. When this happens, (as it invariably does in breaking out), the HBO can modify the plan by advising the hauler operator of the change and the reason for it. The hauler operator should document each change and the time it occurs on the day sheet as it is called in. When the breaker outs revert back to the original plan, the time should once again, be recorded on the day sheet.

ADVANTAGES:

The advantages of the zoning system are:

1. Breaker outs have some flexibility in determining the SRP with input from the crew manager
2. More than one person is making the decision and it is made before the operation starts
3. Landforms or other barriers can be used as part of the Safe Retreat Position
4. Only significant changes have to be reported to the hauler operator
5. Breaker outs do not have to walk as far when in the green or orange zones.

DISADVANTAGES:

The disadvantages of the zoning system are:

1. The zone system is more complicated than some of the other systems
2. Unscrupulous users could set unrealistic SRP's which could compromise safety
3. There is a possibility of mistakes being made if the area isn't properly assessed.

DETERMINING A SAFE RETREAT POSITION USING THE ZONE SYSTEM:

INTRODUCTION:

Breaking Out in Cable Harvesting operations is a high risk job where there is little margin for error if something goes wrong. The purpose of this exercise is to pre-plan the operation and identify hazardous situations in advance, so that safety precautions can be taken to keep you safe. Your role is to participate in the compilation of the plan, agree on its contents, then follow the processes that you have agreed to.

INSTRUCTIONS:

Before the operation starts each day, the crew manager or Head Breaker Out shall facilitate a meeting of the Extraction Crew to discuss and decide on where the Safe Retreat Positions will be for the line or day's work. The Extraction Crew includes the following people:

- The Head Breaker Out
- Other Breaker Outs
- The hauler Operator
- The Poleman
- The Crew manager.

Note that other personal may also be included in this meeting if it is appropriate for them to be there. Examples of this are:

- Tree Faller.
- Processor Operator.
- Loader Operator

RESOURCES:

The following resources should be available for this meeting:

- The Harvesting Plan for the setting
- A Map of the Harvesting Area
- A copy of the Code of Practice
- Any Instructions from the Forest Owner.

FOLLOW THE PROCESS:

Refer to the Harvesting Plan and take note of any potential hazards that the Harvest Planner has identified. If you have a map of the setting, locate your current position, (usually the landing), and orient the map so that it is facing the same way as you are.

Take note of any land forms or terrain features that can be used as reference points and make sure they are clearly marked on the map. If it hasn't already been done, locate the hazards that the Harvest Planner has identified and mark them on the map.

Look at the setting and identify any potential hazards that could put Breaker Outs at risk. Ask the person who felled the block if there are any other hazards that they have noticed, which may not be immediately obvious to you. Refer to the Code of Practice and divide the setting into zones, taking into account the critical conditions listed in clause 12.2.22.

Use the following criteria to help you decide where the different Zones are, making sure you understand the degree of risk that the hazards in each zone present. Relate the boundaries of the zones to land forms or terrain features on the ground, then locate them on the map. In general terms, the zones will be decided according to the following criteria:

- **Red Zone:**
  - The Red Zone is anywhere in the setting where the Breaker Outs have to stand below the extraction process.
- **Orange Zone:**
  - The Orange Zone is anywhere in the setting where the Breaker Outs have to stand adjacent to, or along side the extraction process.
- **Green Zone:**
  - The Green Zone is anywhere in the setting where the Breaker Outs can stand Above and/or Behind the Extraction Process.

Note that unusual or upset conditions could make any part of a setting a Red Zone.

Mark the zones on the map and shade or cross hatch the Red and Orange zones accordingly. There is no need to shade or mark the Green Zone. Discuss the significance of these hazards as a group and decide on the controls necessary to keep Breaker Out's safe.

Determine the Safe Retreat Position for the different zones in your Line or Day's Work. Note that your Safe Retreat Position could be to; a physical feature, or a pre-determined distance, depending on the situation. Decide on what the absolute minimum distance should be for each zone and make sure that everyone agrees with the decision.

Discuss any other issues that might influence how the Break Out site is managed to keep people safe. Make sure it is clear who is responsible for making the final decisions on the ground and check that the communication system is functioning correctly.

DOCUMENTATION:

Ensure that the form is filled out for each line or days work, whichever is greater. Write in the Crew Name, the Forest, the Location, (Compartment, Road or GPS Coordinates), the Date, the Mean Tree Height, the System being used and circle the type of machine being used.

The breaking out plan is to be completed at the start of each shift by the extraction team and is to include the following information:

- Extraction team and team competency
- Responsibilities for the shift. E.g. head breaker out, who is doing the shifts etc.
- Communication devices and who has them (radio/tooter)
- Defining the zones for the day
- Additional hazards expected in the zones
- Agreed safe retreat position for each zone
- Sign off by the extraction team, including the crew manager.

In the space provided, write in any specific Breaking Out hazards that have been identified and the controls that you have agreed to put in place to keep people safe. If you are using a physical land form as a Safe Retreat Position, include a Minimum Distance as well to ensure that the Breaker Outs are well clear of any hazards.

Fill out the other details on communication, lineshifts & other responsibilities and get everyone involved to sign the form, confirming their role and their understanding of the plan that has been agreed to.

APPLICATION:

The head breaker out will be allocated a rangefinder or hip chain for the purpose of establishing the agreed safe retreat position on the hill. The rangefinder or hip chain can also be used to check distances are appropriate at any time and re-establish safe retreat positions when moving into a different zone during the course of the day.

Once the head breaker out has determined the safe retreat position he will then mark his point with a flag or marker to make it obvious to all in the extraction team.

Follow the agreed plan as you carry out your day's work. Talk to your fellow workers and make sure that everyone understands where the boundaries of the zones are and what the specific hazards are in each zone. Keep talking to each other throughout the day and encourage novice Breaker Outs to ask questions or speak up if they feel unsafe.

If an Upset condition occurs, (that might change the distance retreated or the location of your Safe Position), notify the hauler Operator and advise him or her of the revised plan, including any change in Retreat Distance or Position. Make sure that these changes are documented by the hauler Operator with the time and details of the change recorded.

Keep these documents as a record of how you are **Actively Managing** your **Break Out Site.**

THE ZONE SYSTEM PROCESS:

1. Extraction Crew meets every morning to discuss the Breaking out Plan
2. Locate current position and reference points on the map.
3. Identify potential hazards that could put the Breaker Outs at risk.
4. Divide the setting into zones and work out where their boundaries are.

- **Red Zone:** Below Extraction Process
- **Orange Zone:** Adjacent to Drag.
- **Green Zone:** Above Extraction Process

5. Mark the zones on the map or describe where the boundaries are.
6. With reference to the hazards, determine where the Safe Retreat Position will be for each zone.
7. Decide what the Minimum Safe Retreat Distance will be.
8. Document on the form, the Safe Retreat Positions for the day, decided at the meeting.
9. Make sure you understand the SRP decisions made and confirm this by signing the form.
10. Update any changes during the day by advising the yarder operator and recording it on the day sheet.
11. **FOLLOW YOUR PLAN!!!**

Safe Retreat Position Meeting – Example Form for the Zone System

Safe Retreat Position Meeting			
Crew Name:		**Forest:**	**Date:** / /
Location: *(Road Name (or GPS Coordinates).*			**Average Tree Height (for calculating SRD)**
Tower Type (circle one)		**System being used:**	
Tower	**Swing Yarder**		

Red Zone: *List the Hazards*	***Controls:*** *How to manage the Hazard*	***Minimum Retreat Distance***	**m**
		(Note Terrain Features)	
Orange Zone: *List the Hazards*	***Controls:***	***Minimum Retreat Distance***	**m**
		(Note Terrain Features)	
Green Zone: *Why it is Green?*	***Controls:***	***Minimum Retreat Distance***	**m**

Additional Hazards, *Not related to Zones*	***Control Measures:***

Breaking Out Task: *(Note Name or Position)*	***Who is Responsible:***
Drag selection and instructing BO crew.	
Determining SRP and Identifying where it is.	
Communicating with the Yarder Operator.	
Planning & carrying out Line Shifts.	
Moving the Mobile Tailhold, (If Applicable).	

Extraction Crew Details: *Print Name and Sign to show you Agree with the Plan*			
Position:	***Name:***	***Signature:***	***Qualified?***
Head Breaker Out:			
2IC Breaker Out:			
Breaker Out:			
Breaker Out:			
Yarder Operator:			
Poleman (if Applicable)			
Crew manager (If Applicable)			
Chute Machine:			

Daily Record Sheet

Felling & Extraction

Crew:	Date:	Location:

Tree Felling

Faller Check in

Time	Comment

Tree Driving Log

Start Time	Comment	End Time

Breaking Out

Changes to Breaking Out plan

Start Time	Explanation of Change	End Time

Yarding Delays

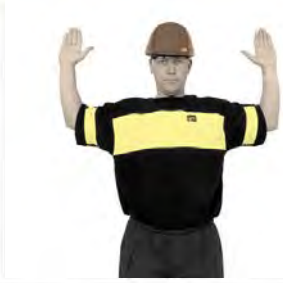
Start Time	Reason for Delay	End Time

Keep this sheet in the folder and have it available for the next Breaking Out planning meeting

APPENDIX 3: HAND SIGNALS

Here are some of the key hand signals that can be used in a cable harvesting operation.

Emergency



One continual blast

Stop any rope

One short blast

Ahead on tailrope

Two short blasts

Ahead on mainrope

One long and one short blast.

Slack mainrope

Three short blasts.

Slack on tailrope

Two short blasts followed by three short blasts.

Lower skyline

Four short blasts.

Raise skyline

Five short blasts

Strawline

One long - two short - one long blast.

Smoko

One long - two short blasts

Safety Alert: Any worker, at any time, can signal an emergency so that others will stop working and wait further instructions.

Safety Alert: The preferred signaling system is radio. From a distance, hand signals for “ahead on tailrope”, “Slacken tailrope” and “strawline” would all look the same!!

APPENDIX 4: ACOP RULES – MOBILE PLANT

ACOP RULES RELATING TO MOBILE PLANT OPERATION.

A COP RULE

6.1.3

Seatbelts shall be worn at all times on all mobile plant.

6.1.4

Where there is a provision for doors (hinges, door jams, and latches), doors shall be fitted and closed while the plant is in use.

6.1.6

Mobile plant with any structure that may come in contact with overhead power lines shall have a warning sign displayed in the cab.

6.1.7

Mobile plant shall be equipped with a braking mechanism capable of holding itself and its load on any slope on which it is operated.

6.1.8

All pulleys, shafts, and belts shall be guarded to the minimum original manufacturer's specifications.

6.1.9

Where operating noise levels may cause damage to hearing an ear protection warning sign shall be displayed.

6.2.1

Mobile plant and machinery shall be operated to the manufacturer's specifications.

6.2.2

Where the stability of mobile plant may be compromised by slope, weather or ground conditions, a specific hazard management plan shall be developed, implemented, and monitored.

6.2.3

Mobile plant shall not be operated on slopes that exceed the maximums in accordance with the manufacturer's specifications.

6.2.5

No person shall:

- get on or off moving mobile plant
- ride on a mobile plant not provided with proper seating
- ride on a load carried or towed by a mobile plant.

6.2.6

Mobile plant cabs shall have all objects secured.

6.2.7

When mobile plant is shut down or left unattended with the engine running:

- brakes shall be applied where fitted
- blades and accessories shall be resting on the ground.

6.2.8

The mobile plant operator must remain in the cab if operating closer than two tree lengths of tree felling.

6.2.9

Any piece of mobile plant that becomes unsafe, or is suspected to be unsafe, shall be shut down and secured. The mobile plant shall be inspected, repaired and tested before returning to service.

6.2.10

Emergency exits shall not be hindered by protective structures.

6.2.11

Machine operators shall ensure people are clear before slewing, driving or positioning mobile plant. They must also ensure that people are clear before moving any stems, logs or logging debris.

APPENDIX 5: BEHAVIOUR STANDARDS

This is a full list of behaviour standards for breaker outs, head breaker outs and crew managers. The PCBU has a duty to ensure the following standards are met.

BREAKER OUT BEHAVIOURS

Standards (Follow rules)	Follow instructions and use correct signals. Work according to rules and safe practices e.g. work in a safe position, pass strops safely, strop logs in safest sequence, hook on correctly. Adhere to the safe working load. Challenge all noncompliance and unsafe behaviours and practices. Understand the rules that apply to my job
Communication (Speak up)	Ask questions to clarify if unsure or do not know. Check and clarify instructions that are not clear. Keep other crew members informed. Listen to others' views and concerns. Stop work if in any doubt and warn others of dangers.
Reporting/ Investigation	Identify and report hazards to crew. Report near misses, incidents and unsafe conditions promptly. Report any defective and unsafe equipment. Contribute to incident investigations. Learn from own and others mistakes.
Risk Management (Be mindful)	Monitor the drag until at landing or out of sight. Constantly assess what is a safe distance and communicate with the head breaker out. Stay alert, focused and aware of and respond to any changes in the environment. Keep a watch out for hazards such as moving ropes, rigging and people coming into work area. Be involved in planning and organising the steps and gear to do the job safely.
Involvement	Warn others of hazards. Challenge the unsafe behaviours of others. Participate in initiatives to improve safety. Work as a team and help others when needed.
Personal Accountability	Wear correct PPE gear and keep gear in good condition. Come to work drug and alcohol free. Keep myself fed and hydrated. Do my fair share of the workload. Work within own capabilities.

HEAD BREAKER OUT BEHAVIOURS

Standards (Ensure compliance)	Explain that full compliance with safety standard is expected at all times. Set good examples by demonstrating sound technical and safety knowledge and always follow the safety standards and rules. Check that all crew are following the required safety standards rules, procedures and working to the Best Practice Guides. Challenge all noncompliance and unsafe behaviours and practices. Ensure all breaker outs have adequate skills and provide training as.
Communication (Encourage)	Give clear, safe instructions. Seek the opinions of breaker outs and ask for safety suggestions. Listen to all safety suggestions from breaker outs and hauler drivers. Promptly take all safety issues, raised by breaker out crew, to crew manager and discuss. Report to crew manager if plan is not working and ask for help if needed.
Reporting/ Investigation (Follow up)	Ensure breaker outs identify hazards and risks. Ensure breaker outs reassess risks when changes occur. Immediately deal with hazards reported. Follow up on all reported hazards and incidents. Take hazards and risks identified to the crew.
Risk Management (Promote risk awareness)	Regularly check ropes and rigging ensuring all equipment is in good working order. Adapt to changing situations, and consult with the crew manager about changing the plan if needed. Monitor workload and work pace of crew; keep crew alert and motivated, allocate tasks fairly according to individual abilities. Monitor and deal with any changes in the behaviour of the crew including fatigue levels. Predict potential risk situations and respond appropriately.
Involvement (Involve the crew)	Take time to discuss work with breaker out crews each day, including unplanned log movements. Encourage breaker outs to give suggestions for improving safety. Train and develop new breaker outs. Check breaker out understands what is required when delegating tasks. Recognise and reward individual and crew safe behaviours. Only ask people to do what they are capable of doing; allocate the best.
Personal Accountability (Hold accountable)	Make sure the right gear is in place and in working order and that there are enough people to do the work. Ensure all crew wear the correct PPE and are fit to work and monitor hydration. Challenge any complacency about routine work and hold people responsible for their actions. Be responsible for decisions Stop anyone that is working unsafely.

CREW MANAGER BEHAVIOURS

Standards (Set high standards)	Set the safety standards and emphasize that these standards are never compromised Regularly walk the block to check that the terrain is safe to work Personally always follow the set of safety standards and practices Make sure the correct safety systems are in place Ensure the equipment and people needed to work safely are available.
Communication (Communicate openly)	Hold regular tailgate and safety meetings Be open to all safety suggestions and ideas coming from breaking out crew Give honest, prompt feedback on safety concerns raised by breaking out crew Keep breaker out crew informed of both production and health and safety statistics Report all safety issues raised to the owner operator or forest owner.
Reporting/ Investigation (Feedback and action)	Ensure effective reporting systems are in place and used Ensure incidents are investigated and documented Follow up all safety concerns raised by individuals or at safety meetings Be involved in investigations Share lessons learned from own and other investigations.
Risk Management (Confront risk)	Manage identified risks Prepare an operational plan that sets realistic and sustainable targets Check that the head breaker out is carrying out the plan Remind breaking out crew to be cautious and to stop the job if they have any safety concerns Do regular risk assessments and safety audits Talk through safety alerts with crew.
Involvement (Involve the workforce)	Take time to plan work with the breaking out crews Praise work safe practices and good safety records Be approachable so that breaker out crews feel able to raise safety concerns Seek new ways to increase participation of breaker out crews in safety Involve breaker out crew in implementing safety improvements with support and coaching.
Personal Accountability (Set accountabilities)	Explain safety requirements for the breaking out crew and check that these expectations are understood Take action fairly and consistently to deal with any breeches of safety standards and practices Work with breaking out crews to ensure they understand their safety responsibilities Keep the morale of the crew positive and maintain discipline.

APPENDIX 6: HAZARDS AND CONTROLS

Here is a list of some of the more common hazards associated with breaking out and possible control methods.

Hazard	Control methods
The bight and bind	You must not enter a bight unless there are extra safety precautions in place to avoid injury should an anchor, tailhold, tailblock, or corner block fail. Precautions may include an extra block suitably located on the tail rope, a high stump, or standing tree. Watch for binds when tensioning the rope. A rope may be able to be lifted over an obstruction by hand. Ensure that all tension in the rope is released and it is resting on the ground before attempting to lift it over the obstacle. Watch for sprags by wearing leather gloves.
Overhead hazards	Do not stand under loaded ropes. Do not approach rigging until it has stopped moving.
Anchor failure	Do not stand directly below or on an anchor when it is loaded. Do not stand within 6m of any stump anchor that is under load. Do not sit on a mobile tailhold while extraction is in progress
Overloading	Reduce the drag size by hooking fewer stems and/or pieces. Instruct the hauler operator to lower the skyline (increase deflection). Always try to hook on the top stems first, watch for binds or tail locking. Unhook stems if the drag is too heavy. Ensure the safe working load of all ropes and rigging equipment is at least the same safe working load of the working rope. Be aware that different rope constructions may increase or decrease rope strength. Avoid sudden movements in the ropes, particularly when breaking out.
Unexpected stem movement	Do not approach stems that you suspect of being unstable. Hook on stems that are stable. As these are broken out they should move remaining unstable stems. Keep at least one tree length away from the stems that are being broken out unless other precautions have been taken. Always stand in a position where you can move if necessary and have an escape route planned should quick action be required. Watch for stems that are part of the drag moving during breakout. Watch for stems on the landing being moved by incoming drags.
Terrain and obstructions	Move carefully across the cut over. Take the safest route when walking in to or out of the hook on area. Wear spiked boots for added traction if soil permits. Make sure you are wearing adequate footwear with good ankle support. Ensure secure footing on steep slopes. On rocky sites, avoid dislodging rocks that may fall into the path of co-workers.

Hazard	Control methods
Heavy undergrowth	Hook on stems in order that provides the best access. Wear protective eye wear to reduce the risk of an eye injury unless the wearing of them creates added hazards.
A fouled drag	Do not signal to increase the pull as rigging or anchor failure may result. Signal stop to the hauler operator. Assess the situation. Instruct the hauler operator to lower the working rope or move the drag away from the landing using the tailrope, if present. This may be sufficient to avoid the obstacle on the inhaul. It may be necessary to unhook a stem to reduce drag weight. This must only be done if there is no stem or drag moving during unhooking. Approach the drag from the uphill side.
Flying debris	Signal the cable hauler to raise the rigging slowly during break out and tight lining. Assess the risk of debris movement if ropes are fouled beneath debris (broken heads, stem waste etc). Stand in safe position, at least one tree length from the break out position, unless protected by a physical barrier or terrain feature.
Runaway stems from landing slash or slovens rolling off landing	Select a safe position to stand, which is at least one tree length to the side of the skyline and not directly down slope of the chute. Stand on elevated ground to the side of the area below the chute wherever possible. Ensure the hauler operator and operators of machines clearing the chute or landing are aware of your presence below the landing. Always watch the drag until it is safely landed or under the control of the hauler operator.
Terrain	Move carefully across the cut over to avoid losing your footing. Take the safest route. Wear spiked boots for added traction, unless in rocky terrain. Wear safety protective footwear that provide good ankle support . Ensure you have secure footing when working on a steep slope.
Other machinery and operations	Remain two tree lengths from any felling operations, or further where there is any risk of sliding stems. Only enter the work area of another machine when signalled to by the machine operator.
Dislodged rocks, stems or debris	Carefully watch breakout and inhaul from a safe position. Be aware of material dislodged at the tailhold end of the span - if standing on the back face, you may be looking at the drag and unaware of the hazards behind you.
Standing in dangerous positions	Do not stand within two tree lengths of a felling operation. Do not stand within one tree length of a drag being broken out. Unless precautions have been taken. Do not stand downhill of a drag being broken out. Do not stand directly downhill of the landing while the drag is being landed or unhooked. Do not stand beneath a loaded or moving rope. Do not stand in front of the cable hauler when the drag is being landed. Do not stand beneath the landing where loader operators dump slash. Do not stand on an anchor stump or mobile tailhold when the working ropes are loaded. Do not stand beneath a load bearing guyline during breakout and unhook.

GLOSSARY

Bight
An angle between two parts of a rope running round a block or obstruction e.g. a stump. To be “in a bight” is to be in a dangerous position.

Bind
Used loosely to describe some difficulty or obstruction

1. Of a saw cut; pressure causing the kerf to close up and jam the saw
2. Of an operating rope; rope being held out of line by a log, stump, or other obstruction
3. Logs lying in such a position that they cannot easily be extracted.

Bottleneck
A term describing a critical part of the harvesting process, where reduced activity or capacity can affect the total output.

Breaker out
The title of the worker who scouts for the next drag and hooks on stems.

Breaking out
The work activity of the breaker out for cable skidders and tractors; the combined process of hooking-on and winching or accumulating a drag and getting it moving (dislodging the drag from other felled trees) to a travel speed for extraction.

Bridle
A stropping technique where two wire rope strops are used to connect to a stem where a single strop is too short.

Butt
The large end of a felled stem or tree.

Choker
Short length of wire rope or chain fitted with hooks, which forms a noose around stems to be extracted. (see Strop)

Clearfell
A term describing the non selective harvesting of all standing trees.

COPS
Cabin Operator Protective Structure - intended to protect equipment operators from injuries caused by rolling over, falling objects and objects entering the cabin. (ROPS, FOPS and OPS)

Cut over
A term for the logged area after felling and extraction.

Dehydration
Insufficient water for normal body function.

Double stropping
The encirclement of two stems by one strop.

Drag
A group of stems or trees collectively attached to a machine for extraction. Also known as a haul.

Excavator
A tracked, turntable-mounted, boom-equipped machine primarily designed for digging and transferring soil or rock. Configured as a log or stem loader, using a grapple, for harvesting operations, or as a base or carrier for felling or harvester heads.

Extraction cycle
The total time taken to acquire, extract, and offload one drag and return to the felling site.

Extraction direction
The direction in which the extraction machine is expected to extract drags or loads to the landing.

Ferrule
A fitting that is pressed, wedged, or filled with white metal and affixed to the end of a wire rope.

FOPS
Falling Object Protective Structure (see COPS)

Harvest plan
A document detailing the timing and nature of a number of harvesting operations in a given area, i.e. logging systems to be used, timing, skid or landing locations, haul directions, environmental and safety considerations,.

Head (of a tree)
The top or tip of the felled tree.

Health hazard
An occurrence, condition, or situation, often arising off-site, that could adversely affect the general health of a worker.

Job prescription
The document, provided by the forest owner or manager to a selected contractor, detailing all the requirements and conditions associated with a particular operation.

Logging operations
The forestry processes and activities of felling, extraction, processing, and loading.

Occupational Overuse Syndrome (OOS)
Describes work-related disorders of the musculo-skeletal system.

Operational
The plan formulated by the contractor or crew manager that specifies how the job is to be done.
Normally a short-term plan that will be modified as the job proceeds.

Operational hazard
An occurrence, condition, or situation arising on-site that could adversely affect the health of a worker through physical injury.

OPS
Operator Protection Structure - designed to prevent objects entering the cab and injuring the operator.

Piece size
The size of a tree which has been felled. Normally, the size to the first break at approximately $^{2}/_{3}$ total tree height.

Pre-stropping
Where the strops are connected to the stems for the next drag while the previous drag is being extracted.

ROPS
Roll Over Protective Structure. Intended to protect equipment operators from injuries caused by machinery overturns or rollovers. To be fitted to any mobile plant operated anywhere except on level ground. Excavators are exempt and require COPS.

Shock-loading
The sudden loading of a rope or structure which exceeds the safe working load. Can result in premature wear or failure of the rope, chain, or structure.

Stem
A tree which has been prepared for extraction by felling and possible delimbing. Distinct from a log, which is cut from a stem.

Strop
Short length of wire rope or chain fitted with hooks, which forms a noose around stems to be extracted. (see Choker)

SWL
Safe Working Load - A calculated operating load that can be applied to a wire rope or chain. In forestry this is $^{1}/_{3}$ of the breaking strength. Working within the SWL ensures that the rope will not wear rapidly or fail.

Tightlining
Tightening the mainrope and tailrope by braking one against the other.

Tensile grade
The tensile strength of the steel used to form the wires of a rope.

Tree size
The size of the tree, up to the minimum small-end diameter, as it stands.

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BEST PRACTICE GUIDE

FOREST OWNERS ASSOCIATION

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