Best Practice Guidelines for Manual log-making and processing

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Revised edition January 2005
This Best Practice Guideline is to be used as a guide to manual log-making and processing. It does not supersede legislation in any jurisdiction or the recommendations of equipment manufacturers.
FITEC believes that the information in the guideline is accurate and reliable; however, FITEC notes that conditions vary greatly from one geographical area to another; that a greater variety of equipment and techniques are currently in use; and other (or additional) measures may be appropriate in a given situation.

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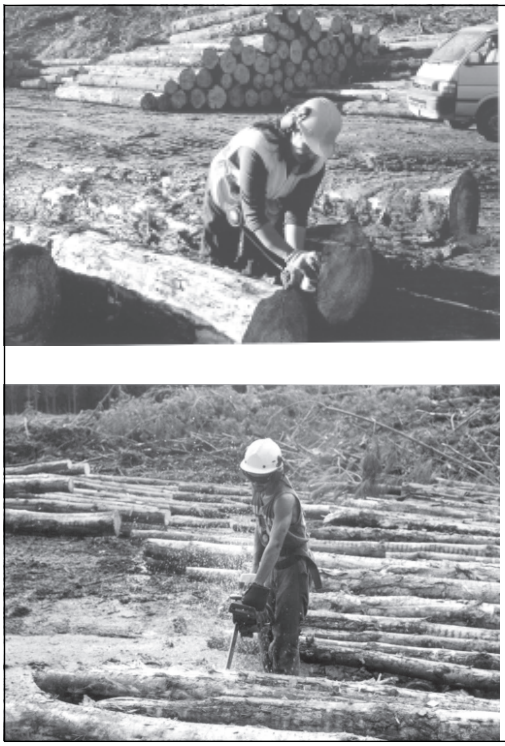
Manual log-making and processing basics



What is manual log-making and processing?

Manual log-making and processing is about deciding what logs to cut from a stem according to your current cut plan or cutting instructions. Then the logs are cut with a handheld chainsaw.

Manual log-making and processing usually occurs on the landing to which the stems were extracted. Sometimes this happens on a separate processing landing.

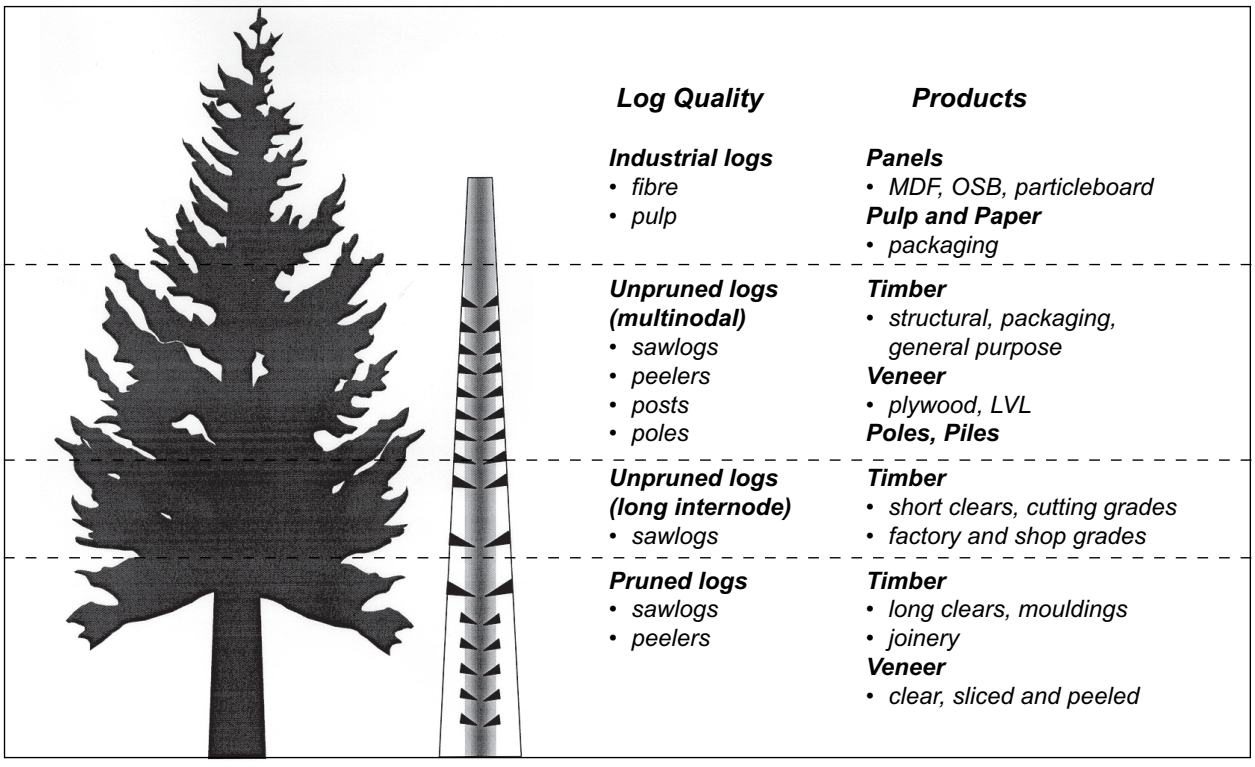
These Best Practice Guidelines for Manual Log-Making and Processing focus on the following landing activities:

- Unhooking the drag
- Grading, measuring and marking logs
- Stem cutting

The extraction and loading phases of a logging operation are covered in separate best practice guidelines.

Aims of log-making and processing

The aim of log-making and processing is to produce the optimal value combination of log products from individual stems. This should also be done in a safe and efficient manner. This ultimate aim is to obtain the best value for the forest owner.



Log qualities and products

A tree contains a range of log qualities, from pruned logs at the bottom to industrial logs at the top. Each of these has different log characteristics and intended markets. Each product is also worth different amounts of money.

In setting up a cut plan for the stand, the forest owner's goal is to maximise stand value. This is not as simple as cutting up the stem to yield the most valuable products. Ideally, the cut plan should accommodate:

- Market requirements for logs
- Stock levels.

As these change, the potential value of the stand will change.

Log quality standards are used to make sure that a log product matches a customer's requirements. For instance, in high-quality framing logs, all knots may have to be less than 7 cm in diameter.

Scheduled log types or grades

A scheduled log type or grade is a shortened description that separates one type or grade from another.

A log grade is a defined standard. The log specification is a set of log attribute rules which define the log grade. Log grades allow for different logs to meet different market requirements.

This allows increased value to be obtained from each stem.

The process of log-making aims to maximise stem value while meeting market requirements. This is called log value optimisation. The actual mix of grades cut is driven by log priority or relative values decided by the forest owner.

Different parts of the forest, or stands, can produce different amounts of certain log grades.

Defining log grades allows the forest resource to be matched to the market. This makes the best use of the forest as a resource.

A Log Specification Manual includes:

- Features of a particular log type that makes it different from others, such as quality (e.g., pruned or unpruned)
- Log lengths, and allowable defects or attributes.

Note: Different forest owners may have different specifications and grade names.

Some generalised log grades and their end-uses — an example

Log grade	Typical (relative) value ($/m^3)	Quality features	End-use (products)
Peeler	150	Length, size, ovality, central pith. No needle flecks, resin pockets, mechanical damage, sweep, nodal swelling, fluting.	Veneer appearance grades
Pruned butt		PLI (Pruned Log Index), size, length. No resin pockets, intra-ring checking, mechanical damage, nodal swelling.	NZ clear grades, US moulding and Shop grades
P1	167		
P2	136		
Sawlog		Branch sizes, basic density, shape, branch frequency.	Framing, Dressing,and Shop grades, Boxing
S1	98		
S2	88		
L1L2	67		
S3L3	65		

Some generalised log grades and their end-uses — an example (cont...)			
Log grade	**Typical (relative) value ($/m^3)**	**Quality features**	**End-use (products)**
Pulp	38	Density, tree age, time since felling, species.	Paper industry
Oversize	9		Pulp for the paper industry
Smallwood	55	Branch sizes.	Fence posts, strainers, poles for buildings
Internodal	95	Distance between whorls.	Finger-jointed beams, mouldings, furniture
Export		As for domestic grades above.	As for domestic grades.
Pruned	211		
Unpruned A	112		A significant use for smaller sawlogs is packing.
J grade	87		
K grade	83		
Pulp	51		

Roles and responsibilities in log-making

Log-maker

The log-maker manages the log-making and processing activities to comply with the grade-mix specified by the forest owner. Logs produced also need to be produced to the right specifications (in-spec) and on time. The log-maker is responsible for the quality of all logs leaving the operation.

Log-making has a big influence on crew productivity, because it is one of the last operations in the chain of harvesting activities. For instance, felling and extraction rates may exceed target. However, this cannot be translated into value until logs are marked and processed.

Log-makers have a range of management responsibilities, including:

- Assessing and marking stems for cutting
- Managing quality control
- Managing sorting and stacking operations.

The log-maker usually has supervisory control over:

- His/her assistant
- Skiddies or skid workers
- The loader operator.

Log-maker's assistant

The role of the log-maker's assistant is to assist the log-maker.

The assistant helps the log-maker by:

- Holding the logger's tape
- Recognising defects and measuring sweep
- Log-making in the log-maker's absence.

Skid workers (Skiddies)

Skiddies are expected to:

- Unhook drags
- Assist the log-maker
- Trim all accessible branches or stubs flush, avoiding stem damage
- Process at a rate meeting operational needs
- Cut logs accurately to marked lengths, without splitting or slabbing
- Carry out branding or stencilling of logs
- Carry out log checking or quality control (QC)
- If necessary, re-manufacture logs (re-cut logs found to be out of specification).

A skiddy carrying out quality control (QC) — checking logs for length and grade

Stem and log attribute identification and measurement

A number of stem or log attributes are recognised and/or measured during log-making. Some are considered defects.

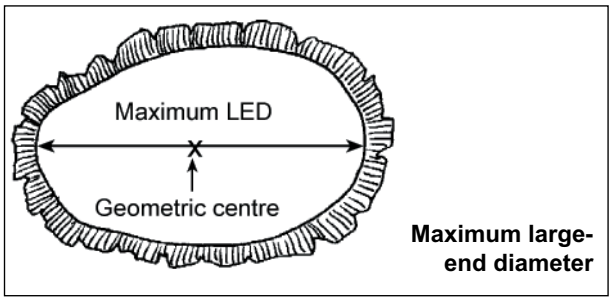
- Geometric centre
- Length
- Cut face
- Knots
- Pruned/Unpruned
- Taper
- Kink
- Nodal swelling
- Pith centre
- Malform
- Sloven
- Draw wood
- Pulled wood
- Slabbing
- Holes
- Insect infestation
- Sapstain
- Large-end diameter (LED)
- Small-end diameter (SED)
- Collar
- Spike knot
- Internode
- Sweep
- Wobble
- Out of round/Ovality
- Crutch
- Fluting
- Scarf face
- Machine or stem damage
- Shatter
- Split
- Incorrect cutting
- Rot

Note: The following definitions and guides to measurement are not intended to replace similar guides supplied by forest owners or managers, who have often developed their own systems for their own specific purposes and markets. Guides supplied by employing organisations must be followed for all operational log-making decisions.

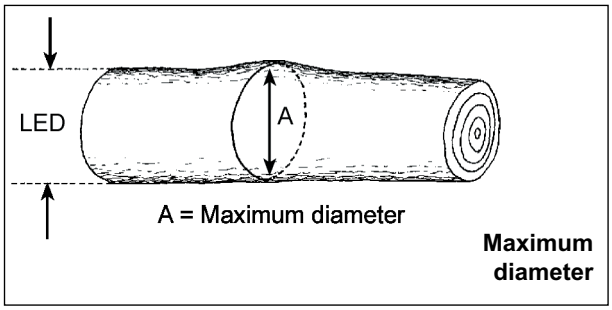
Geometric centre (or middle)

The geometric centre of a circular area is the centre of a circle which has an end-area based on the average of two diameters.

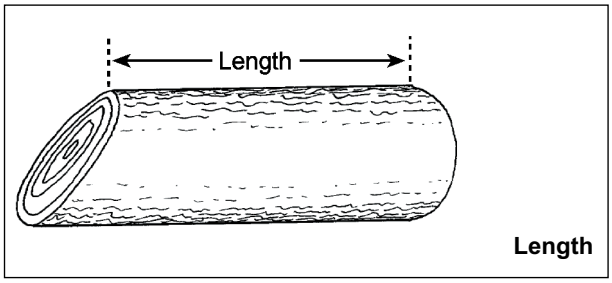
In practice this is located by eye. A useful aid is to imagine the mounting of the log end on a lathe. The chuck centre is then placed at the geometric centre.



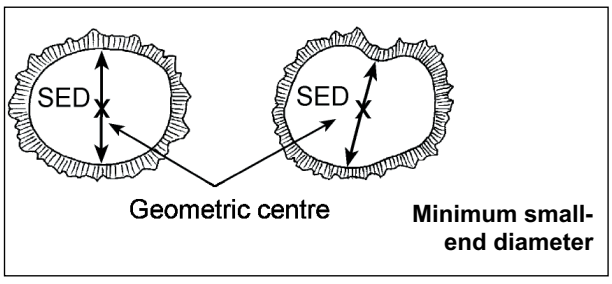
Maximum large-end diameter



Maximum diameter



Length



Minimum small-end diameter

Large-end diameter (LED)

Maximum large-end diameter

The maximum diameter (cm) as measured inside bark at the large end of the log (usually closest to the butt). The measurement is of the longest diameter through the geometric centre of the log.

Large-end diameter

The average of two measurements. The first to be measured is the minimum diameter. This is on a line taken through the geometric centre. The second is on a line at right angles to the first (also through the geometric centre).

Maximum diameter

The largest diameter present in the whole log.

Length

The length of the log is the distance measured along the shortest straight distance between the cut ends.

Measure length in metres to two decimal places (e.g., 4.95 m, 5.50 m).

Tolerances

Lengths may often be cut to a defined tolerance, and tolerances vary according to organisational requirements. Typical tolerances might be ±5 cm, or alternatively –0 and +5 cm.

Small-End Diameter (SED)

Minimum small-end diameter

The minimum diameter (cm) as measured inside bark at the small end of the log. The minimum SED is the shortest distance through the geometric centre of the log small end. The measurement line does not have to pass through the pith.

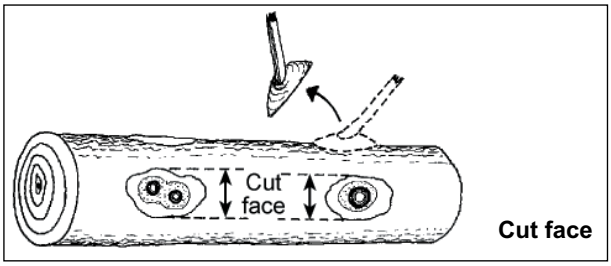
Small-end diameter

The average of two measurements. The first to be measured is the minimum diameter, on a line taken through the geometric centre. The second is on a line at right angles to the first (also through the geometric centre).

Cut face

The cut face is a result of removal of nodal swelling around a knot or knots. This leaves a cut surface on the log, larger than the diameter of the branch(es).

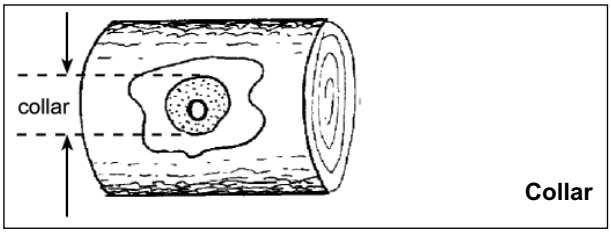
The cut face is measured in centimetres at right angles to the axis of the log at its widest point.



Cut face

Collar

The collar is a single, sometimes irregularly-shaped, ring of wood surrounding the knot. It is not usually included in knot measurement.



Collar

Knots

A knot is defined as where a branch has been cut off flush with the stem.

There are two methods for measuring knot size:

(1) Measure at right angles to the log length

(2) Measure the maximum diameter.

With either method, the cut face is not included in the measurement.

Method 1

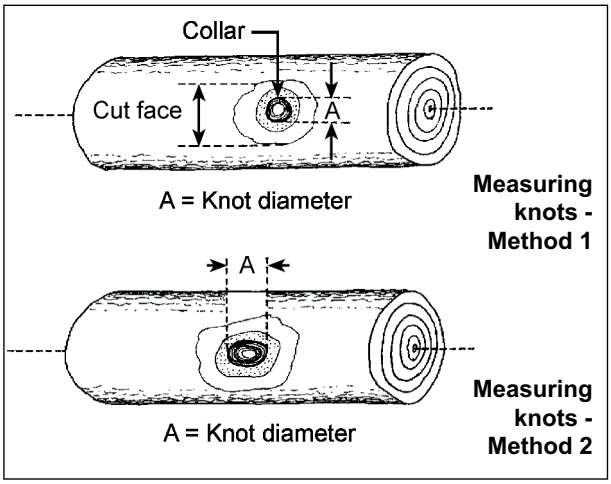
Measure the diameter (in centimetres) of the knot that is at right-angles to the axis of the log, at the maximum dimension.

Ensure that the cut face is not included in the measurement.

Method 2

Measure the knot at its maximum dimension, ensuring that the cut face is not included in the measurement.

Unless otherwise stated, Method 1 is the standard method to be used.



Measuring knots - Method 1

Measuring knots - Method 2

Effects on the log or end-products:

- Not allowed in pruned logs
- Log quality reduces with increasing knot size.

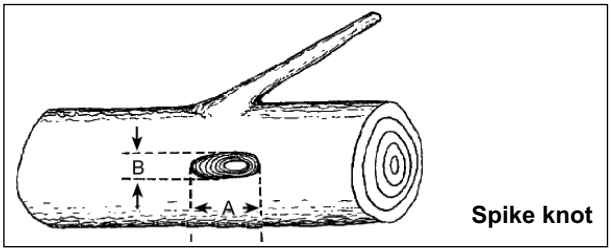
Spike knot

Spike knots are the result of acutely angled branches.

These knots are often measured by comparing the length of the knot parallel to the log axis (A), with the knot's width (B). A high ratio of A:B (e.g., where length is more than four times the diameter) will indicate a more serious defect.

Effects on the log and end-product:

- Reduces quality
- Reduces value
- Makes material unsuitable for peeling or for some sawn products.

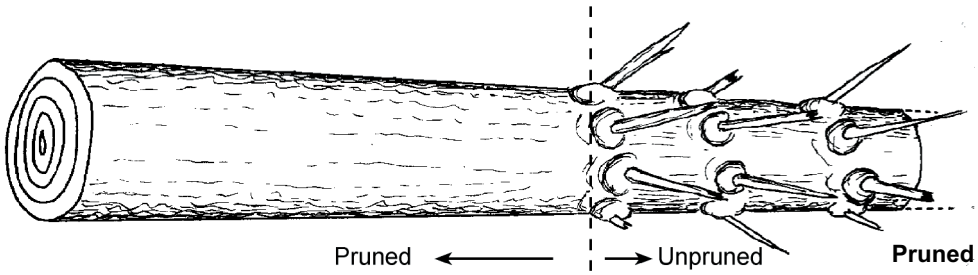


Spike knot

Pruned/unpruned

The pruned zone extends from the butt to where the branches of the first whorl begin. In practice, this over-estimates the pruned length because branches slant back to the pith.

The unpruned zone extends “above” the pruned zone.

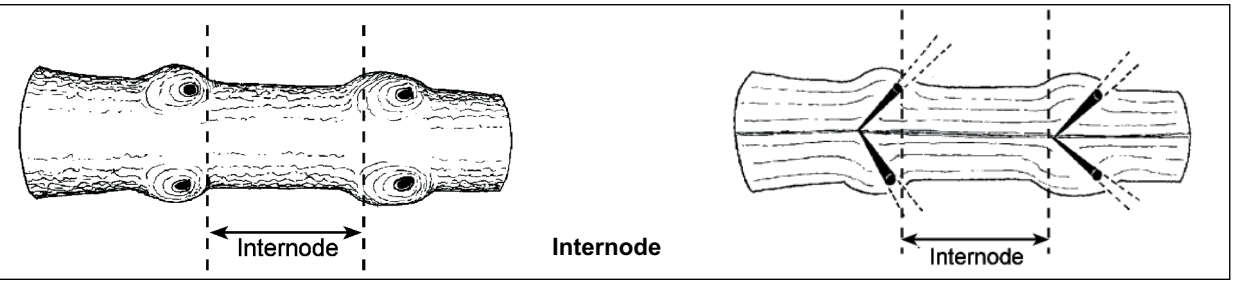


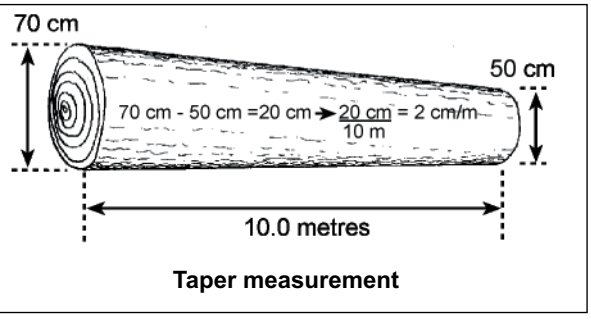
Pruned and unpruned zones

Internode

An internode is a knot-free section of the log.

Measurement is of the shortest length parallel to the log axis. Usually, an internode is described as such when the whole circumference is knot-free.





Taper measurement

Taper

Taper is the diameter change per unit of length, expressed as a ratio.

It is calculated as one diameter measurement minus another. This value is then divided by the length of log between the measurement points. Taper is expressed in centimetres per metre.

Excessive taper at the butt is termed butt flare.

Butt flare is measured from the tip of the flare to the outside edge of the log on the line of normal projected taper.

Sweep

Sweep is defined as a predominant curve or bend in a single direction or plane. Wobble may also be present within the predominant curve and must be measured independently.

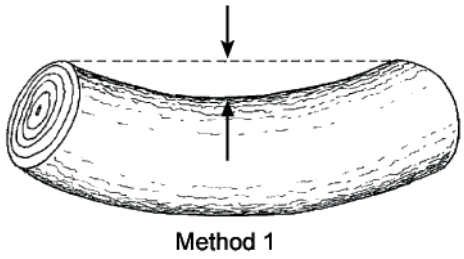
There are two measurement methods:

Method 1

The allowable deflection must not exceed a proportion of the SED (e.g., SED/2) of the log produced.

Sweep is measured over the length of the log (unless specified otherwise in the log specification). Hold a tape tight across the inner side of the bend, and measure the distance between the log and the tape at the widest point. Measure the gap in centimetres (cm).

If the logger's tape is held outside bark, the gap should also be measured outside bark. If the measuring tape is inside bark, the gap should also be measured inside bark.

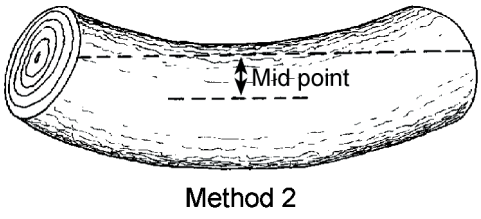


Measuring sweep — Method 1

Method 2

Hold a tape tight along the stem between the centres of the log ends. Measure the distance between the tape and the log centre line at the point of maximum sweep.

The allowable deflection must not exceed a proportion of the SED (e.g., SED/2) of the log produced.



Measuring sweep — Method 2

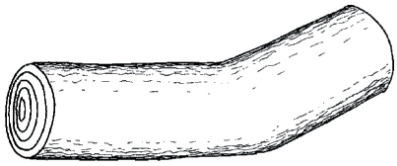
Kink

A kink is a short deflection within part of a stem. In logs it appears as a sharp change in the direction of the axis of the log.

It is measured using a similar method to that for sweep.

Effects on the log and end-product:

- Reduces quality
- Reduces value
- It is usually cut out of stem, otherwise treated as for sweep.

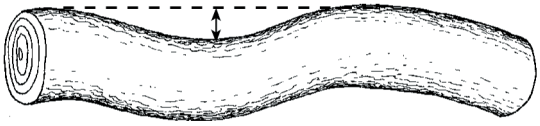


Kink

Wobble

Wobble defect is more than one bend over the length of the log. It can also be described as sweep in more than one plane.

Wobble is measured using the same methods as for sweep.



Wobble

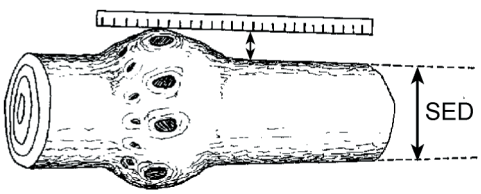
Nodal swelling

Nodal swelling occurs around a branch node (includes nodal swelling in pruned logs).

The swelling is measured as the maximum distance between two points:

- The top of the swelling (not the branch stub) parallel to the overall taper of the log,
- The SED side of the log where it resumes its "normal" shape.

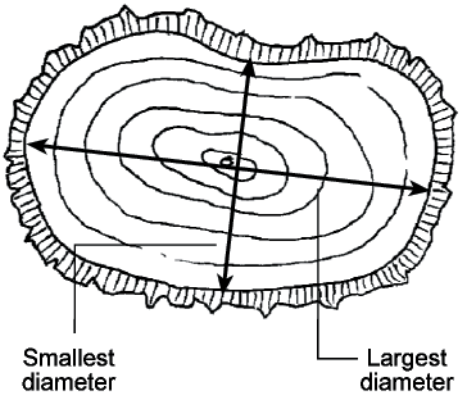
It is recommended that the measurement be made using a straight edge ruler and a short tape.



Nodal swelling

Effects on the log and end-product:

- Reduces value
- Reduces quality
- Makes material difficult to transport, or process (de-bark, primary saw breakdown).



Out of round/ovality

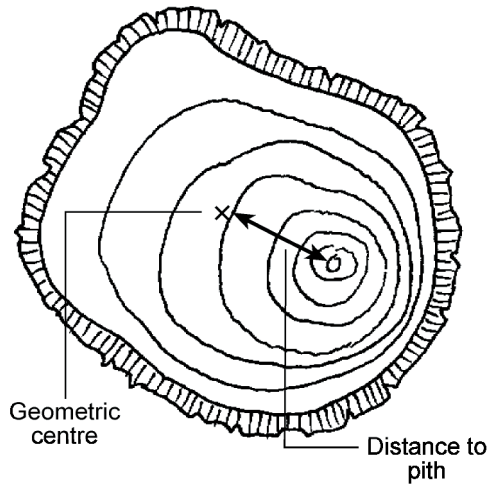
Out of round/ovality

Out of round, or ovality, of a log is the difference between the shortest and the longest diameter at one end.

The defect is measured as the smallest diameter subtracted from the largest diameter. This should not exceed a given value. The larger diameter is usually measured at right angles to the smaller diameter.

Effects on the log and end-product:

- Reduces quality
- Reduces value
- Causes loss of sawn product volume, poor veneer product.



Pith centre

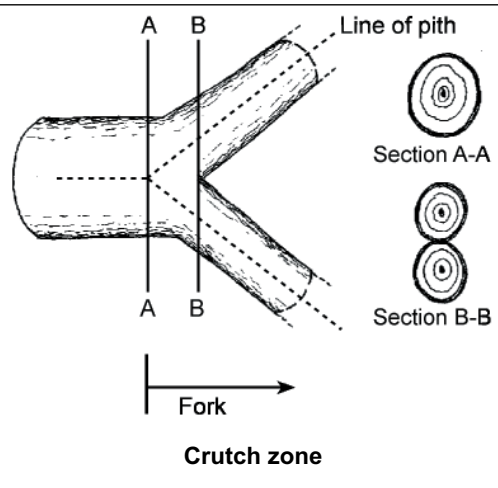
Pith centre

The pith centre is where the pith lies in relation to the centre of the log. The pith is not necessarily the centre of the log.

First, the geometric centre of the log is found. The defect is measured as the distance from this point to the centre of the pith in centimetres (cm).

Effects on the log and end-product:

- Reduces quality
- Reduces value
- Affects appearance in veneer product; affects appearance and quality in sawn product.



Crutch zone

Crutch

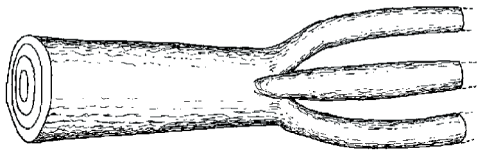
The crutch zone is the part of the stem from where the pith diverges, to where the two stems diverge. A fork is where two diverging stems remain attached to the crutch zone.

The crutch zone is assessed by observation.

Malform

Some common types of malformation include:

- Forks
- Basket whorls
- Ramicorn branches.



Basket whorl

Forks are usually caused by the loss of a leader by disease or animal damage. The lost leader is then replaced by two other leaders. Basket whorls are multiple forks coming from the same whorl. They are also usually a response to leader damage.

Ramicorn branches are large, steep-angled branches. A smaller, trimmed, ramicorn branch is termed a spike knot.

Malformations may also include kink, wobble, and sweep.

Malformation has the effect of limiting the potential value of a stem. Most areas affected are cut to waste. This is because resulting logs are difficult to handle, transport, or process by the end-user.

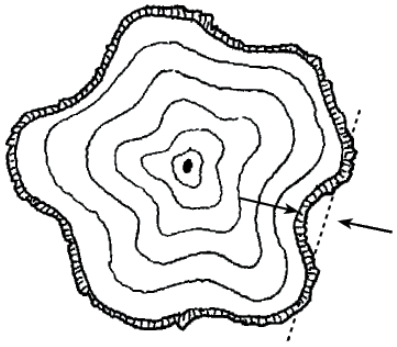
Fluting

Fluting is a depression in the circumference of the butt of a stem. It is often due to creasing of the bark or the growing together of buttresses.

It is measured as maximum depth in centimetres from a straight line (measured under bark).

Effects on the log and end-product:

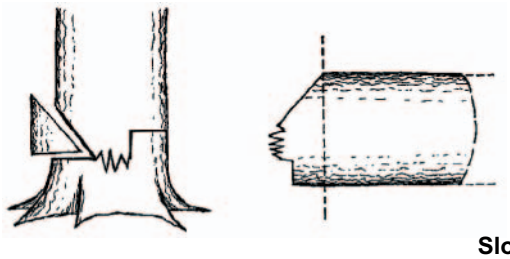
- Reduces quality (depends on sawing method)
- Reduces value (depends on sawing method)
- Can cause bark wane on boards.



Fluting

Sloven

The sloven is the unwanted portion of the stem butt that retains the shape of the felling cut/s. It is usually removed in order to obtain a flat end-face, and to remove felling-related draw wood defect. Sometimes a limited amount of scarf face is allowed on the end of the log, depending on the log grade.

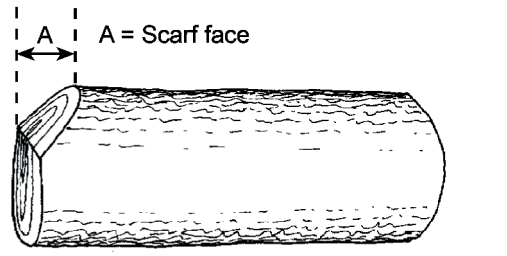


Sloven

Scarf face

The part of the scarf top cut that is retained on the log.

The scarf face is measured as a length along the axis of the log.

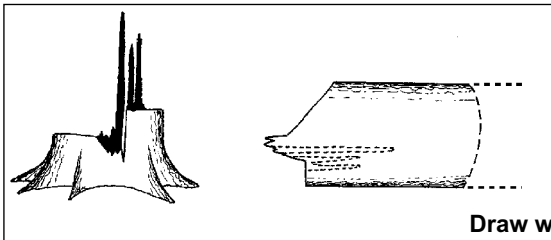


Scarf face

Draw wood

Draw wood defect occurs as a hole or holes at the large end of the stem. It is normally caused when wood fibre is pulled out during felling or cross cutting. Draw wood holes may remain despite the cutting of the sloven.

The depth of the hole is measured in centimetres (cm).

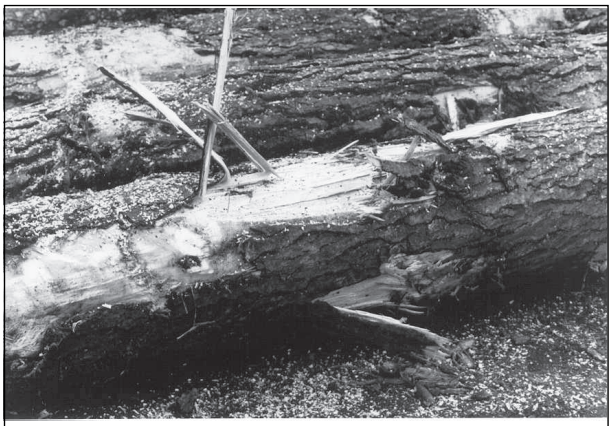


Draw wood

Effects on the log and end-product:

- Reduces quality
- Reduces value
- Results in shorter lengths of board to be cut, and sorting problems

Machine or saw damage



An example of machine damage caused by a grapple loader

Machine damage is log damage caused by:

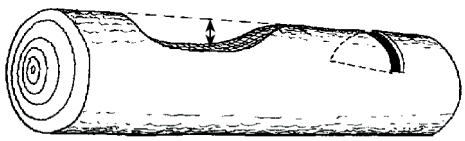
- Harvester drive rollers and knives
- Delimber knives
- Extraction machine blades or grapples
- Loader forks, tines, or grapples.

Damage may differ in terms of depth, width, and length.

Other kinds of damage which have a similar effect include:

- Partial chainsaw cuts
- Holes
- Pulled branches.

The depth of the damage is measured at a maximum point from a straight line of non-damaged stem inside bark. This can be measured as a percentage of the SED. It can also be measured as a specified gap in centimetres (cm).

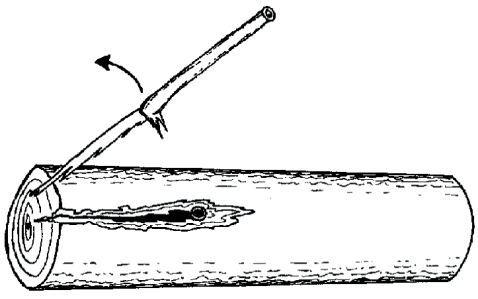


Measuring the depth of stem damage

Effects on the log and end-product:

- Reduces quality
- Reduces value
- Causes damage to boards, pins and fines within chips making them unsuitable for pulping

Pulled wood



Pulled wood

Pulled wood refers to where the branch is pulled free of the tree. This is usually against its natural growth angle and often after it has been partially cut. The effect is to tear a slab of wood from the stem, and this usually includes the knot.

Pulled wood damage can occur when:

- Stems are extracted by the tip
- Stems are delimbed tip-first
- The delimbing knife is driven back from the tip towards the butt.

Pulled wood damage can include wood pulled or drawn from part of the knot area (i.e., not a clean cut) by delimbing knives.

Pulled wood is measured as for machine or stem damage.

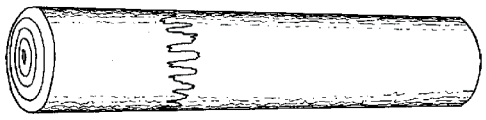
Effects on the log and end-products:

- Reduces quality
- Reduces value
- Reduces volume of useable sawn product.

Shatter

Shatter is a breakage of fibre within the stem. It is often caused during felling, or during cable extraction.

Shatter is assessed by examination of the stem.



Shatter

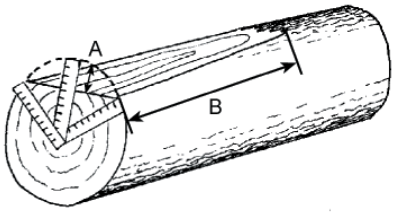
Slabbing

Slabbing of logs is the loss of wood from the side of the log, often towards the ends. It is caused by incorrect cutting, usually of the part of the log under compression.

Slabbing can be assessed by taking the measurements indicated in the diagram.

Effects on the log and end-products:

- Reduces quality
- Reduces value, often because of reduced SED measurement (JAS)
- Reduces volume for end-use, either peeled or sawn.



Measuring slabbing

A = the greatest distance from the edge of the slab to the outside of the log prior to slab removal. This is measured by using a ruler swung in an arc to approximate the outside of the log prior to slab removal. The maximum deviation is measured.

B = distance in centimetres.

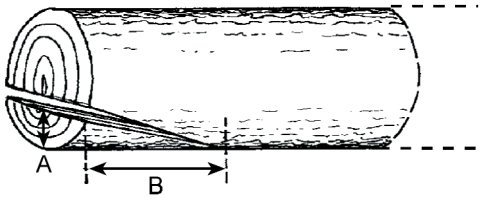
Split

A split is a crack or fracture of the log visible from the log end. It is measured as indicated in the diagram.

Normally, B is measured only if A is outside the allowable tolerance.

Effects on the log and end-products:

- Reduces quality
- Reduces value
- Reduces useable volume for peeled or sawn product.



Split

A = the greatest distance from the edge of the log to the split, measured at right angles to the split (on the shortest side).

B = an absolute distance in centimetres.

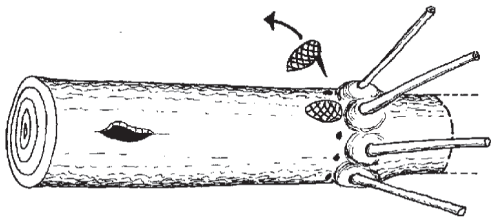
Holes

Holes in the stem or log include cone-holes, or holes caused by other means. Cone holes can be considered small bark-encased knots.

Depth of hole is measured in centimetres.

Effects on the log and end-products:

- Reduces quality
- Reduces value
- Causes bark-encased knots in boards, and holes in veneer if peeled.



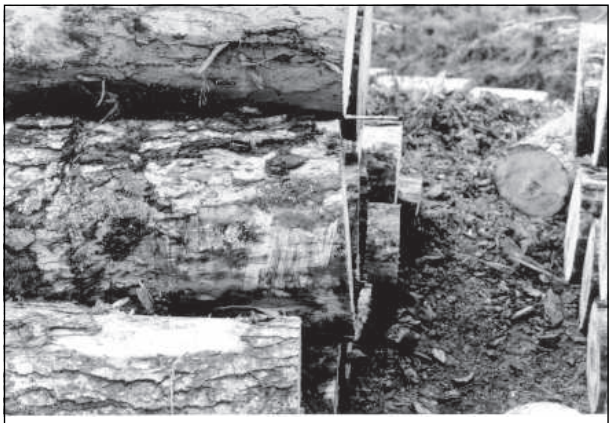
Holes in the stem

Incorrect cutting

End-cuts should be at right angles to the centreline of the log.

Incorrect cutting may occur as a result of either faulty equipment or work method, including:

- Unevenly sharpened cutters
- Loose chain
- Worn or damaged chainsaw bar
- Careless cutting.

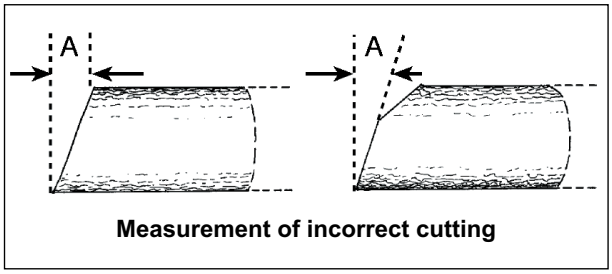


An example of incorrect cutting

The measurement (A) is taken from the shortest point of the crosscut, to a point at right angles to the longest point of the crosscut. When a tolerance is specified, it is measured as a percentage of the log diameter (measured in cm). Where the log has scarf face included, this is not considered to be part of the end cut angle.

Effects on the log and end-products:

- Short log length causes downgrade to next length, loss of volume
- Reduces value
- Causes shorter boards, with poor width control if peeled for veneer.



Measurement of incorrect cutting

Insect infestation

Insect infestation is attack of stems by wood boring or bark chewing insects. Evidence of infestation is normally the presence of the insects, larvae, or frass and holes. On the stem the clearest indication of insect attack is holes in branch ends, or a yellowing of the log or stem end.

All assessment is by observation.

Effects on the log and end-products:

- Reduces quality
- Reduces value
- Makes material unacceptable for sawn timber, and so it is downgraded to pulp or waste. Insect infestation is usually cut out, resulting in a shorter log.

Rot

Rot is wood decayed as a result of action by bacteria or fungi. The affected wood can be soft and spongy to the touch.

Assessment is by observation.

Effects on the log and end-products:

- Reduces quality
- Reduces value
- Causes rotten wood which is unsuitable for any end-use.

Sapstain

Sapstain occurs as a result of infestation of logs by fungi. A common form of sapstain is bluestain. Exposed sapwood is colonised first. Sapstain fungi favour warm, humid conditions.

Assessment is by observation.

Sapstain can range in colour from light grey to black, and will penetrate into the log.

Effects on the log and end-products:

- Reduces quality
- Reduces value
- Is unacceptable in appearance grades because of its dark colouration.

Cutting instructions and log specifications

Information about log types or grades is found in two places:

- A Log Specification Manual
- The current cutting instructions (CI).

Both of these documents should be available on-site for reference. A Log Attributes Guide with information on defect description and measurement should also be available. The Log Specification Manual and Log Attributes Guide may be combined in one reference booklet. All documents must be current in order to be valid for use.

Log specifications

The Log Specification Manual contains information such as:

- Company name
- A revision date or copy number
- A listing of all log grades or types
- Specific log types
- Species referred to
- Diameter and length information
- Associated allowable defects and measurement criteria, e.g., knots <10 cm
- General comments
- Log age restrictions or rotation dates, etc.
- Branding or marking details such as symbols, colour, brand frequency
- Pruned log index (PLI).

Example of a log specification

25/05/01

	H 30			
	PREFERRED		UNPREFERRED	
LENGTHS	4.89 m	(4.87 – 4.92)	3.69 m	(3.67 – 3.72)
	5.49 m	(5.47 – 5.52)	4.29 m	(4.27 – 4.32)
	6.09 m	(6.07 – 6.12)		
DIAMETERS	Minimum	SED	30 cm	
	Maximum	LED	50 cm	52 cm if straight
KNOTS	Maximum 15 cm including collar and not to exceed 1/3 SED			
	Spike knots maximum 8 cm, not to exceed 1/4 SED			
SWEEP	A maximum sweep of SED/4 over log length permitted			
WOBBLE	Up to 5 cm wobble is permitted			
KINK	Not permitted			
OVALITY	No restriction			
PITH	No restriction			
FLUTING	No restriction			
NODAL SWELLING	5 cm			
BARK DAMAGE	Bark damage resulting in decay not permitted			
GENERAL	No draw wood, rot, stain, dry wood, or splits. Ends cut square. Trim flush with log. Maximum depth of superficial damage 1 cm under bark (e.g., machine damage, partial sawcuts).			
MARKING	Every log to have crew number stencilled in blue. Blue stencilled “H” on every 5th log. Felling date on every 1/10th log (in pen or crayon).			

DOCKET	INFORMATION
LOG TYPE	Sawlog
GRADE	H 30
LENGTH	Random short
CUSTOMER	Acme Sawmilling Co.
UNLOADING POINT	Rotorua

Cutting instructions

Organisational requirements

Cutting instructions are developed to meet marketing requirements.

Cutting instructions must be current and valid for use before they are applied in operational log-making. They contain information such as:

- Company name
- Compartment or stand
- Priority of cut
- Length and diameter information
- Comments
- Crew name
- Date
- Log type
- Sweep or other defect allowances
- Destination of log grade

Example of a Cutting Instruction

CUTTING INSTRUCTION **ACME FORESTS LTD**

CREW: LOGGER 2000 CPT/STAND: 52/1 DATE: 25/05/01

PRIORITY	GRADE	LENGTH	MIN SED	MAX DIA	MAX KNOT	MAX SWEEP	STENCIL	COMMENTS CUT TO ORDER	EST PROD	NEXT WEEK
160	A	5.30	40	85	Nil	SED/6	A	Pith in central 3rd, Max Ovality 4cm	1.0	
145	B	6.50	38	80	Nil	SED/4	B		1.0	
142	C	4.90	38	80	Nil	SED/4	C		1.0	
140	D	4.15	38	120	Nil	SED/8	D	Pith in central 3rd.	1.0	
								Ovality 20% of diameter up to max of 10cm	1.0	
135	E	4.30	38	80	Nil	SED/4	E		1.0	
130	F	3.70	38	80	Nil	SED/4	F		1.0	
110	G	12.13	32	60	10	SED/2			1.0	
105	H	5.30	35	90	6	SED/6	H	Pith in central 3rd, Max ovality 4cm	1.0	
90	I	6.08	32	60	10	SED/4			1.0	
88	J	5.48	32	60	10	SED/4			1.0	
84	K	4.88	32	80	10	SED/4			1.0	
77	L	4.85	16	20	5	SED/4	L	Stencil L on 1 in 10 logs	1.0	
75	M	3.70	50	UL	15	SED/4	M		1.0	
71	N	4.88	22	30	7	SED/4	N		1.0	
69	O	4.28	32	60	10	SED/4			1.0	
67	P	3.68	32	60	10	SED/4			1.0	
65	Q	6.05	22	50	10	SED/4	Q		1.0	
65	R	8.6 - 12.5	7	22	D/4			Crew No. on 1 in 10 logs on large end	1.0	
58	S	3.70	22	50	15	SED/4	S		1.0	
55	Total	3.7 - 8	7	18	D/4		T		1.0	
48	U	3.70	16	40	15	SED/4			1.0	
46	V	3.70	28	80	UL	SED/4		No double leaders allowed	1.0	
40	W	2.6 - 7m	10	55	UL			Double leaders OK, must be cut flush to stem	1.0	
40	X	1.6 - 2.4m	10	55	UL			Double leaders OK, must be cut flush to stem	1.0	
30	Y	2.4 - 6m	50	UL	UL			Double leaders OK, must be cut flush to stem	1.0	
	Total	All							26.0	

NOTES:

Changes to cutting instructions

Cutting instructions can be changed at any time. Usually, a new version is issued by fax or e-mail on the morning of, or preferably the evening before, the workday to which they apply. The current version may be changed verbally by the supervisor, harvesting manager, or other authorised person at any time. A written verification of the change should be issued within 24 hours.

The log-maker, the foreman or contractor, and the loader operator should hold copies of the current cutting instruction. Quality control staff may also hold a copy. When a cutting instruction is changed verbally, all copies should be amended as soon as possible.

If there is a slow response to cutting instruction changes, the effects will include:

- A shortage of some log grades produced
- A surplus of some other grades
- Less-valuable (unwanted) logs may be cut from each stem.

The surplus logs will be downgraded as they age. The result is a significant loss of value for the forest owner.

Theory of log-making

All log-making is carried out “as the log or stem lies”. This is because a log-maker cannot easily examine the underside of the log for defects. Later, quality control operations may re-grade or re-cut a log because of a previously missed defect.

The log-making process is centred on the attempt to cut the combination of logs that will produce the greatest value from a given stem. The cutting instruction is a guide to achieving this.

Deciding which log grade or length to mark/cut

The log grades and lengths that can be cut from a stem depend on four main stem attributes:

- The length of the pruned zone
- The position and length of the unpruned zone (large and small knot-zones)
- The stem diameter at any point
- The location and extent of sweep
- Any other defects that may be present in the stem

As log-making progresses, the pruned and unpruned sections are considered in turn. The boundary region between sections may involve additional decisions over which lengths and grades to cut.

As each target log is considered, its inclusion will also be based on the presence of other stem attributes or defects. These attributes or defects include SED, sweep, sapstain, spike knots, internodal qualities, etc. The allowed or disallowed features will be listed in the cutting instruction.

Priority and priority value

The choice of log to be made from a given stem section is made on a priority basis. The log grade in the cutting instruction may be assigned a priority value (e.g., 150). Log grades with the highest priority or priority value should be selected first. Usually grades at the top of the instruction list are higher priority than those towards the bottom.

The cutting instruction may present log lengths for a given log grade in two ways:

A. P1 3.7 m 4.1 m 6.1 m (listed on the same line)
The log lengths for “A” have equal priority. They are sometimes called random lengths.

B. P1 6.1
P2 3.7
Listed on different lines, the log lengths have different priorities/priority values, and can be considered to be different grades. They may also have different SED specifications.

Pruned zone

The aim of log-making in the pruned zone should be to maximise the use of pruned volume.

The log grade with the highest priority is considered first.

If pruned log lengths have the same priority (on the same line), a log combination that maximises the use of pruned material should be chosen. For instance, for 7.4 m of pruned length, 2 x 3.7-m logs should be marked, rather than a single 6.1-m log.

Unpruned zone

The approach taken is similar to that for the pruned zone. The cutting instruction may have a mix of grades and lengths, with both random lengths and fixed length logs listed.

The log grade with the highest priority is always considered first.

Fleet marks or log grade symbols

Pruned and unpruned logs may be marked with a symbol to guide the loader operator in telling grades apart. These symbols are not “official” markings. It is important that both loader operator and log-maker have agreed on the meaning of the symbols.

Dealing with some selected defects

Sweep

Sweep is initially assessed as the log-maker views the stem from the large end. Sweep is then measured using the logger’s tape and diameter tape as log lengths are marked.

Sweep defect measurement is usually expressed as a proportion of the SED of the target log (e.g., limit is SED/4).

The longest possible log should be marked (this usually has the highest priority value).

With severe sweep in one plane (not wobble), the positioning of a cut can apportion the defect so that two partially swept logs are cut. The cut will be made at, or near, the point of maximum sweep. Both logs cut should then be within specification for sweep.

Kink

If this defect occurs in a high-value part of the stem, it should probably be cut out and allocated to waste. The cutting instruction will indicate how the defect can be treated in lower value parts of the stem.

A single whorl of large knots in the high-value portion of the stem

This may occur at the beginning of the unpruned stem section. This defect will sometimes be cut out as waste to enable production of maximum volume of high-value log. A similar defect and treatment might apply to localised thinning damage or sapstain in the pruned zone.

Often, the forest owner or supervisor will have a policy on marking such defects to waste. This is because the alternative is to downgrade a larger high-value log.

Work area safety

Log-making and processing activities

Skidworkers and log-makers work as a team. A common work method uses a ratio of two skidworkers to one log-maker. This ratio depends on whether stems have previously been delimbed by machine, and on the number and size of branches.

Log-makers can assess and mark logs properly only when defects and log attributes can be measured. Slovens should be cut, and stems trimmed before they are marked and bucked.

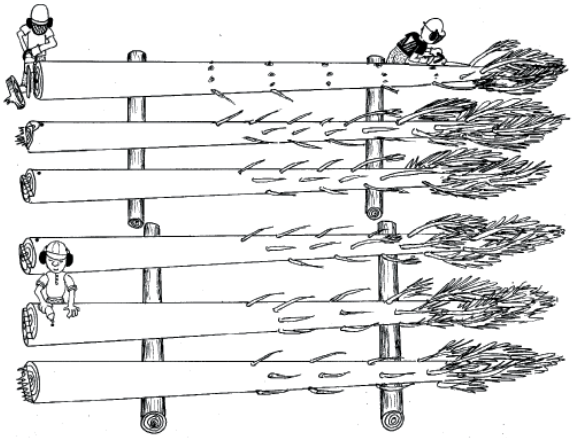
Log-makers often prefer bucking to take place more than two stems behind them because they can make better log allocation decisions when not working under tight production pressure.

The usual procedure is for the stems closest to the loader/fleeter’s position to be processed first. The outermost stem will be done first. Then slovens will be marked for cutting while the first stem is being trimmed.

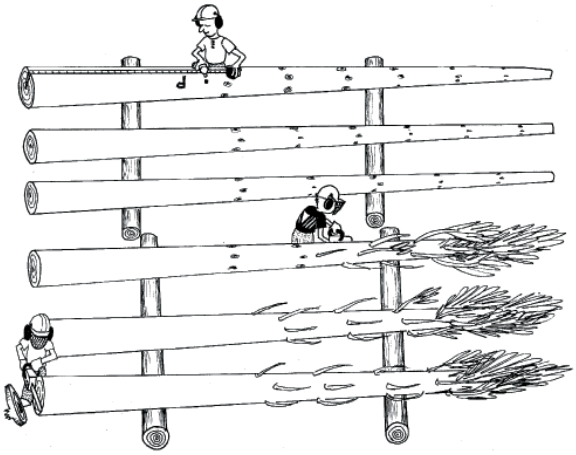
The log-maker will mark the first stem when it is trimmed and the sloven cut.

Skidworkers will trim ahead of the log-maker, and buck the stems when the log-maker has two or more stems marked.

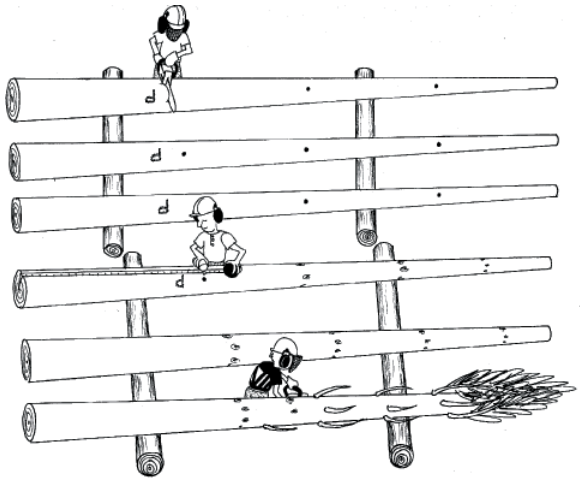
Processing organisation



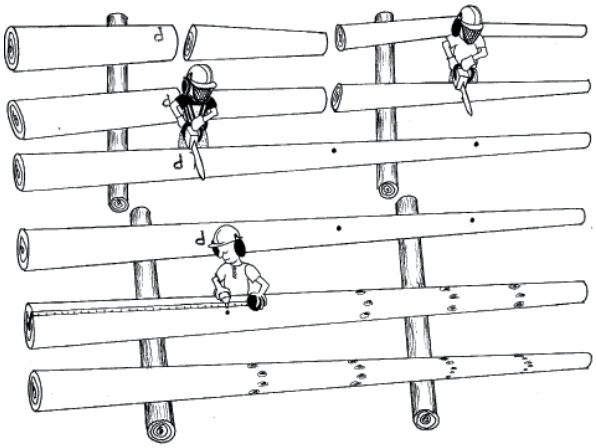
(1) The log-maker marks slovens for removal, and a skiddy starts trimming.



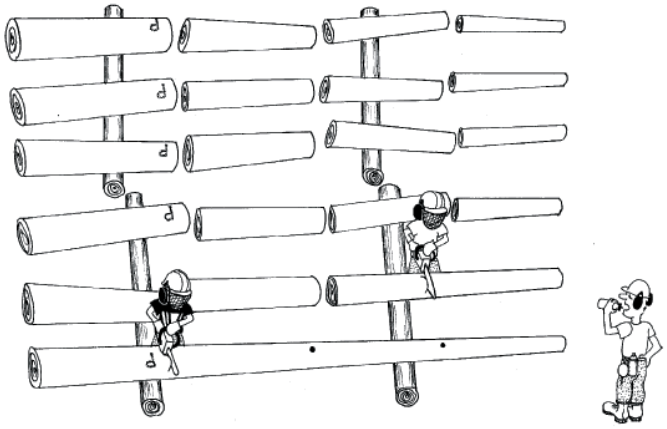
(2) With slovens cut, log-making begins.



(3) When the log-maker is a safe distance away, bucking can start.



(4) Log-making and bucking continue. The skiddy who has finished trimming can now assist with bucking. It is important to maintain a safe distance from chainsaw users.



(5) The log-maker has finished marking logs, and bucking will soon be completed.

Management of QC, branding, and stacking activities

Log-makers should plan the location of stacks, processing zones, safe zones, and checking or re-manufacturing areas. This should also involve the loader and extraction-machine operators.

Stack location is determined by factors such as:

- Landing size and shape
- Processing zone location
- Loadout or truck movement requirements
- Number of log grades
- Direction of extraction machine movement

Quality control

Log quality is often checked prior to stacking. If the landing is of sufficient size, a separate area may be set aside for quality control. At least one person will be carrying out this function on a full-time basis. He/she will check lengths and diameters of sawlogs and other high-quality logs. Skiddies will be called over to make any cuts necessary.

The log-maker should carry out daily checks on the quality of work, including grading, and branding or marking. Regular checks should be formalised, with a written record kept of log sample size, time of check, and results.

Branding

In most operations, logs are required to be branded. This may involve spraying a stencil with the company logo and marking the log grade and crew identification. Often a felling date will be transferred from the sloven to the large end, and from there to the logs when in the stacks. Logs are usually branded and marked when they have been fleeted to the stacks because access is easier and safer.

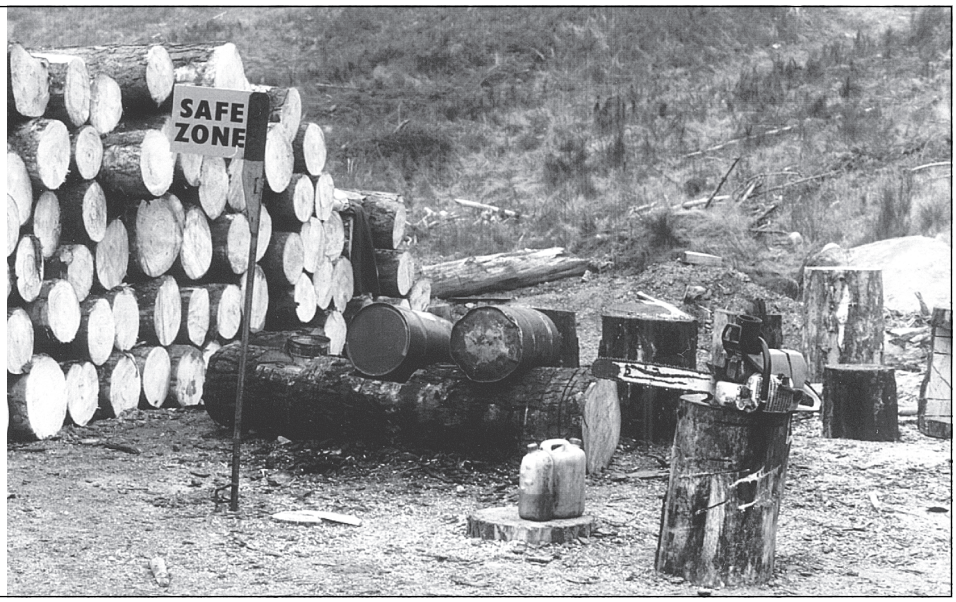
In many operations, higher-value logs are checked after log-making to see that they conform to specification for length, diameter, and sweep. Finding defects may mean re-cutting or marking the log. This checking is carried out by QC staff either in the processing area or at a separate checking area.

In the interests of safety, branding of logs to be high-stacked should be done on the ground before stacking.

Stacking

Regular communication with loading and fleeting staff should ensure that logs are segregated in the appropriate stacks.

The age of logs should also be managed to meet the forest owner's requirements. This will mean occasional re-location of selected stacks to bring older logs to the front (or top). This activity should not interfere with the flow of production.



A safe zone is a non-operational area where machines are not allowed to enter.

Landing Layout

Safe zones

Safe zones should be clearly identified and signposted. Before work, or immediately after any changes to landing layout, all workers required to work on the landing should be told the location of safe zones. They should also be advised of the conditions under which the zones may not be safe — e.g., when logs are being fleeted or taken from the stacks next to the safe zone.

Machines often work close to safe zones when fleeting and stacking. Staff working on foot must be aware of, and show consideration for, the work patterns of machinery and time their use to avoid conflict. Likewise, machine operators need to be aware of the requirements of skiddies. For example, skiddies need to service their saws between successive placements of stems in the processing zone.

Layout

Landing layout can vary according to the type of logging operation. Landing layout must consider:

- Safe zones for log-making/processing, saw maintenance, and branding equipment
- Extraction machine entry and exit relative to stems
- Logs, stacks, and their optimal location
- Quality control operations
- Loader movement for fleeting
- In some operations, truck access and loader movement
- Parking for crew transport and maintenance vehicles
- For cable hauler operations, chute and surge pile location and guyline positions.

The number of stems to be processed at a time will depend on:

- The landing area
- How much space is provided for access between stems. Enough space must be left between stems for accurate log-making, and for safe processing.

Landing areas should enable log-making and processing to be unhindered by extraction and fleeting activity. This can be achieved by using multiple skids. When the stems are processed, the log-making crew moves to the next full landing to do the processing. While they are doing this, the logs on the previous landing are being fleeted and stacked.

Other operations may feature either one or two processing areas on the landing. A single processing area will usually be centrally located. This will enable fleeting from either side, with loading machines always clear of log-making and processing workers.

A two-processing area landing enables log-making free of loader interference, with the workers working in the two areas alternately.

Superskids

These large processing landings allow more area for processing, fleeting, stacking, and loading. Transport of stems to the skid is usually by truck. Superskids can be dangerous places for workers on foot.

Bearers

Some processing areas use bearers to keep stems off the ground. This has advantages:

- When bucking, the skiddy's sawchain is less likely to make contact with the ground. This makes the chain lasts longer.
- The stem to be trimmed is at a better height. This enables the saw to be rested on the log and puts less strain on the user's back and arms.
- The compression and tension in the stem are more apparent.
- The log-maker can see more of the stem. This should allow better log-making decisions to be made.

Disadvantages of using bearers:

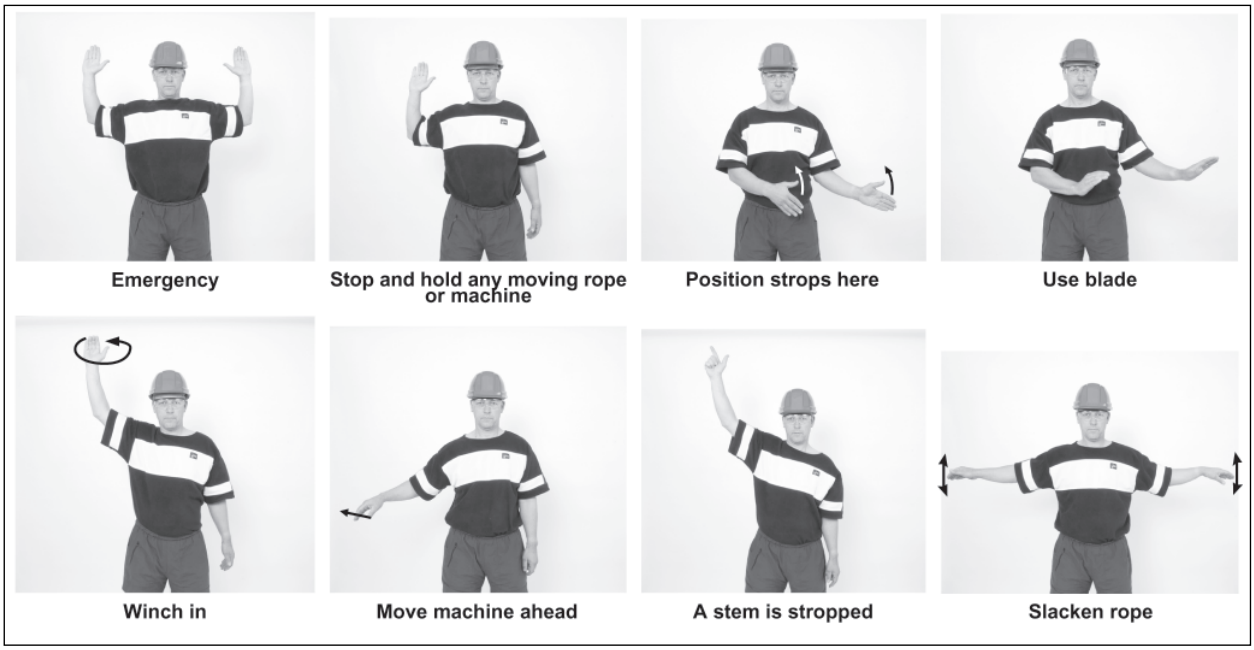
- Bearer zones are more difficult to "sweep" clear of branches and cutting waste. This may be carried out infrequently, which creates a hazard for movement.
- Bearers must be "loaded" with stems. Often excavators are used and stems are lifted and slewed into position. Workers must be aware of the hazards related to log and stem movement.
- When cut, logs will drop, and may roll.
- Bearers set far apart may disguise the appearance of sweep in the stem
- Incoming stems behind extraction machines can damage or move bearers out of place.

Communication

Hand signals

- Hand signals may be used to direct the movement of a machine.
- Any person can give the stop signal in an emergency.
- Predict machine movement and allow time for the operator to react.

The following are some recommended hand signals:



Specific signals for log-making

Specific signals between log-makers and their assistants, and skiddies or machine operators, such as "Move, or lift this log" should be agreed beforehand.

Training and supervision

Manual log-making and processing involve people working close to each other. They may also be working near extraction, fleeting, and loading machines. Workers must therefore be competent at their tasks and able to work safely on the landing.

Accidents involving manual workers can result in death, being disabled, or losing income through injury. For the employer, this may mean increases in cost through increased accident insurance levies, and potential loss of jobs and contracts.

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

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

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

All workers must be under a documented training programme and should be aiming to pass the relevant NZQA Units that apply to manual log-making and processing.

Workers need to be fit, active, alert, properly trained or supervised, and appropriately equipped.

Knowledge of hazards

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

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

The two main hazard categories are Health Hazards and Operational Hazards.

Health hazards

Manual log-making and processing are physically and mentally demanding jobs.

Your safety and the safety of those around you will be affected if you are not fit and healthy. To maintain performance levels and prevent accidents through fatigue, ensure that you:

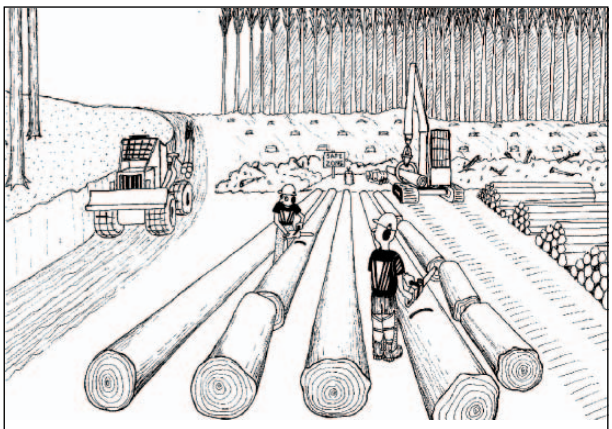
- Take adequate rest breaks
- Maintain an adequate level of hydration and diet
- Keep physically fit
- Get adequate sleep
- Do not let drugs or alcohol impair your judgement.

Health hazards

Hazard	Control
Fatigue (mental and physical)	• Build short frequent rest breaks into your day. • Take at least two evenly spaced 30-minute rest breaks during the working day. • Regularly drink fluids at a rate of 0.5 litres per hour and up to 1 litre per hour in hot conditions.
Manual handling hazards: • Twisted, stooped, awkward postures • Fixed, sustained, rigid postures • Sudden, uncontrolled or jerky movements • Handling or reaching away from the body • Handling heavy or awkward loads.	• Keep loads such as chainsaws close to the body. • Stand up and stretch at frequent intervals. • Avoid sudden, jerky movements. • Avoid lifting or carrying heavy or awkward loads. Ask for assistance if necessary.
Occupational Overuse Syndrome (OOS)	• Use correct techniques. • Be aware of muscle tension as you work, if you experience discomfort, take a break and let muscles relax. • Regular medical examinations.
Early starts	• Learn to go to bed earlier to replace the sleep you lose in the morning. • Your body needs time to adjust to changes in sleep patterns. When first beginning early starts in spring/summer or after the Christmas holidays, recognise that you may remain tired until your body adjusts. • Also, allow time for your body to adjust once you go back to late starts.
Lack of sleep, tiredness	• Ensure that you have at least 5 hours' continuous sleep every day. • Use power-naps (short sleeps of 20–30 minutes duration).
Alcohol abuse	• Avoid drinking alcohol for at least 24 hours before carrying out any hard physical work.
Poor nutrition ***(most accidents occur between 9 and 11 a.m. when you are tired and running low on energy, so stop and have a smoko break)***	• Start each day with a high carbohydrate breakfast like porridge, cereal, toast, bananas, pasta, or potatoes. • Eat high protein foods such as 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.

Health hazards (cont...)

Hazard	Control
Exposure to sun	• Wear sun block (SP30+). • Wear a light shirt rather than a singlet on hot days. • Install a neck flap on your helmet. • Wear tinted UV protective eyewear. • Carry out regular health checks of moles, freckles, etc.
Drugs	• Avoid all non-prescription drugs as they seriously affect both your mental and physical ability to work. • Inform the boss if you are on any medication that may affect your work. Stay home if necessary. • Before receiving any medication, tell your doctor what you do for a living. • If you are on long-term medication for a serious health complaint inform the boss or crew of your condition in case you are involved in an emergency at work.
Dehydration/heat exhaustion	• Regularly drink fluids at a rate of 0.5 litres per hour and up to 1 litre per hour in hot conditions. • Drink before you feel thirsty. • Do not drink fluids, such as soft drinks and cordials, that have more than 8% carbohydrate content. • Drink high-carbohydrate drinks after work to replace energy levels. • Drink plenty of water at night to recharge the body. • Drink a couple of glasses of water before leaving for work.

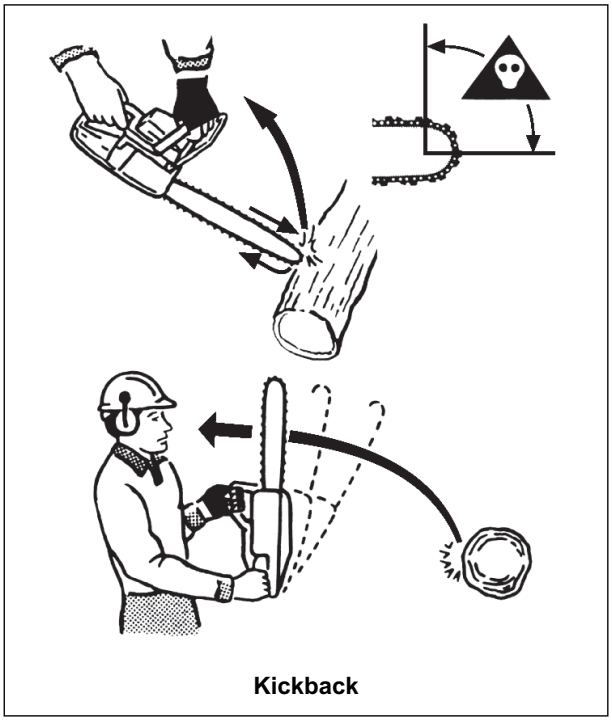


A landing has many hazards which can affect a log-maker or skiddy

Operational hazards

Operational hazards will be specific to the type of operation being undertaken. The operational hazards have been divided into the following areas:

- Landing hazards
- Log-making hazards
- Processing hazards.



Kickback

Chainsaws

Chainsaws are a significant hazard for log-making and processing personnel. The chainsaw is the fastest unprotected cutting blade used in any industry. The most common injuries to chainsaw users are cuts to the feet and legs. These often occur during trimming. A chainsaw is a potentially dangerous tool requiring skilled use and maintenance.

Kickback is a potential danger whenever a saw is used. It happens when the upper part of the bar nose contacts a solid object or is pinched. This causes a reactive force that may throw the guide bar in an uncontrolled arc towards the user. This can result in a serious injury.

Kickback can occur when:

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

Kickback occurs in the plane of the bar, when using the saw with the guide bar horizontal or vertical.

Operational hazards

Landing hazard	Control
Movement of logs initiated by: • Extraction machines/drags • Loading and fleeting machines or stem trucks • Crosscutting of logs	• Be aware of the location and activity of machines,and swinging or suspended loads. • Position yourself to minimise the effects of logs moving or rolling. • Move/stand clear when machines are required to load stems on bearers or remove logs to stacks. • Stand clear of stacks being worked on by loading or fleeting machines. • Ensure that stem placement in the processing zone allows sufficient room to enable bucking while standing on the ground, and to avoid rolling logs.
Rolling logs from stacks or slipping or falling from stacks	• Minimise any time spent working directly in front of stacks. • Do not trim or climb on stacks. • If logs appear unstable, direct a machine to re-stack them.
Movement of machines **Machines with restricted visibility**	• Skidworkers should be aware of the location and activity of machines. • Keep clear of a machine's work zone. • Do not pass alongside trucks when they are being loaded. • Make eye contact with the operator and clearly signal your intentions before moving into a work zone. Only move when signalled to do so by the operator. • Avoid working back-on to moving machinery. Try to face the operating machines, if possible. • Remain in view of the operator. • Notify a machine operator if leaving or returning to the skid area.
Unsafe chainsaw maintenance areas	• Ensure the maintenance area is not inside a machine's work zone. • A safe area should be identified with a suitable sign (i.e., SAFE ZONE). • Fuel and oil should be kept secure in approved containers. • There should be no smoking or naked flames in the general area.

Operational hazards (cont...)

Landing hazard	Control
Slash and obstructions on the ground leading to risk of tripping or slipping	• Keep the ground clear of obstructions, such as slovens or slash. • Remove small offcuts and branches manually, and put on a nearby slash heap. • When production pressure permits, arrange either for the processing zone to be bladed clear of slash and impediments to worker movement, or for grapple-equipped machines to be used to move larger pieces such as slovens or waste log sections or “biscuits”.
Proximity of others	• Be aware of the location and activity of others. • Maintain a safe distance from workers using chainsaws. Chainsaw users should also ensure that a safe distance is maintained. A safe distance should allow for the possibility of the chainsaw user or any other nearby worker slipping or tripping (e.g., 2 m).
Bight of a rope, other dangerous rope situations	• Stand clear, and out of the bight of ropes when machines are winching hauls, or guy ropes are being re-positioned on hauler landings (if not taking part in the process).
Unhooking a drag: • Rolling logs • Sprags • Strops or chain crushing • Hooks or Choker-bells • Ropes and rigging	In skidder or tractor operations: • Skidworkers should stand clear, making eye contact with the skidder/tractor operator, and await a clear signal to proceed with unhooking. In cable hauler operations: • Skidworkers should stand clear, in an agreed safe place, in view of the operator, and await a clear signal to proceed with unhooking. General: • Skidworkers or polemen should be aware that drags are sometimes unstable, and logs can shift with little warning. • Care should be taken if climbing on to (and off) logs in order to unhook other logs. Spiked boots should be worn if there is the need to stand on logs. • Gloves should be worn to protect against sprags or crush injuries. • Be aware that when the tension is taken off wire strops, the ferrule ends can flick out and whiplash. • Keep well clear when strops or chains are winched free, logs or stems can move or roll.

Operational hazards (cont...)

Log-making hazard	Control
Sprains and strains from falling off logs	• Wherever possible, walk alongside the log or stem rather than on top. • Stems should be spaced to enable log-making from alongside the stem.
Sprains from slipping, tripping on slash or waste wood	• Move slowly and deliberately. Remove slash and waste wood whenever possible.
Logger's tape cuts	• Keep fingers clear of the tape edge, or wear gloves.
Paint fumes	• Avoid breathing fumes. If using more than three cans per day, gloves and a respirator with replaceable filters should be used. • Mark logs starting from the bottom of the log stack to avoid breathing fumes.
Dermatitis from paint/solvents	• Wear protective gloves or use barrier cream.
Excessive noise in the log-making zone (work area)	• Wear hearing protection when working close to machinery and chainsaws.

Operational hazards (cont...)

Processing hazard	Control
Ineffective personal protective equipment	• Do not use a chainsaw if personal protective equipment is ineffective or unavailable. • Clean dirty hi-vis garments and oil-soaked protective legwear. • Replace any soiled or worn, damaged, or expired protective equipment. • Routinely check the condition of protective equipment.
Unsafe chainsaws	• Do not use a chainsaw unless safety features, such as the chainbrake or chain catcher peg are intact and working properly. • Tighten or replace loose or missing parts.
Carrying chainsaws	• Turn saw off or activate chain brake when walking any distance, or over obstacles. • Carry a chainsaw in both hands so that it can be thrown clear if you slip. • When walking long distances, carry the chainsaw by the top handle with the bar facing to the rear.
Starting chainsaws	• Use only recommended starting methods. • If cold starting, place saw on the ground, have left arm straight and in mitt, right foot in rear handle or knee on handle. • If warm starting, use step-over method of starting with the bar to the left, not in front, in case of kickback.
Sharpening chain	• Work on a firm base. • Use file handles and file guides. • Replace the file if it is worn. • Always rotate the chain towards the bar tip.
Moving chainsaw chain	• Wear all required protective equipment and ensure it is in good condition. • Use the correct stance and work techniques. • Hold the saw securely in both hands while cutting.
Kickback	• Hold the saw firmly with both hands. • Make sure the left thumb is wrapped firmly under the front handle and in the mitt. • Be aware of the location of the bar nose at all times. • Stand to the side when cutting, not directly behind the bar. • Do not let the guide bar nose come into contact with any object.

Operational hazards (cont...)

Processing hazard	Control
Kickback (cont...)	• Be careful when cutting small limbs or light material that may catch in the chain. • Do not over-reach or cut above shoulder height. • Use extreme caution when re-entering a cut. • Cut only one log at a time. • Correctly maintain the chainsaw; make sure there are no loose-fitting nuts, bolts, or screws. • Ensure that safety devices are operable. • Make sure the chain is tensioned and sharpened, and that depth gauges are set to the manufacturer's specification. • Use a safety chain, and the correct bar and chain combination.
Burns from exhaust/muffler	• Keep bare skin away from the exhaust and muffler.
Chainsaw exhaust fumes	• Do not operate the saw in poorly ventilated or confined areas for prolonged periods. • Ensure the fuel/air mix is correct and the saw is correctly tuned.
Fires	• Do not smoke while re-fuelling. • Move away from the re-fuelling area before starting the saw.
Vibration injuries	• Ensure the vibration-damping mounts on the saw are in good condition.
Proximity of other workers	• Maintain a safe distance from other workers, their chainsaws, or work tools. A safe distance should allow for the possibility of the chainsaw user or a nearby worker slipping or tripping (e.g.,2 m). • Do not make chainsaw cuts if the result may pose a hazard to another worker (such as if a log rolls or sawdust obscures their vision).
Log movement when cut	• Be aware of sudden log movement as tension is released. • Assess tension and compression within the stem before cutting.
Sprains and strains from falling off logs	• Use approved methods. • Wherever possible, trim by walking alongside the log or stem, rather than on top. • Stems should be spaced to enable trimming and bucking from alongside the stem.

Operational hazards (cont...)

Processing hazard	Control
Sprains from slipping, tripping on slash or waste wood	• Move slowly and deliberately. Remove slash and waste wood whenever possible.
Strains from trying to remove "jammed" saws	• Use wedges. • Ask for assistance to cut the saw free. • Arrange for a machine to take the tension off the log.
Flying wood chips or sticks	• Use eye protection.
Saw maintenance	• Use the correct bar spanner when loosening or tightening bar nuts. • Use care when filing, fitting handles to files, or removing bars with a spanner. • Wear protective gloves. • Use bar clamps or other means to hold the saw still while working on it. • Always rotate the chain towards the bar tip when checking chain tension.

Personal Protective Equipment (PPE)

The Approved Code of Practice for Safety and Health in Forest Operations requires that people working in logging operations wear the following personal protective equipment:

- Hi-vis helmet
- Safety footwear providing ankle support
- Hi-vis shirt, vest, or jacket
- Protective eyewear, unless it creates a greater hazard.

Chainsaw operators are required to wear the following:

- Hi-vis helmet
- Visor or safety glasses (if eye-related hazards exist) except where the eye protection is likely to cause a greater hazard
- Hi-vis shirt, vest, or coat (clean)
- Earmuffs (Grade 4 or better)
- Protective chainsaw legwear, chaps or trousers
- Safety boots, steel-capped leather boots or chainsaw-resistant gumboots

Further information on PPE standards and care is provided in the **Best Practice Guidelines for Personal Protective Equipment.**

General clothing

Clothing should fit fairly closely but be comfortable and allow free movement. Loose clothing may become tangled in equipment or branches and lead to injury or falls.

Log-making equipment

Log-making requires several items of equipment:

- A logger's tape
- Log callipers
- Identification stencil
- A diameter tape such as a builder's extending tape
- Logger's tape refills
- Spray paint can
- Belt to attach equipment

Logger's tape

A logger's tape is used to measure log lengths. The start point is the spike hinge on the tape's linkage.

A calibration tag with the current month marked on it must be attached to the logger's tape.

Logger's tape

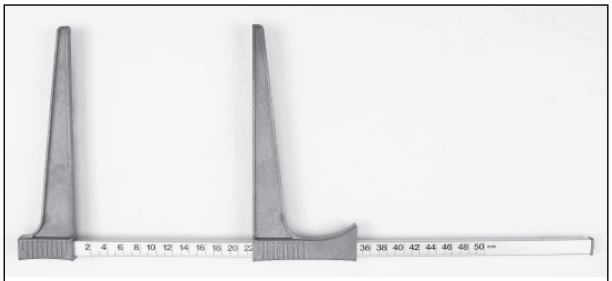
Logger's tape refills

A tape refill is used to replace a damaged or out-of-specification logger's tape. The linkage is sometimes transferred to the refill tape.

Diameter tape

A diameter tape is used to measure log end diameters and sweep deflection as well as other defects. Diameters are measured inside bark. Extending builder's tapes are often used. The diameter tape can also be used for the weekly check of the logger's tape linkage.

Diameter tape



Log callipers

Log callipers

Log callipers are used to measure log or stem diameters, often over bark, at points other than at the ends. Bark thickness must be estimated unless missing at the point of measurement. Callipers should be capable of measuring a 50cm-diameter log.

Spray paint

Spray paint is used to mark cut points, and in conjunction with stencils to brand log ends. For log marking, a fine or medium nozzle should be used.

Identification stencil

This is a mask, which when sprayed with paint, leaves a clean-edged painted shape, letter or number on the log end.

Unhooking the drag

Follow these procedures when unhooking a drag from a rope skidder.

(1) Observe the machine's approach to the landing, and move clear.

(2) Signal the machine to stop.

(3) Signal lower rope.

(4) Skidder moves forward to clear access to the butts of the stems and loosen winch rope.

(5) Ensure that the machine is stationary, that the stems are stable, and that there is sufficient room between machine and drag to access strops.

(6) Skiddy walks in to unhook drag.

(7) Unhook the drag: take the tension off a strop by pulling or pushing the ferrule end of the strop (wire strops) towards the choker. Then slip the ferrule out. For chains: pull the chain to loosen, and remove the hook from the chain.

(8) Move clear and signal winch in.

(9) Machine moves off.

If a stem is still hooked on:

(10) If one or more stems remain hooked on, move clear and signal stem still stropped.

(11) Machine moves forward required distance.

(12) The stem is winched free.

(13) Signal the machine to stop winching and lower the rope.

(14) Ensure that the machine is stationary, and the logs are stable before moving in.

(15) Walk in to the drag.

(16) Unhook the stem.

(17) Move clear and signal winch in.

(18) Machine moves off.

Signalling one or more stems still hooked on

Cable hauler

Follow these procedures when unhooking a drag from a cable hauler.

The person doing the unhooking should wait in a **safe place** while the winch ropes are working. This place must be clear of the chute.

(1) Wait well clear of the drag, in the agreed safe place, until the drag stops, the ropes are lowered, and the strops are slackened. Wait until the stems in the drag are stationary.

(2) Walk in **only after** being signalled by the hauler operator. This is usually a talkie tooter signal.

(3) Before unhooking, check that the stems or pieces in the drag are stable, especially if it is necessary to climb on stems or logs to reach the strops. Strops can be removed from stable easy-to-get stems first. If unsure about stem or log stability, signal the hauler operator to raise the drag and lower again.

(4) Unhook the drag: take the tension off a strop by pulling or pushing the ferrule end of the strop towards the choker. Then slip the ferrule out. For chains: pull the chain to loosen, and remove the hook from the chain.

(5) Signal OK to the hauler operator.

(6) Move well clear of the drag and out of range of swinging strops, to the agreed safe place.

If a stem is still hooked on:

(7) If one or more stems remain hooked on, signal stem still stropped, and move clear to the agreed **safe place**.

(8) The drag is lifted and dropped.

(9) Wait until the drag stops, the ropes are lowered, and the strops are slackened.

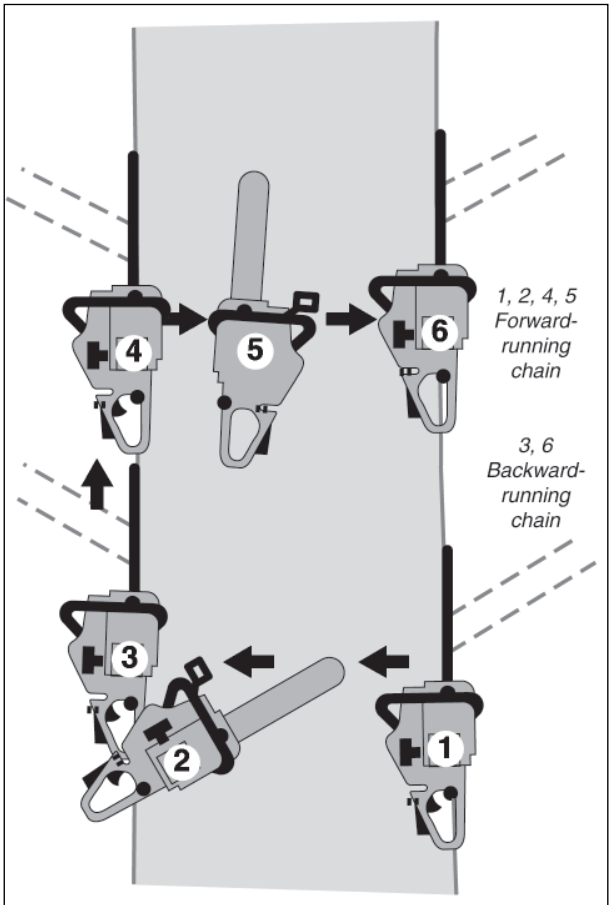
(10) Move in **only after** being signalled by the hauler operator. This is usually a talkie tooter signal.

(11) Before unhooking, check that the stems or pieces in the drag are stable, especially if it is necessary to climb on stems or logs to reach the strops. If unsure about stem or log stability, signal the hauler operator to raise the drag and lower again.

(12) Unhook the stem/stems.

(13) Signal OK to the hauler operator.

(14) Move well clear of the drag and out of range of swinging strops, to the agreed safe place.



Lever limbing method

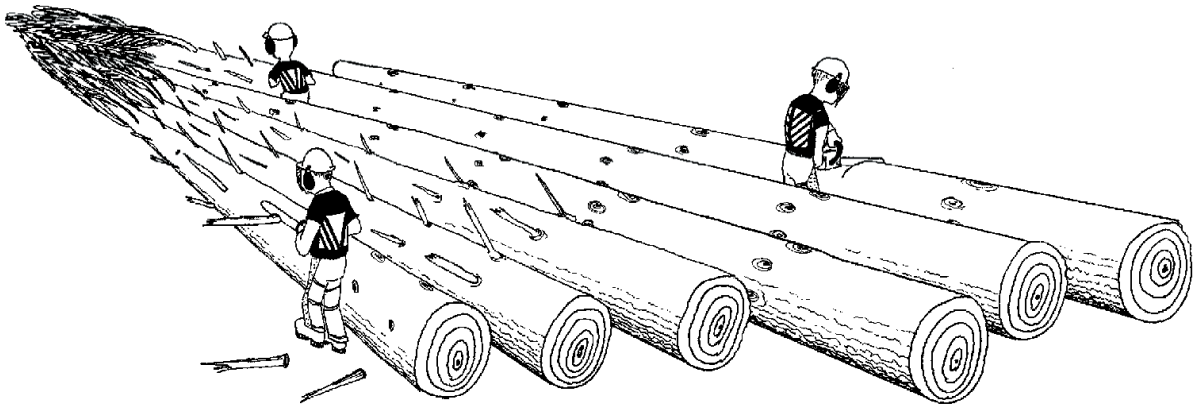
Trimming

Trimming of branches is most safely carried out while moving beside the stem, from the large to the small end or tip. In this way, the stem can be used to support the saw and, for most of the trimming, the bar can be kept clear of the user's body. This method is possible only where a suitable gap is left between stems when laid out for processing.

Branches are to be cut flush, the collar may be cut also. The nodal swelling is not cut as a matter of course, unless requested in the cutting instruction.

All trimming should be carried out while the stem or log is on the ground or on bearers. It is not safe (or legal) to trim while standing on a log stack.

Maintain a relaxed stable stance, with both feet on the ground



While trimming or bucking, maintain a safe distance from other workers.

Skid workers may have to re-manufacture (re-cut) a log that has been downgraded by QC. For instance, the SED may be too small. The log is re-cut to the next shortest length for that grade, or downgraded to a lower priority log grade.

Checking and calibrating a tape or calliper

The accurate marking and cutting of logs requires the use of accurate measuring equipment. The consequences of inaccurate equipment may be out-of-specification log or logs which:

- If discovered at the landing, they are re-cut or downgraded to a lower log grade.
- If discovered at the log processor, they (and the rest of the truckload of logs) may be sent back to the logging contractor for checking and re-manufacturing.
- If discovered by the forest owner's quality control audit, and if they exceed the allowed limit of out-of-specification logs in a given period, result in a significant penalty to the logging contractor's rate per tonne, affecting the viability of his business.

In addition, the cutting of one or more out-of-specification logs from a stem may mean that other higher value logs could have been cut from the same stem. The potential value of the whole stem has been reduced. If losses are systematic and occur over the longer term, they can be substantial when applied to a large output volume.

Frequency of check or calibration

If the forest owner has a policy relating to calibration of measuring equipment, that should be followed in preference to the following suggested procedure.

Measuring equipment should be checked weekly, and logger's tapes calibrated against a Registered Master Tape on a monthly basis. A registered master tape is usually held by the forest owner or harvesting management staff.

A master tape

Logger's tape

Monthly

A registered master tape is obtained.

Both the logger's tape and the master tape are attached properly to a heavy object so that when the tapes are laid out, the ends cannot move.

The hinge reference points of both tapes must be correctly aligned.

The tapes are laid parallel, at even tension, on even ground.

(1) Linkage check

The tape markings are compared at 1 metre. This checks the length of the logger's tape linkage.

If the 1-m marks are not aligned, the linkage must be checked for wear and adjusted or, if this is not possible, the tape should replaced.

(2) Tape marking check

The tape markings are then compared at 10 m and at 15 m. If the markings at either of these points are mis-aligned by more 2 cm, the tape should be replaced.

After the monthly calibration, a calibration tag with the current month marked on it must be attached to the logger's tape.

Weekly

A builder's tape is obtained. Alternatively, a 1-m steel ruler can be used (it can be kept in the crew vehicle and ensures that a standard check can be made of all logger's tapes used).

Both the logger's tape and the builder's tape are attached properly to a heavy object so that when the tapes are laid out, the ends cannot move.

The hinge reference points of both tapes must be correctly aligned.

The tapes are laid parallel, on even ground.

The tape markings are compared at 1 metre. This checks the length of the logger's tape linkage.

If the 1-m marks are not aligned, the linkage must be checked for wear and adjusted or, if this is not possible, the tape should replaced.

Tape refills should be calibrated preferably before, or otherwise as soon as possible after, being used to measure logs.

Wear and tear

Tapes must be replaced when they become hard to read and measurements cannot be made accurately.

Callipers

Callipers can be checked with a diameter tape or a 1-m ruler.

Open the callipers to their fullest extent and measurethe gap from tip to tip of the measuring tines.

Log-making procedure

Before Log-making

(1) Before starting work, ensure that cutting instructions and log specifications are verified as current by:

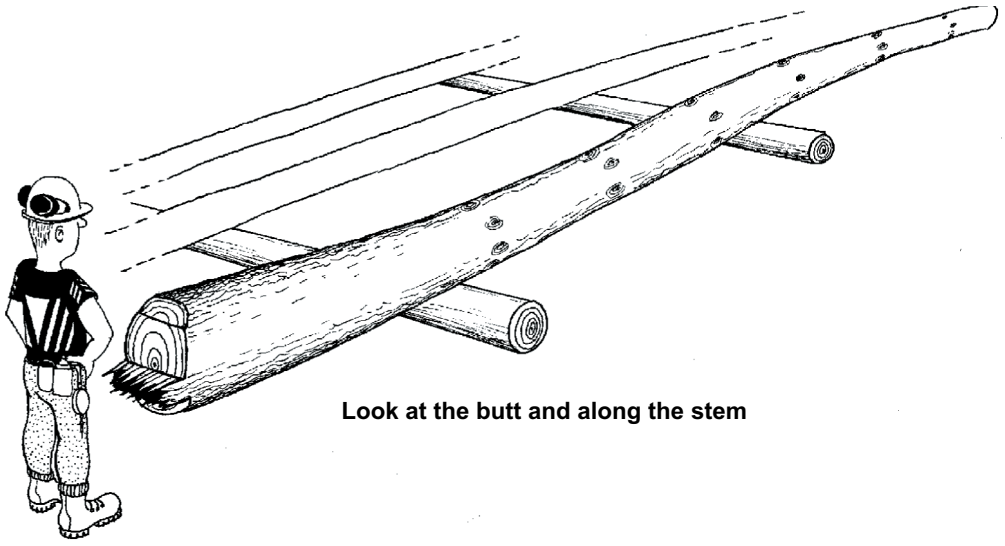
- Checking the dates
- Informing the loader operator and communicating with harvesting operations staff (logging manager or supervisor).

(2) Ensure that log-making assistant(s), and processors or skiddies understand the work method and the log quality requirements (i.e., cutting quality, actions on finding defects that make the log out of specification).

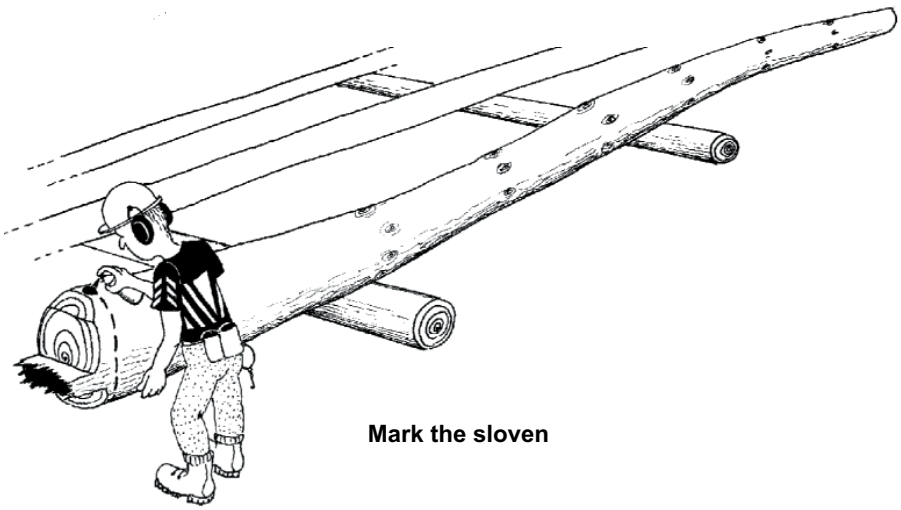
(3) Stems should be sufficiently spaced out to enable the log-maker to assess as much of the log's surface as possible.

(4) Stems should be trimmed and slovens removed before the log-making process begins. Mark with spray paint so that that the scarf face is removed (some log grades permit a limited length of scarf face). A cut mark consists of a small single spot on the uppermost part of the stem surface.

The skid site is often very noisy. An agreed system of hand-signals, especially between log-maker or QC person and loader operator, can make the work process function more effectively. Radio communication is a preferred option.



Look at the butt and along the stem



Mark the sloven

Log-making

(1) Log-making begins at the large end of the stem.

(2) Inspect the large end for defect and mark for removal if necessary.

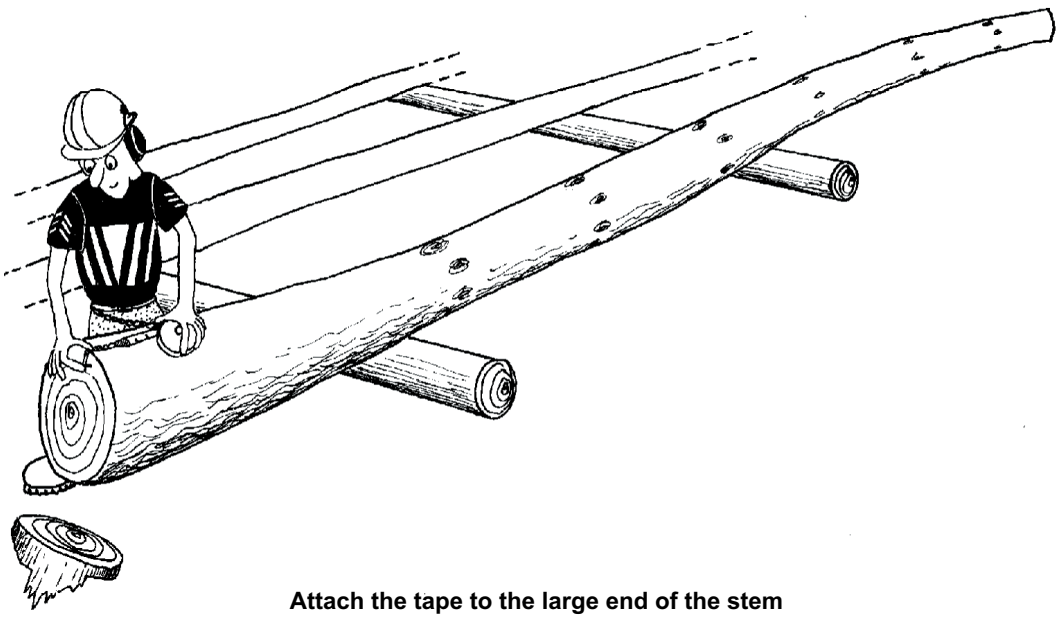
(3) Look down the stem towards the tip, assessing visually for sweep. Pay particular attention to the butt or pruned section.

(4) Mark the sloven for removal if necessary.

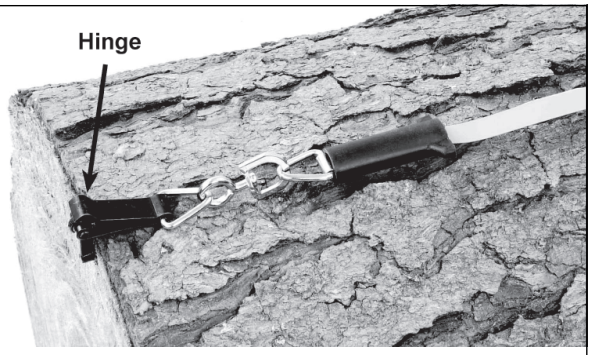
(5) When the sloven has beenremoved, inspect the end of the stem for defects, especially draw wood if the stem has been felled manually.

(6) Attach the tape so that the **hinge** is level with the end corner of the stem.

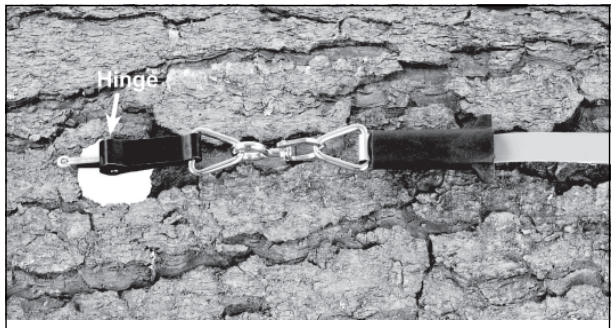
Check for draw wood



Attach the tape to the large end of the stem



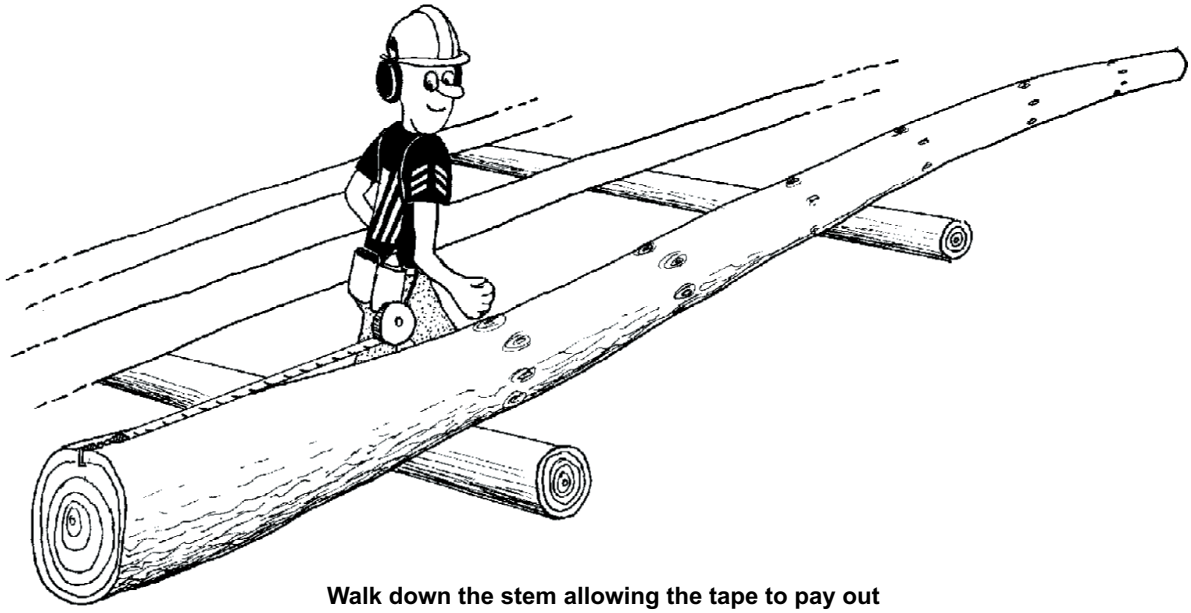
Attachment of the tape at the end of the stem



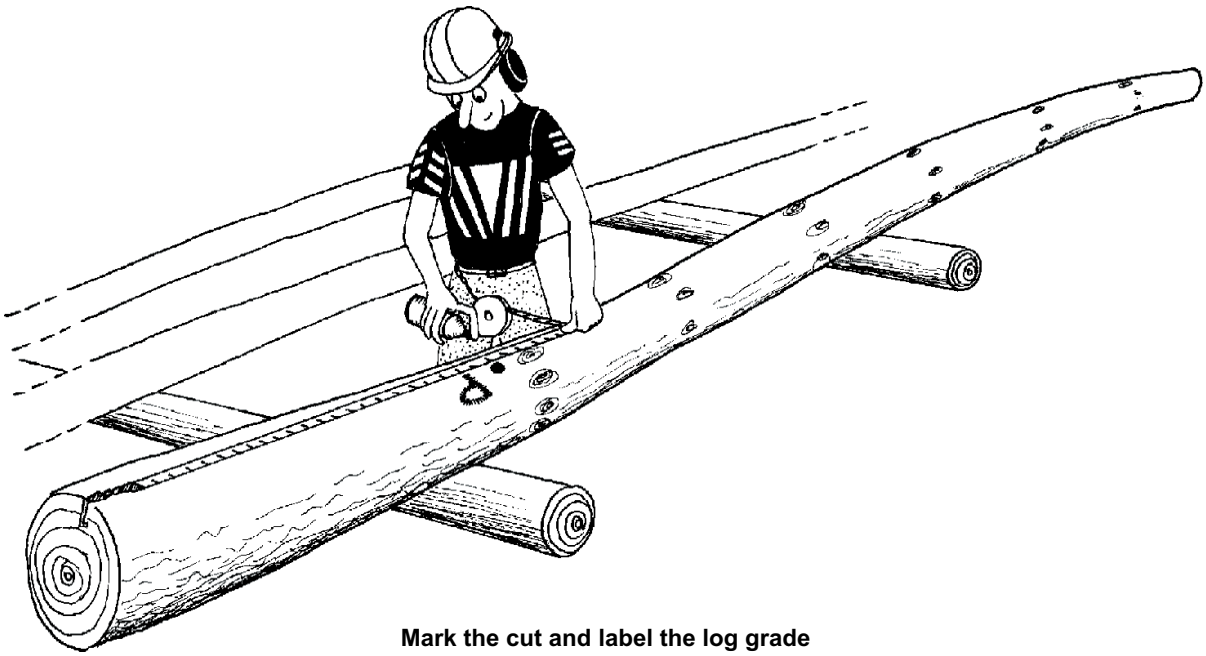
Attachment of the tape on the stem's surface

(7) Walk alongside the stem, inspecting attributes and/or defects.

(8) Decide which log to cut and mark the stem. A cut mark consists of a small single spot on the uppermost part of the stem surface.



Walk down the stem allowing the tape to pay out and looking at attributes and defects

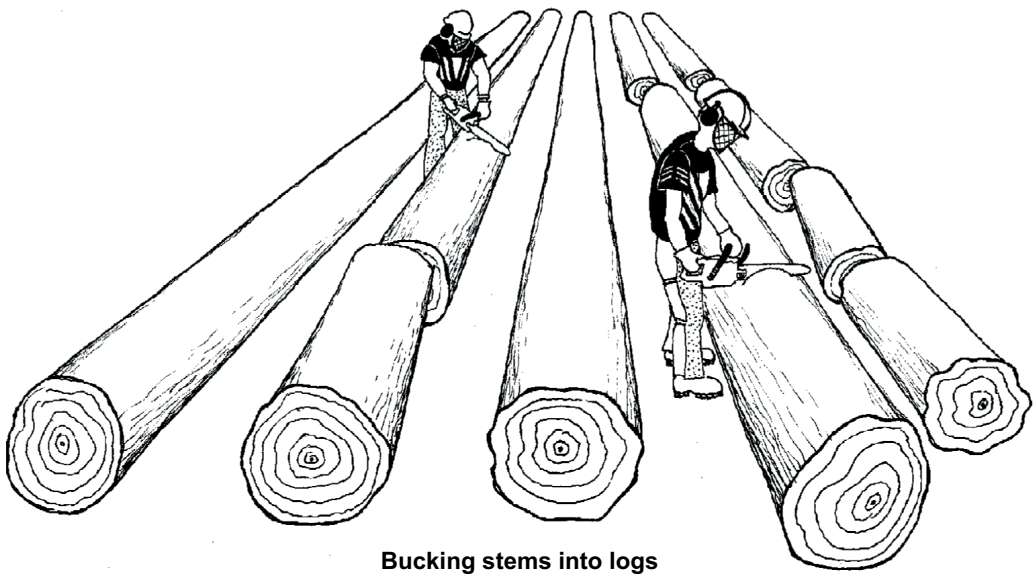


Mark the cut and label the log grade

Bucking or crosscutting procedure

Accurate bucking relies on:

- Sufficient room to buck a log safely. Stems should be spaced to allow the skiddies to carry out the bucking with both feet on the ground.
- A well-maintained saw with evenly sharpened left and right cutters, and correctly set depth gauges.



Bucking stems into logs

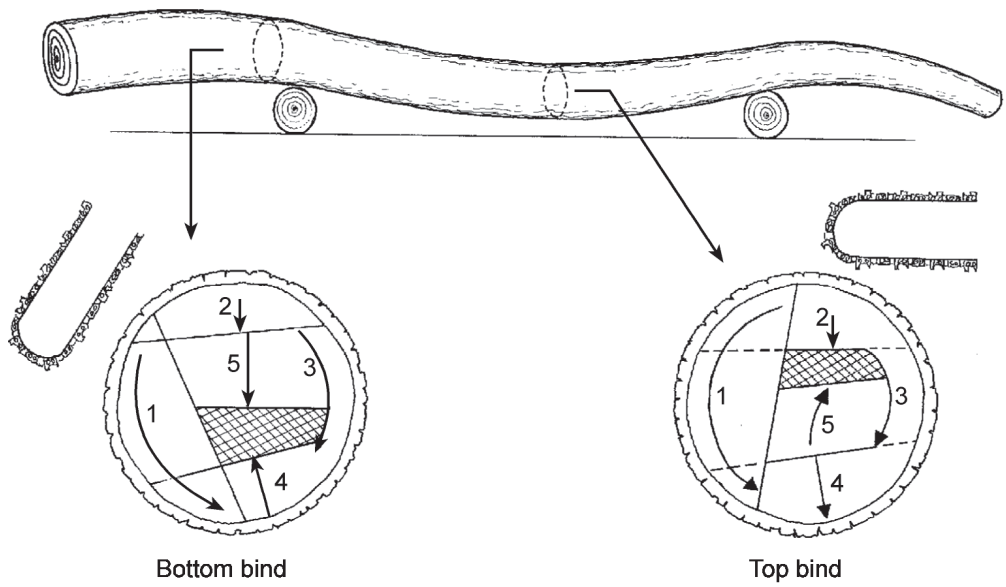
Before bucking

(1) Ensure that you are wearing all the appropriate PPE and it is in good condition.

(2) Ensure that your saw is well maintained and running properly. Check that other equipment such as wedges and hammer are available and in good condition. Further information on chainsaw operation and maintenance is provided in the **Best Practice Guidelines for Chainsaw Use**.

Bucking

(1) Assess the log for tension and compression (binding).



Cutting methods for top and bottom bind.
For bottom bind, Cut No. 4 must be made carefully, stopping when the saw begins to bind.
For a top bind, Cut No. 2 is treated the same way.

(2) Ensure that you have a stable relaxed stance.

(3) Ensure that other workers are a safe distance (e.g., 2 metres) away from your work zone. Consider the effect of your actions on other workers.

(4) Make the cut directly on the paint spot mark, at right angles (squarely) to the log's axis.

(5) If the log is under tension/compression, the first cut will be made on the compression side of the log. As the cuts are being made, be aware of how the log will drop and/or roll.

(6) If bearers or stem supports are being used, logs may have a tendency to roll after dropping.

(7) Ensure that the stem is cut right through. Bar penetration into the skid running surface should be minimised (this will blunt the chain).

Glossary of terms

Bell loader A three-wheeled loading and sorting machine. It has two differentially-driven steering and traction wheels and a third non-steerable jockey wheel. The Bell loader has a short boom and rotating grapple.

Bight An angle between two parts of a rope running round a block or obstruction (e.g., a stump). “In a bight” is a dangerous position.

Bind Used loosely to describe some difficulty or obstruction.

(1) Pressure on a felled tree or log resulting from it not lying flat on the ground. Bind has two parts — pressure and tension.

(2) Of a saw cut: pressure causing the kerf to close up and jam the saw.

(3) Of an operating rope: rope being held out of line by a log, stump or other obstruction.

(4) Log/s 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 felled trees or stems.

Breaking out The work activity of the breaker-out and/or of 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.

Buck To cut a stem or log with a chainsaw (also crosscut)

Butt The large end of a felled stem or tree.

Cable skidder An articulated, four-wheel-drive machine for towing felled trees. The towing and attachment of the trees is by winch and strops (chokers).

Choker Also known as a strop. A short length of wire rope or chain furnished with hooks or other connecting devices. In extraction, the choker forms a noose around the end of a tree or stem and is connected to the main extraction rope.

Choker-setting Also known as breaking out. The task of a breaker-out i.e., hooking on or “stropping” stems or trees.

Chute An area used for a depositing stems or trees. In cable logging, the area just in front of the hauler, where the drags are landed.

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

Collar The collar is a single, sometimes irregularly-shaped, ring of wood surrounding the knot.

Compression The effect on part of a stem or log that is not evenly supported. The area affected is the inside curvature. Compression is the effect on the opposite side of the stem or log affected by tension.

Crutch The crutch zone is the part of the stem from where the pith diverges, to where the two stems diverge.

Cut face The cut face is a result of nodal swelling removal around a knot(s) which has left a cut surface on the log.

Cutover A term for the terrain conditions after felling.

Cutting instruction A list of log grades to be cut showing priorities, lengths, diameters, sweep parameters, defects not allowed, etc. Used by a log-maker to optimise log value recovered from a stem.

Cycle *see* Extraction cycle

Glossary of terms (cont ...)

Dehydration	Insufficient water for normal body function.
De-phase	A term describing the change of logging system from a strictly linear process to one where some parts can operate independently of others (e.g., multiskid operations).
Drag	Also known as a haul. A group of stems or trees collectively attached to one mainrope for extraction.
Draw wood	Draw wood defect occurs as a hole or holes at the large end of the stem (it is normally caused when wood fibre is pulled out during felling or cross-cutting).
Excavator	A tracked, turntable-mounted, boom-equipped machine designed primarily 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, transport, offload stems or trees, and return to the felling site, for one drag or haul.
Extraction direction	The direction in which the extraction machine is expected to transport drags or hauls.
Extraction machine	A machine used to move stems or logs from where trees are felled, across cutover, to where they are either processed into logs and loaded out, or transported (e.g., by stem truck) to a landing for processing — forwarder, skidder, tracked skidder, cable hauler or yarder, clambunk skidder, etc.
Fairlead	A cluster of free-spinning rollers that guide a winch rope on/off the winch drum.
Ferrule	A fitting which is either pressed or filled with white metal and affixed to the end of a wire rope; or composed of three parts, two of which are wedged tight into the end of the rope.
Fleeting	The process of moving sorted logs to a stack.
Fluting	Fluting is a depression in the circumference of the butt of a stem due to creasing of the bark or the growing together of buttresses.
Fork	A fork is where two diverging stems remain attached to the crutch zone.
Frass	The powdery or fragmented wood residue resulting from insect infestation of logs.
Geometric centre	The middle, or central point, of a defined area.
Grapple skidder	An articulated, four-wheel-drive machine for towing felled trees. The towing and attachment of the trees is by a hydraulically operated grapple.
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, etc.
Harvester	A machine, usually tracked, equipped with a harvester head. The harvester may function as a full-time feller-delimber-buncher, a processor, or a full harvester.
Harvester head	A head attachment for a boom, with felling, delimbing, and bucking functions. Trees are cut with a hydraulically operated chainsaw, delimbed by grapple/knives and driven through the knives by toothed rollers. Most harvester heads are fitted with a computerised length and diameter measurement system.
Harvester-processor	A harvester operating as a processor — that is, it may or may not delimb, but it will cut the stem into logs.
Head (of a tree)	The top or tip of the felled tree.

Glossary of terms

Health hazard	An occurrence, condition or situation, often arising off-site, that could adversely affect the general health of a worker.
Internode	An internode is a knot-free section of the log.
Kink	(1) Of rope: a short deviation or change of rope straightness. (2) Of a tree or log: a short deviation or change from an ideal of straightness of form.
Knots	A knot is defined as where a branch has been cut off flush with the stem.
Knuckle-boom	A hydraulically articulated boom with a terminal attachment, often a loading grapple capable of 360-degree rotation.
Landing	A prepared area, usually close to the felling site, for the processing of stems, then the storage and loading out of logs. for transport (also Skid)
Large-end diameter	The average of two measurements at the large end of a stem or log. The first to be measured is the minimum diameter, on a line taken through the geometric centre. The second is on a line at right angles to the first (also through the geometric centre).
Length	The length of the log is the distance measured along the shortest straight distance between the cut ends.
Log grade or log type	A classification of logs for purposes of sale. A grade differs from other grades on the basis of length, small-end diameter, large-end diameter, allowable defects, and other characteristics. (also log type)
Log specification	A detailed description of a single log grade, showing all possible variations of length, diameter, allowed and disallowed features, and other details. Usually combined with other log specifications and details of log attributes and defects, into a bound Log Specification Manual.
Log type	*see* Log grade
Log (value) optimisation	The process of maximising the value of a stem or stand given the presence or absence of external constraints such as market demands and/or stock levels.
Logging operations	The forestry processes and activities of felling, extraction, processing, and loading.
Log-maker	A person charged with assessing, measuring, and marking a stem into logs. Tasks include an overall responsibility for log production and quality.
Machine or stem damage	Machine damage is log damage caused by machines such as: harvester drive rollers and knives; delimber knives; extraction machine blades or grapples; loader forks, tines, or grapples.
Mainrope	*see* Winch rope
Malform	A malform is a form of stem defect involving branch growth. A fork is a malformation. Malformations may also include kink, wobble, and sweep.
Maximum diameter	The largest diameter present in the whole log.
Maximum large-end diameter	The maximum diameter (cm) as measured inside bark at the large end (usually closest to the butt) of the log. The measurement is of the longest diameter through the geometric centre.
Minimum small-end diameter	The minimum diameter (cm) as measured inside bark at the small end of the log. The minimum SED is the shortest distance through the geometric centre of the log at the small end.
Nodal swelling	Nodal swelling occurs around a branch node (includes nodal swelling in pruned logs).

Glossary of terms (cont ...)

Occupational Overuse Syndrome (OOS)	Describes work-related disorders of the musculo-skeletal system.
Operational (extraction)	The plan formulated by the contractor or foreman that specifies how the job is to be done, by whom, and when. 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.
Out of round/ovality	Out of round, or ovality, of a log is the difference between the shortest and longest diameters at one end.
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.
Pith centre	The pith centre is where the pith lies in relation to the centre of the log. The pith is not necessarily the centre of the log.
Poleman	In cable hauler operations, a skiddy or skid worker whose tasks include that of unhooking stems from drags.
Pruned	The section of log or stem where branches have been removed as part of silvicultural operations. Knots are not present on the surface of the log.
Pulled wood	Pulled wood refers to a specific form of damage where the branch is pulled free of the tree, usually against its natural growth angle, often after being partially cut. The effect is to tear a slab of wood, which usually includes the knot, from the stem.
Quality control	The activity and process of branding logs, and checking log lengths,diameters and other specifications.
Ramicorn	A large steep-angled branch. A smaller trimmed ramicorn branch is termed a spike knot.
Sapstain	Sapstain occurs as a result of infestation of logs by fungi. A common form of sapstain is bluestain.
Scarf face	The part of the scarf top cut that is retained on the log.
Shatter	Shatter is a breakage of fibre within the stem. It is often caused during felling, or during cable extraction.
Silvicultural operations	The forestry processes and activities of planting, releasing, spraying, pruning, and thin-to-waste.
Site preparation	The process of preparing cutover for planting, e.g., windrowing, ripping and mounding, spraying, chemical releasing.
Skiddy	A skid worker, whose tasks include unhooking, trimming, bucking, marking, and stencilling, and other quality control work.
Slabbing	Slabbing of logs is the loss of wood from the side of the log, often towards the ends. It is caused by incorrect cutting, usually of the part of the log under compression — i.e., not using wing cuts when felling.
Sloven	The sloven is the portion of the stem butt that retains the shape of the felling cut/s. It is removed in order to obtain a flat end face, and to expose the extent of felling-related draw wood defect.
Small-end diameter (SED)	The diameter at the small end of a log.
Solvents	Liquid chemicals such as mineral turpentine used for cleaning tools, or branding templates that have been used with oil-based paints.

Glossary of terms (cont ...)

Sorting	The process of segregating and stacking logs of the same grade.
Spike knot	A knot where there is a large ratio of length to width. Regarded as a log defect. Spike knots are the result of acutely angled branches.
Split	A split is a crack or fracture of the log visible from the log end (this can include windshake).
Sprag	A broken wire which protrudes from worn or damaged rope.
Stand	An area of trees of the same species and age which have had similar management, i.e., they have been thinned and pruned in the same way.
Static delimber	A delimber consisting of a hydraulically operated knife-set through which trees are pulled. The pulling machine may be a Bell loader, or an excavator loader. The knife-set may be mounted on a trailer, or on skids.
Stem	A tree which has been prepared for extraction by felling and possibly delimbing. Distinct from a log, which is cut from a stem.
Strand	A component of wire rope consisting of individual wires wound spirally together.
Strop	Short length of wire rope or chain fitted with hooks, which forms a noose around stems to be extracted.
Superskid	A large more-permanent landing which often collects wood from more than one extraction operation.
Sweep	Sweep is a predominant curve or bend in a single direction or plane in a stem or log.
Taper	Taper is the diameter change per unit of length, expressed as a ratio.
Tension	The effect on part of a stem or log that is not evenly supported. The area affected is the outside curvature. Tension is the effect on the opposite side of the stem or log to that affected by compression.
Thinning	The selective felling of a proportion of standing trees. Poorer specimens are taken, usually according to spacing criteria.
Tolerance	The allowed difference in centimetres between the specified length, e.g., 6.1 m, and the actual log length, e.g., 6.13 m. If length tolerance was ±5 cm, the log would be within tolerance.
Tree size	The size of the tree (up to the minimum small-end diameter) as it stands.
Unpruned	The section of log or stem where branches have been allowed to grow. Knots are present on the surface of the log.
Wheeled loaders	A four-wheeled articulated machine equipped with loading forks.
Wheeled skidder	An articulated, four-wheel-drive machine for towing felled trees.
Winch rope or main rope	A rope fitted to a winch on a skidder or tractor.
Wobble	Wobble defect is where two or more deviations or bends occur on the same plane along the length of the log, or, where these occur in more than one plane.