

GUIDE TO MANAGING RISKS IN CABLE LOGGING

DECEMBER 2013



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1. INTRODUCTION

This Guide provides practical guidance for persons conducting a business or undertaking and workers on how to manage health and safety risks associated with cable logging activities.

It should be read and used with the Code of Practice: *Managing risks in forestry operations* which provides advice on planning, co-ordinating and preparing work health and safety practices for forestry operations. The Code also provides guidance on identifying hazards and common control measures for specific forestry operations relevant to cable logging activities. A list of other useful resources is at Appendix A.

1.1 What is cable logging?

Cable logging is a method of extracting timber or yarding system using a stationary machine with powered drums, spars or towers, blocks, wire rope and butt rigging to move logs from a felling site to a log landing area. Harvested logs may be fully or partly suspended for all or part of the yarding distance.

Cable logging is mainly used to harvest timber from steep slopes where conventional retrieval methods are unsuitable due to the risk of mobile plant rolling over. Cable logging has a lower ecological impact than conventional ground-based skidding methods because it reduces soil compaction, soil disturbance and sediment production. Cable logging can also be used to lift logs and move them over areas protected for environmental reasons. Different cable logging systems are shown in Appendix B.

Key terms used in this Guide are defined in Appendix C.

1.2 Who has health and safety duties?

The Code of Practice: *Managing risks in forestry operations* has information about health and safety duties for cable logging which is a forestry operation.

1.3 What is involved in managing risks?

Cable logging has specific risks including being hit by rolling logs or other objects while working on steep slopes below the landing. Injuries caused by rope wire sprags and being struck by equipment which fails are also risks which must be managed.

To help protect workers from cable logging hazards, the following general safety principles should be applied:

- Stop operating if cable logging becomes dangerous because of high fire danger or bad weather conditions, for example high wind or poor visibility.
- Everyone should stay in a safe area away from moving lines, rigging, loads or standing skylines until the rigging or loads have completely stopped.
- Everyone should remain outside the bight of tensioned running lines.
- No one should ride on hooks, carriages, ropes or other rigging, except if allowed under regulations 219-221.

- No one should ride on logs suspended in the air or being moved.
- Tree felling activities should be a minimum of two dominant tree lengths ahead of active yarding lines and ground workers.
- Lines should be run in a straight line and not be obstructed.

PLANNING AND PREPARATION

Effective planning and proper preparation are important to help understand and consider hazards before work starts and to make informed decisions about risk control measures.

Further information on planning, co-ordinating and preparing harvesting operations and logging coupe access and preparation is in the Code of Practice: *Managing risks in forestry operations*.

2. YARDERS

Control levers, pedals, brakes and other equipment on yarders should be maintained in safe working order.

Foot-operated mechanisms like brakes should have non-slip pad surfaces.

The yarder should be on solid level ground and protected from pooling rainwater.

Outriggers and levelling pads should have a stable base.

All yarders should be securely and safely anchored before yarding operations start.

Guylines used to stabilise the yarder should be at least the size, strength and number recommended by the machine manufacturer. Guylines should always be placed so they oppose the pull of the yarding lines.

Guards should be fitted to protect the operator from flying ropes, broken shackles or other rigging components which may break during operation. Transmission, machinery and hazardous moving parts on yarders should be securely fenced or totally enclosed in accordance with AS 4024.1201-2006: *Safety of machinery - General principles - Basic terminology and methodology*.

Ropes should be securely fixed to the winch drum and be long enough to ensure that in every working position there are never less than four complete wraps of rope on the drum.

A guide pulley, tool, iron bar or other mechanical or manual means should be used to guide ropes onto drums. No one should guide ropes onto drums with any part of their body in direct contact with the rope.

Yarders should not be operated or moved until everyone is in a safe area.

When moving a yarder the operator should have a clear, unobstructed view of the travel direction. If this is not possible a designated signal person who has a clear, unobstructed view of the direction of travel and is in clear sight of the yarder operator should direct the machine operator.

Where a designated signal person is used, the operator should move the yarder only when the signal from them is distinct and clearly understood.

When moving to areas within the immediate landing area, anyone not involved in the yarder movement should stay in a safe area. They should get permission from the operator before approaching or coming close to a machine.

When moving a yarder with an integral tower the tower should be lowered or supported according to the manufacturer's guidelines so the machine remains stable.

3. TOWERS - INTEGRALLY MOUNTED ON A YARDER

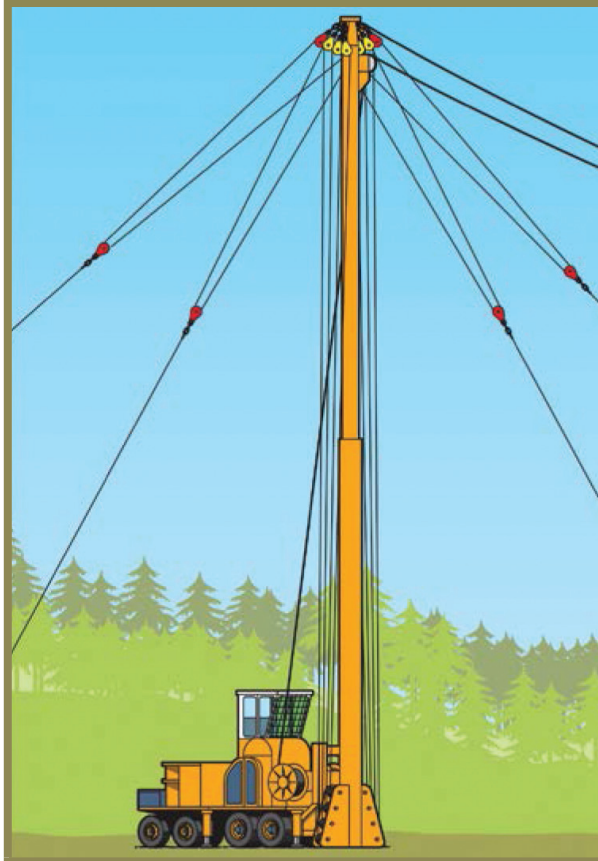
Each portable metal tower should have an identification plate permanently attached to its base with the following information:

- name and address of the manufacturer and the yarder model number
- maximum breaking strength and size of the mainline for which the tower is designed
- maximum breaking strength and size of tail rope (haulback) for which the tower is designed
- number, breaking strength and size of guylines needed, and
- maximum breaking strength and size of skyline, mainline and tail rope which can be used on a tower designed for a skyline or slackline system.

Portable metal towers should be inspected by a competent person whenever there is doubt about whether the tower is safe and each time the tower is lowered to the ground. Whenever a part is damaged or damage is suspected the part should be fully inspected and, if necessary, repaired by a competent person before the tower is used again.

Structural changes to towers should only be made under the direction of the manufacturer, a certified professional engineer or equivalent person competent in this field. The overall safety factor of the equipment should never be reduced when modifying towers.

FIGURE 1 A rigged tower



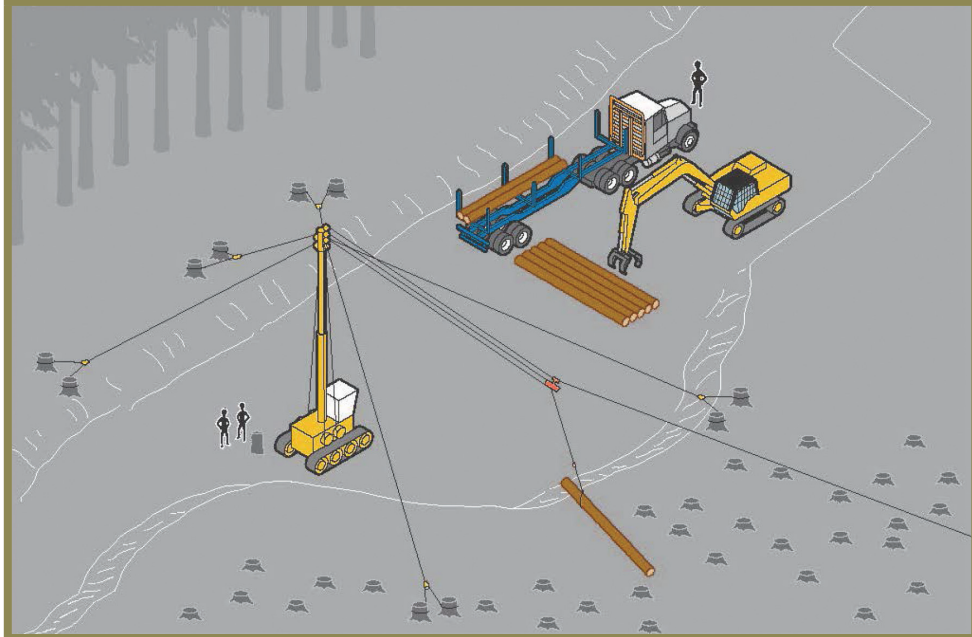
4. LOG LANDINGS

The size and shape of landings vary according to the size and type of yarder, the loader configuration, the log size and length, the number of sorts or volume to be yarded and the space available. Figure 2 shows an example of how a landing area can be laid out.

Landing areas should:

- be large enough to allow:
 - safe entry and exit by all truck types
 - separate working areas for each landing activity
 - space for storing logs and logging debris
 - machinery to move about safely
 - logs to be heeled and swung without hitting standing timber, rigging or other equipment or objects
- be large and level enough to land and deck logs so they will not slide or roll towards workers or equipment
- have a solid and flat foundation with good water drainage
- have no hazardous trees within reach of the landing and the planned guyline placement
- have no trees in the corridor of the guyline to ensure no deviation of the tightened guyline, and
- have clearly identified designated safe areas.

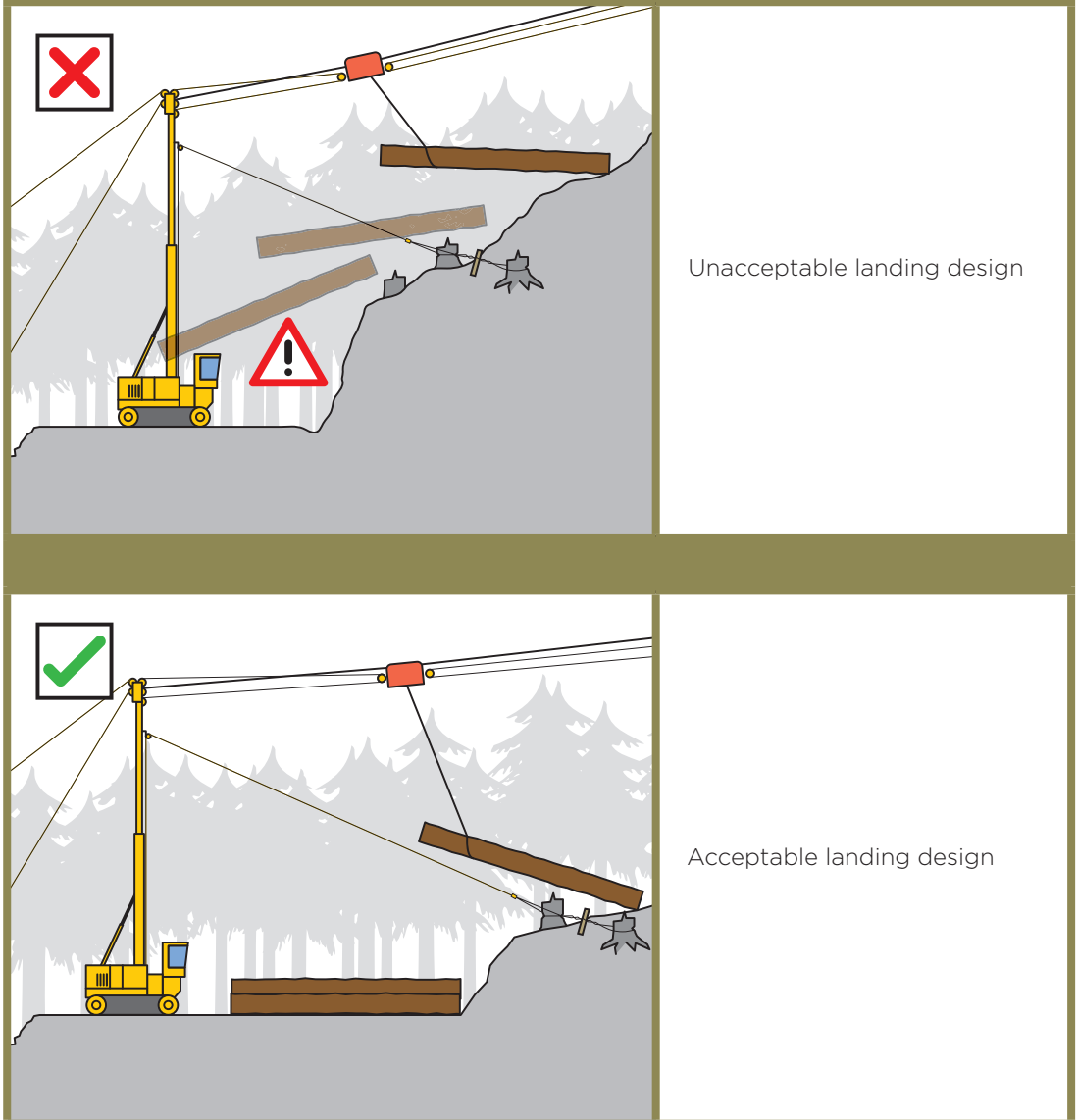
FIGURE 2 Landing design



Continuous landings should be large enough to safely operate and maintain the yarding and loading equipment. Outrigger pads, tracks or wheels should be on firm and stable ground.

For downhill yarding (see Figure 3 below) landings should have enough space between the base of the slope and the tower to catch loose logs and debris.

FIGURE 3 Landing design for downhill yarding



Landing chutes should be long enough to land a whole tree. If this is not possible there should be space for at least two-thirds of the volume of the log to be yarded to rest on the ground. Extra control measures should be in place to ensure log and debris slash does not escape down the chute and create a risk for choker operators.

Landing chutes should be set up in a way so landed logs are stable and secure.

Landings should be clean and material should not be pushed, thrown or dumped over the edges in a way which can endanger workers.

Logs should not be moved into, out of, or around the landing area unless everyone is in a safe area.

Workers should not cut, limb or trim logs from positions where they may come into contact with moving ropes.

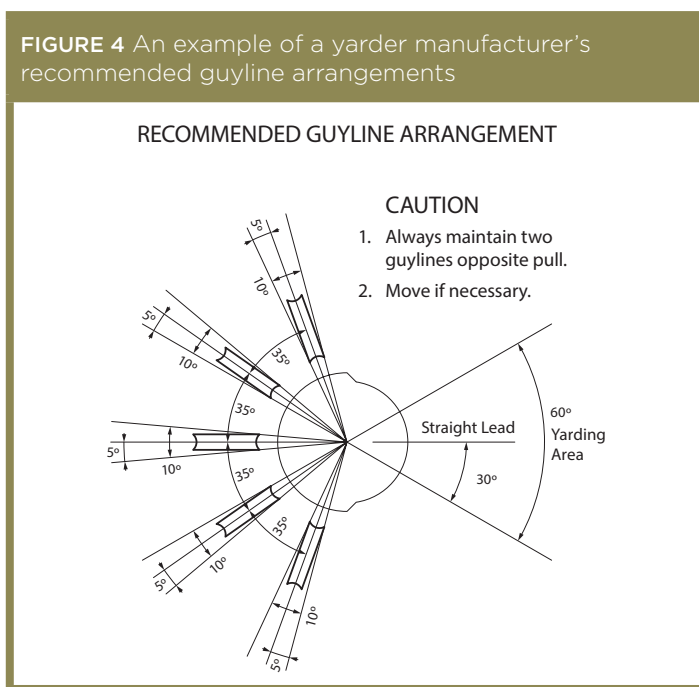
5. GUYLINES

Guylines used with yarding equipment should be positioned and used according to the manufacturer's specifications.

Guy zones established by the yarder manufacturer should be designed to avoid catastrophic failure during the yarding process and be set so they share the load on the yarding lines.

An example of a manufacturer's cabin decal (Figure 4 below) shows a yarder setup with five guylines. This allows at least three guylines to oppose the load in a broader 60 degree yarding window. Manufacturer's specifications or technical manuals for anchor placement within guy zones should always be followed.

FIGURE 4 An example of a yarder manufacturer's recommended guyline arrangements



Guylines should be made of improved plow steel—180 grade or better—and maintained in safe condition.

The number of guylines attached to integral steel towers should be at least the minimum recommended by the equipment manufacturer. Towers should use guylines with one or more of the following:

- spliced eyes
- pressed eyes, or
- poured ferrules.

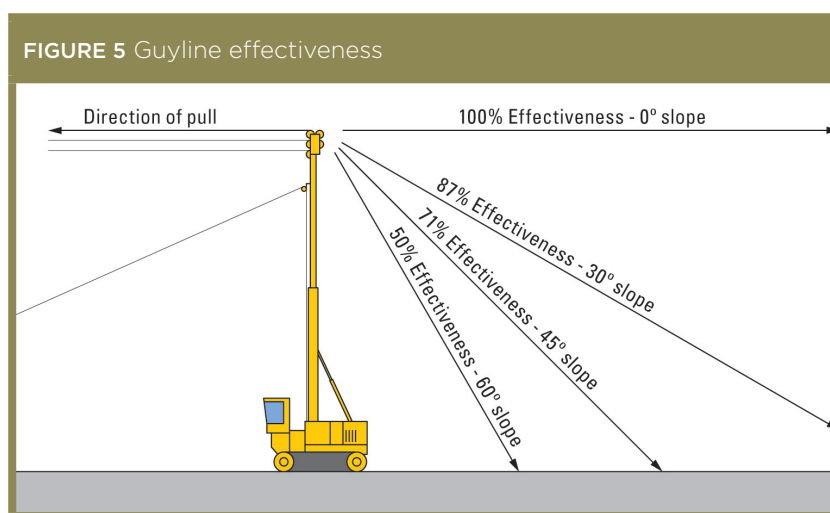
Unless stated otherwise in the manufacturer's rigging specifications, guyline specifications are set out in Table 1.

Table 1 Guyline specifications

Guyline	Specifications
Highlead guylines	Each guyline should be equal in breaking strength to the mainline, or as a group the guylines in their operational orientation should have a factor of safety greater than 1:1 to the mainline.

Guyline	Specifications
Skyline logging	If the skyline is 35 mm or more, guys should be at least 35 mm. If the skyline is less than 35 mm, guylines should be equal to the breaking strength of the skyline.
Other cable logging systems	Each guyline should have a breaking strength equal to the mainline, or as a group the guylines in their operational orientation should have a factor of safety greater than 1:1 to the mainline.

Load bearing guyline angles should be 45 degrees or less measured vertically. If suitable anchors are unavailable or the terrain is so steep the guyline angle exceeds 45 degrees, an extra guyline should be rigged to oppose the load.



Guylines should be securely tightened while the tower is in use and adjusted to share the load as equally as possible.

Where possible, anchor points of equal distances away from the tower should be used. Shorter guylines will tighten more quickly than longer guylines. A shorter guyline can take the majority of the load and not share with the other guylines. This could overload the shorter guyline and cause it to fail.

The 'U' part of shackles or sleeves should be around the guyline and the pin passed through the eye of the guyline.

Extensions to guylines should be:

- equal in breaking strength to the guyline to which they are attached, and
- connected only by a safety pin shackle connecting two spliced eyes, pressed eyes or by double-end hooks.

Guyline connections should have at least 1.5 times the breaking strength of the guylines themselves.

Guylines should never be spliced except to make eye splices. Eye splices should be tucked at least three times.

Loops or molles should not be used for attaching guylines.

Trees posing a hazard to the yarder or guylines should be removed.

6. ANCHORS

6.1 Stump anchors

Single stump anchor points should not be used for anchoring guylines. Where only one stump is available, a 'deadman' anchor should be used to support the single stump tie-back.

SELECTING STUMP ANCHORS

The position and strength of the stump should be considered when choosing an anchor. Stump holding power increases with soil depth and density and stumps are generally strongest with a side pull rather than an upward pull.

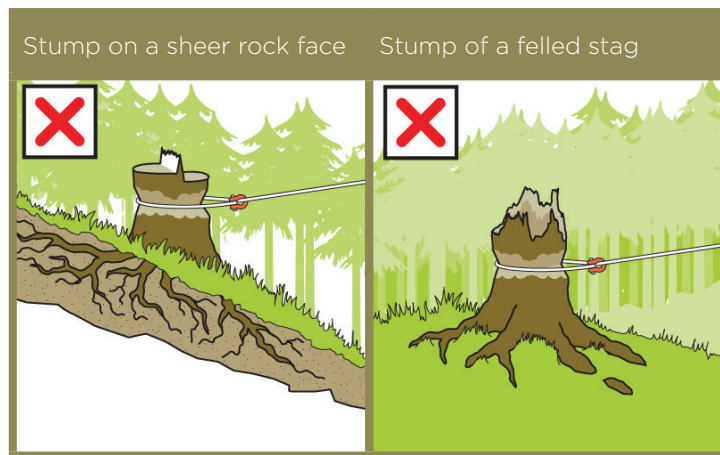
Stumps on slopes have more root structure on the downhill side and are therefore stronger on an uphill rather than downhill pull. Stumps on the back side of a ridge, with an upward pull, are stronger.

Never assume stumps in one setting will be the same as stumps in the next setting.

Tailholds and intermediate supports for the yarding lines may use trees as anchors and support. The yarder guylines however should use stumps to avoid the possibility of trees falling on workers at the landing site.

The position, height and strength of guyline and skyline anchoring stumps should be inspected by a competent person.

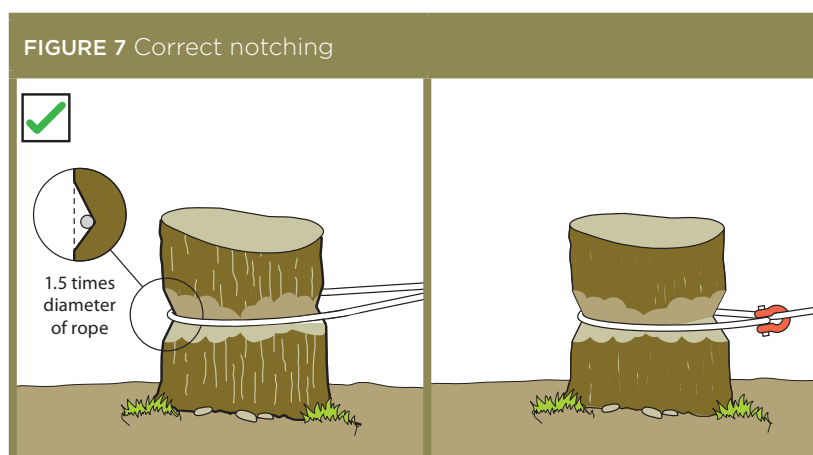




NOTCHING THE GUYLINE STUMP

Notches cut into stump anchors should be no deeper than 1.5 times the diameter of the line to be attached. Deeper notching of swells, burls and other irregularly-shaped stumps can be done to properly secure the line to solid wood.

The position of the notch should be in lead with the guyline and have enough wood above the notch to prevent slabbing. The notch should be as low as possible but the roots should not be cut off. Lower notches give less leverage and minimise the risk of the stump pulling out of the ground.



MULTIPLE STUMP ANCHORS

If unsure about whether a stump anchor is suitable, guylines or guyline extensions should be tied back to another stump or stumps.

Multiple anchors are only as strong as the weakest point and, if one stump fails, the entire system can fail in a surge. If possible, isolate tieback stumps in multiples so if one anchor fails others will hold.

Common methods for combining the holding power of multiple stumps include:

- wrap and go back
- twister tie back, and
- bridle block.

WRAP AND GO BACK

Wrap and go back stumps wrap the line around a front stump and anchor to the back stump. The front stump holds approximately two-thirds of the load force and the back stump one-third, if the line transfers the load. When three stumps are used, the load to the third stump is minimal.

FIGURE 8 Wrap and go back

**TWISTER TIE-BACK**

When setting up a twister tie-back the following procedure should be used:

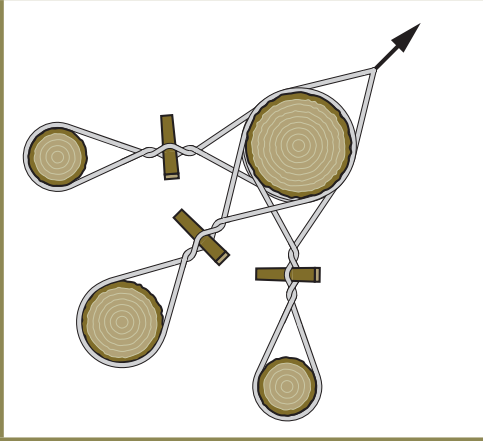
- Use a strong sapling or sturdy limb with enough strength, diameter and length for the twister stick.
- Place the twister line close to the top of the front stump, unless there is a risk of the roots pulling out while tightening the tieback. Cut notches into secondary anchors to stop line slippage.
- Wrap a piece of line around the front and back tree and secure with a timber hitch wrapped under several times. Insert a sturdy stick in the opening created by the line and twist the line over itself until taut. Use a minimum of two wraps or turns. Wedge the stick in the ground so it holds the wrap in the line.
- Keep the twister stick firm to stop it releasing unexpectedly and causing injury.

FIGURE 9 Twister tie-backs

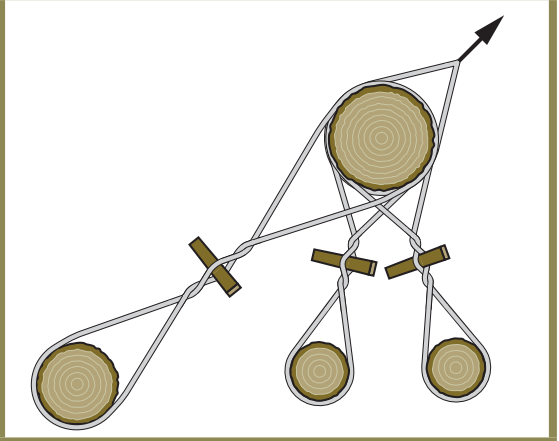


FIGURE 10 Twister tie-backs systems

EFFECTIVE SET UP—alignment in line with line of pull



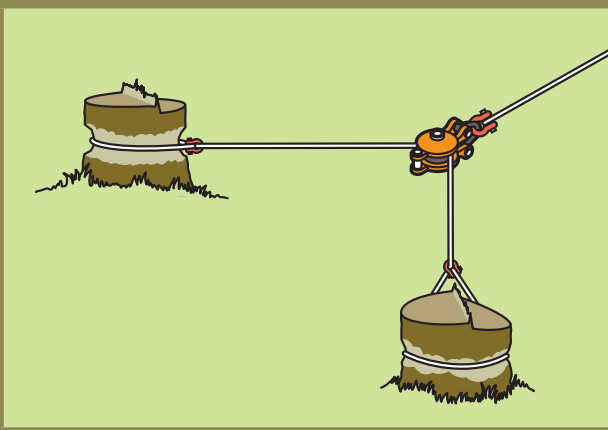
LESS EFFECTIVE SET UP—alignment not directly in line with line of pull



BRIDLE BLOCK

Bridle stump anchors have a line tied to each stump with a block that floats on the line. This allows the force to be distributed evenly to each stump. Never tie a Dutchman knot in a guyline to place the guyline within its guy zone. Instead, use a bridle block or other suitable way to evenly distribute the force.

FIGURE 11 A bridle block set up



Note: The angle between the two legs of the bridle block strap should not exceed 120 degrees. Wider angles increase the force on each stump and angles more than 120 degrees produce a force greater than the original load.

6.2 Deadman anchors

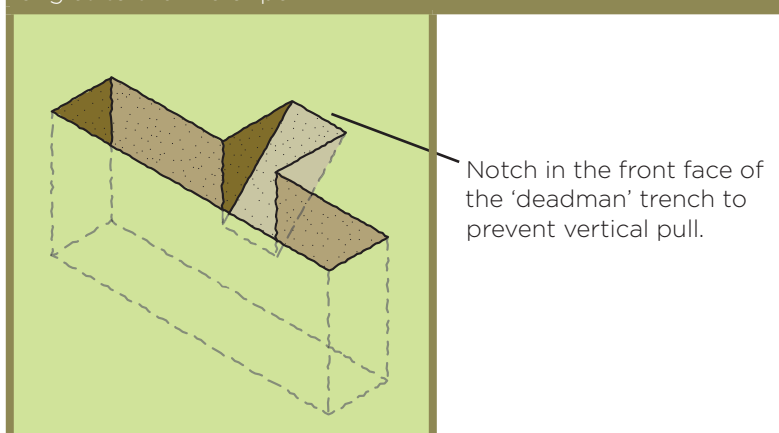
'Deadman' anchors are logs buried in the ground to provide an anchor point when suitable stumps are not available. The logs used should be properly installed and be of a strength, length and diameter to withstand the load to be imposed.

When a 'deadman' anchor is used, the log size and design of the installation should take into account the soil conditions, slope and angle of the ground, angle of pull on the guyline, the size of the yarder and the rigging system being used.

For the minimum recommended installation requirements for 'deadman' anchors see Appendix D.

Trenches for 'deadman' anchors should be at right angles to the line of pull and have a vertical front wall. The exit for the 'deadman' strap should be located midway along the front wall of the trench. It should be angled to stop the strap bending and to stop the 'deadman' from lifting when under strain (see Figure 12).

FIGURE 12 Example of a 'deadman' trench installed at right angles to the line of pull



The guyline should not be attached directly to the 'deadman' but to a strap attached to it. The strap should be the same size and strength of the guyline with suitable eyes in each end. It should be used with one bight around the 'deadman' and both eyes attached to the guyline with a shackle.

The 'deadman' design should include backfilling techniques for suitable compaction between it and the earth fill.

6.3 Alternative anchors

MOBILE PLANT

Where bulldozers or excavator-type machines are used as guyline anchors or a mobile tail hold on cable harvesting equipment, the following procedures should be used:

- The plant should be set up in its most stable configuration with the tracks positioned in an excavation. The excavation should be constructed to ensure the plant will not pull out or ride over the end of the excavation.
- The anchor point should be either a rated winch or a closed-eye and load-rated attachment point.
- Wire rope attachment points should be designed and approved by a certified professional engineer or equivalent person competent in this field.
- The method of attaching the wire rope to the attachment point on the mobile tail hold—on the item of plant—should be designed and approved by a certified professional engineer or equivalent person competent in the field.

- The winch or wire rope attachment point and the method of attachment should have a design load equal to or greater than twice the breaking strength of the mainline used with the yarder tower.
- A competent person should carry out regular inspections of plant used as a mobile tail hold to check for deterioration or damage.
- Where an excavator is used, the manufacturer, certified professional engineer or equivalent person with experience with excavators in the forestry industry should determine the frequency of inspections. This should not be more than every 12 months. Inspections in addition to other requirements should ensure high stress welds on the dipper arm are non-destructively tested.

Mobile plant should not be used where access is limited or where they are in positions which could interfere with other cable logging activities.

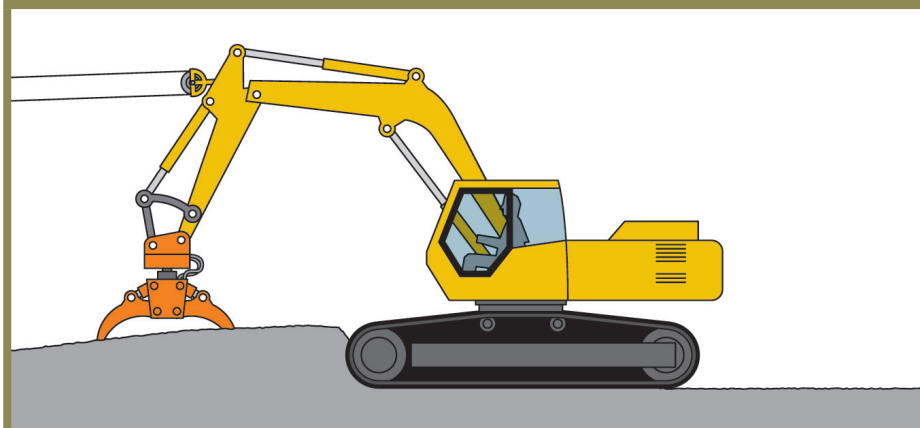
FIGURE 13 A bulldozer used as an anchor point



IMPORTANT: Lines should never be attached directly to the blade because it is not designed to withstand forward pressure.

An excavator containing a suitably modified dipper arm for specific use as a tailhold or guyline hold in a cable logging operation is shown at Figure 14.

FIGURE 14 An excavator used as a tailhold or guyline hold

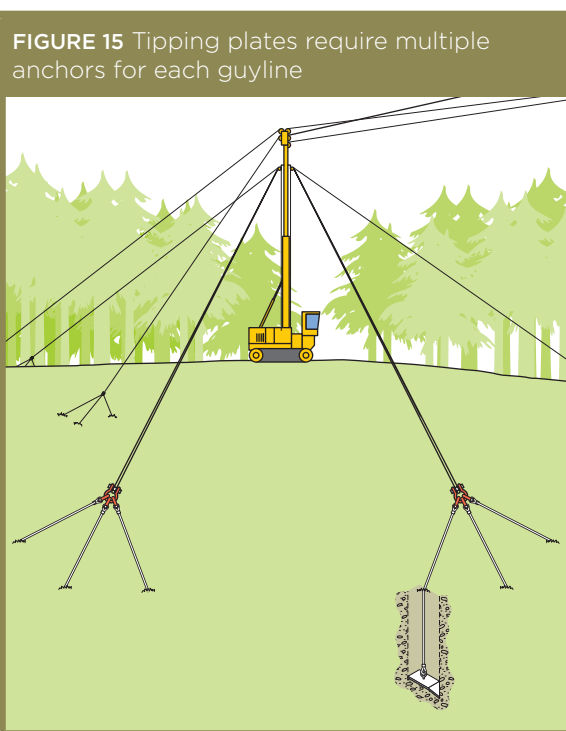


Note: The excavator dipper arm and pin couplings should be designed and approved by a certified professional engineer or equivalent who is competent in this field to ensure it can withstand twice the breaking strength of the mainline used with the yarder tower.

TIPPING PLATES

Tipping plate anchors are used in clay, sand or gravel. They are manufactured in many shapes and sizes and are effective when installed correctly according to the manufacturer's recommendations. In some conditions a pre-drilled hole is used then backfilled. In softer conditions special vibrating installation equipment may be required to force the anchor through the soil to a predetermined depth. The anchor is set by applying a heavy load.

When using tipping plates guylines skylines or mainlines should not be directly attached to the anchors. Attach a strap or system of straps from multiple anchors to hold the line (see Figure 15). The combined strength of straps or lines attached to multiple anchors should be the same strength as the line held.



ROCK BOLTS

Although uncommon rock bolts may be necessary when other anchor systems are not possible. If rock bolts are used they should be installed according to the manufacturer's recommendations.

6.4 General anchoring methods

Use stumps, 'deadmen', earth anchors or other alternatives with enough strength to anchor the yarder.

Where guylines are tensioned from the yarder, a guyline hook and ferrule can be used. Alternatively, an eye fitted with a sleeve type shackle can be used to choke the stump.

Skylines should be anchored by one of the following methods:

- Anchor directly to a stump or suitable manufactured anchor.
- Anchor directly to the base of a standing tree but ensure the attachment point is no more than 1 metre above the ground and no part of the tree will enter the work area if it is pulled over. The tree can also be tied back above the anchor point so it will not enter the work area.
- Pass the skyline through a jack or block hung on a standing tree then anchor the skyline to another stump or standing tree.

Skylines when anchored to stumps should be secured by either:

- choking it to the stump using a large sleeve-type knockout pin shackle or a safety pin-type shackle over the skyline with the pin through the eye, or
- using an approved strap with both eyes hung in a shackle and the knockout pin or safety pin through the eye of the skyline.

When removing a skyline from a stump designate a worker to be in charge. They should exercise caution and give clear warnings before releasing the rope so other workers are out of the area.

Extensions to skylines should be at least equal in breaking strength to the skyline to which they are attached. Also:

- If the carriage runs over the extension, the extension should be attached only by a long splice or shackle connecting two eyes, spliced—that is, tucked at least three times—or pressed.
- Shackles should have at least 1.5 times the strength of the line they join.

When rigged in a tail tree the skyline should be anchored no more than 8 degrees off-line from the rearward projection of the skyline. It should not create an angle greater than 50 degrees measured from the horizontal as it leaves the tail tree.

Where a mobile tailhold is used as an anchor check the machine cannot move.

7. RIGGING

A thorough inspection of rigging including blocks, straps, guylines and butt rigging should be carried out by a licensed rigger before it is used.

The inspection should be according to the manufacturer's specifications and include checks for damaged, cracked or worn parts, loose nuts and bolts, strap and guylines condition and whether parts need lubrication. Where necessary, repairs and replacements should be made to ensure the equipment is safe to operate before being used.

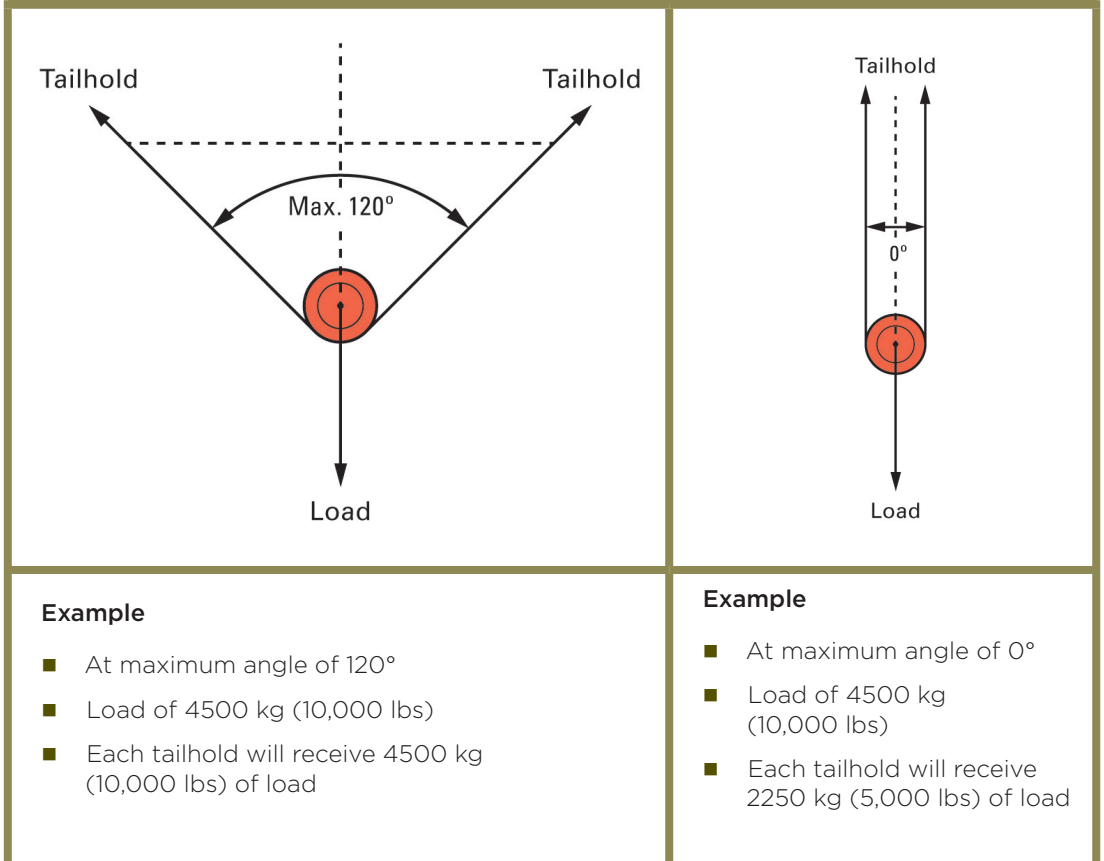
Towers should be raised and lowered under direction from a yarder operator or hook tender. Anyone not involved in raising and lowering towers should stay in a safe area until they are told it is safe to re-enter the work area.

Towers should be levelled to provide proper line spooling and avoid excessive stress on component parts.

Integral steel towers should be fitted with a safety strap which prevents a guylines block falling more than 2 metres if the attachment has a structural or mechanical failure. The safety strap mechanism should have the equivalent strength of a guylines.

A bridle block can be used to distribute forces equally at a tailhold. The angle at the bridle block should not exceed 120 degrees as this will result in a pull on each leg of the bridle greater than the original pull. In general, a smaller pull angle is preferable.

FIGURE 16 Recommended strap angles



Straps should be sized according to Table 2.

Table 2 Recommended strap size

STRAP SIZES IN INCHES		
Running Line Size in inches	Block Hung in Both Eyes & Wrapped*	Block Hung in Single Eye**
5/16	¼	½
3/8	3/8	9/16
7/16	5/16	5/8
½	3/8	¾
9/16	7/16	7/8
5/8	5/8	1
¾	¾	1 1/8
7/8	7/8	1 ¼
1	1	1 3/8
1 1/8	1	***
1 ¼	1	***
1 3/8		
1	***	
1 ½	1 1/8	***
1 5/8	1 ¼	***
1 ¾	1 ¼	***
1 7/8	1 3/8	***
2	1 3/8	***

STRAP SIZES IN MM		
Running Line Size in mms	Block Hung in Both Eyes & Wrapped*	Block Hung in Single Eye**
8	6	13
9.5	9.5	14
11	8	16
13	9.5	19
14	11	22
16	16	25
19	19	29
22	22	32
22	22	35
29	22	***
32	22	***

STRAP SIZES IN MM		
Running Line Size in mms	Block Hung in Both Eyes & Wrapped*	Block Hung in Single Eye**
35	22	***
38	29	***
38	32	***
45	32	***
48	35	***
50	35	***

Key to Table 2

- * For standing skyline only
- ** For standing or running skyline
- *** Block hung in single eye not allowed for larger line sizes

The recommended rigging and strap sizes included in Table 2 does not prevent rigging components for specific operations to be sized by an engineer or similarly qualified competent person who is capable of performing the necessary calculations and who is competent to assess the forces which will be applied in the particular situation.

An assessment which suggests smaller rigging component sizes should be documented. This should include relevant calculations and conditions and be maintained for the duration of the operation.

Both ends of the strap should be under equal tension.

Side blocks may use either type of strap on a running skyline.

Corner block, tail rope and tree straps should be replaced if damaged or broken. Repairs should be done with new wire rope of a similar or better grade of wire than the operating lines with which they will be used.

Sleeve type shackles or choker bells should be used where choked lines are permitted.

8. BLOCKS AND SHACKLES

8.1 Blocks

Load bearing blocks should:

- not be used for heavier strains or ropes than those for which they were constructed
- be fitted with line guards and be designed and used in a way which prevents fouling
- be kept in proper alignment when in use
- have bearings and yoke pins which should be securely fastened and be made of a material which will easily withstand the imposed strains, and
- have sheaves of a size designed for the size of the wire rope used.

Blocks with cracked or worn sheaves in excess of those set by the manufacturer or Australian Standards should not be used.

Block bearings should be kept well lubricated.

Rigging blocks should have guided sheaves and cross heads secured by nuts, split pins or wire and be maintained in safe condition.

Block pins should be correctly secured. If a molle is used for locking it should be as large as the pin hole will allow and have the loose ends rolled in.

Chains should not be used for hanging blocks.

Straps should be at least the same strength as the line which they support (see Table 2).

8.2 Shackles

Shackles with bodies forged from high tensile steel or mild steel and fitted with high tensile steel pins may be used if:

- they are fitted with screw pins when used for yarding
- they are fitted with high-tensile steel bolts with nuts secured with a split pin or a molle, when used for hanging blocks or attaching guylines to the top of spars, and
- shackles meet the specifications of AS 2741-2002: *Shackles*.

Shackles used to hang blocks, jacks or rigging on trees should have the pins secured with a nut and a cotterkey or a molle. Molles should be as large as the pin hole will allow with the loose ends rolled in.

Sleeve-type shackles or choker bells should be used where choked lines are allowed.

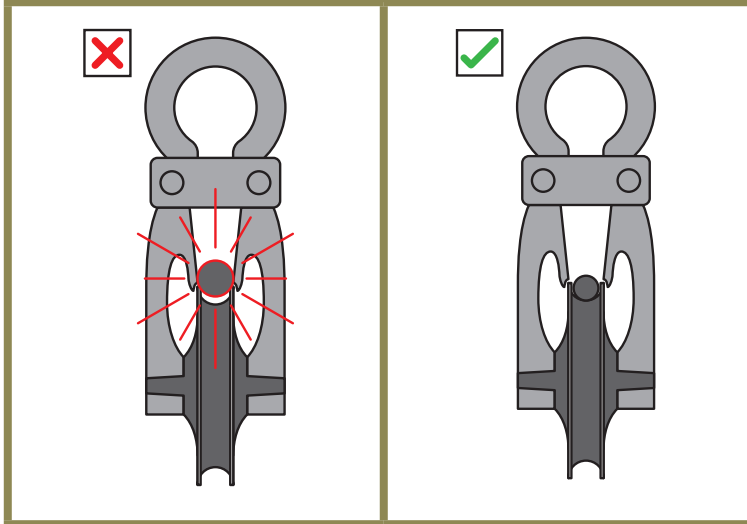
Flush pin, straight-sided shackles should be used for mainline and skyline extensions and be one size larger than the rope used.

Screwy bells may be used for guylines and skyline attachments.

The size of the opening between the jaws of shackles used to hang blocks, jacks, rigging and for joining or attaching ropes should not be more than 25 mm greater than the size of the rope, swivel, shackles or similar device to which it is attached.

Shackle pins and nuts should be replaced when worn or when threads are worn or stripped.

FIGURE 17 Sheave sizes



9. WIRE ROPE

9.1 Grade

Wire rope used in logging operations should be preformed and not less than 180 tensile grade. It should also comply with AS 3569-2010: *Steel wire ropes – Product specification* and AS 2759-2004: *Steel wire rope – Use, operation and maintenance* or equivalent standards.

9.2 Breaking strength

Wire rope comes in many grades and dimensions and every rope has its own strength and resistance characteristics for crushing and fatigue.

Wire rope has an assigned breaking strength determined by engineering test results. These are based on a number of characteristics, for example the grade of the wire, the number of strands, number of wires per strand, filler wire construction, lay pattern of the wires and diameter of the line.

Wire rope should not be used in cable logging operations unless the breaking strength has been confirmed by the manufacturer or supplier.

9.3 Breaking strength safety factor

Wire rope working load limits are set at a fraction of the rope's breaking strength. A minimum safety factor of 3:1, or one third of the breaking strength, should be the maximum load applied to wire ropes, fittings and components.

For example, if a standard 6 x 26 IWRC wire rope with a diameter of 1 inch (25.4 mm) has a confirmed breaking strength of 45 tons, the maximum working load limit which can be applied will be 15 tons, which is one third of 45.

9.4 Inspection and care

Inspections should be carried out by a competent person and according to AS 2759-2004: *Steel wire rope – Use, operation and maintenance*, AS 2318-2006: *Swivels for lifting applications*, AS 2741-2002: *Shackles* and AS 3775-2004 (Series): *Chains slings*.

Wire rope should be inspected daily and repaired or taken out of service when:

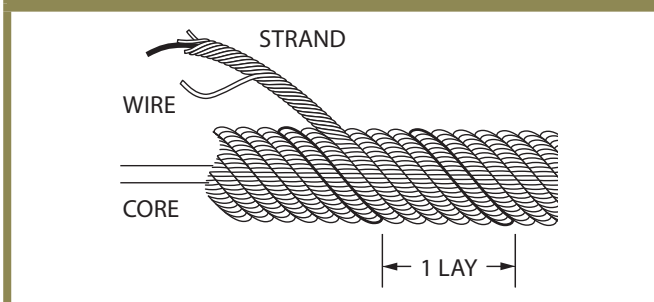
- a complete strand is fractured, or
- 10 per cent of the wires are broken within a distance of one lay, or
- there is evidence of chafing, sawing, crushing, kinking, crystallization, bird-caging, corrosion, heat damage or anything else which may weaken its structure.

Points of the rope subject to the most wear should be closely inspected more often, including the knob ends of lines, eye splices and those sections of line which most often run through blocks or carriages. If there is doubt about the ropes safety the rope should be replaced rather than risking failure during operation.

Load-bearing yarder lines should be inspected regularly.

A competent person should also inspect other lines used on the site and remove those which create a risk to health and safety.

FIGURE 18 Example of a wire rope taken out-of-service



A 6x25 IWRC wire rope = 6 strands in one lay with 25 wires per strand = 150 wires. The rope should be taken out of service when 10 percent, or one-tenth, of the wires are broken, damaged or worn within the distance of one lay = 150 divided by 10 = 15 broken wires.

9.5 Line connections

Only a three tuck long splice or a butt splice should be used for joining a skyline.

Butt and cut splices can be used on ropes other than skylines and guylines where the sheaves have a large enough throat to allow the splices to pass through without binding.

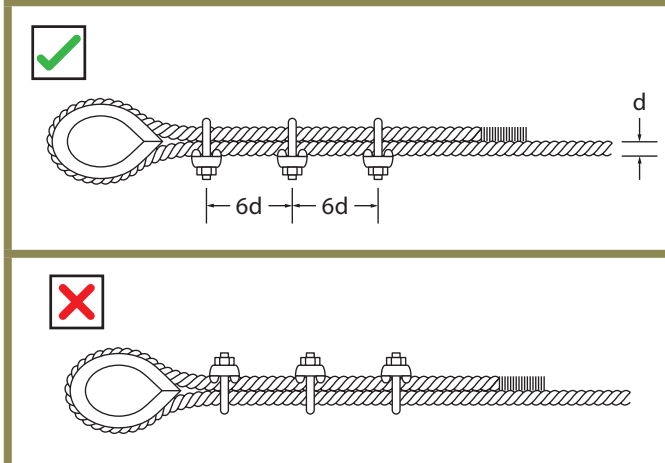
Eyes in ropes and straps should be formed either by splicing with the ends tucked three or more times or held by clamping devices which give at least equal strength. The only exception is for straw lines which only require two tucks.

The manufacturer's recommendations should be followed when attaching sockets and similar end fastenings.

Extra precautions should be taken when using U-bolt wire rope clamps:

- When they are used for making eyes U-bolt wire rope clamps should be attached so the U section touches the dead or short end of the rope.
- U-bolt wire rope clamps should be evenly spaced at least six rope diameters apart for maximum holding power. After the rope has been used and is under tension the clamps should be tightened again to remove looseness from tension reducing the rope diameter.
- When high strength wire rope is used one more U-bolt wire rope clamp should be added for each grade above improved plow steel—180 grade.
- Eyes formed with U-bolt wire rope clamps should not be used with running lines or chokers.

FIGURE 19 Using U-Bolt clamps



Cable clips or clamps should never be used for joining running lines, except where they are used for transferring slack lines from one place to another.

10. CHOKERS AND BUTT RIGGING

Chokers should be at least one size smaller than the mainline.

Molles should not be used in butt rigging as a load bearing connection.

Shackles used in the butt rigging should be of the screw-pin type or with the pin secured with a nut and a cotterkey or molle, except as set out elsewhere for specific purposes.

Where chain is used for chokers it should have the same safe working load as the wire rope it replaces.

Nylon, webbing or polypropylene strops should meet the manufacturer's specifications. Nylon, webbing or polypropylene strops should be removed from service when the wear reaches the limits set by the manufacturer or when they deteriorate.

FIGURE 20 Choker

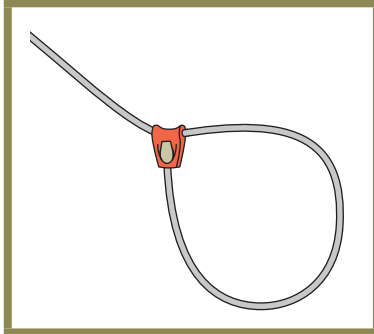
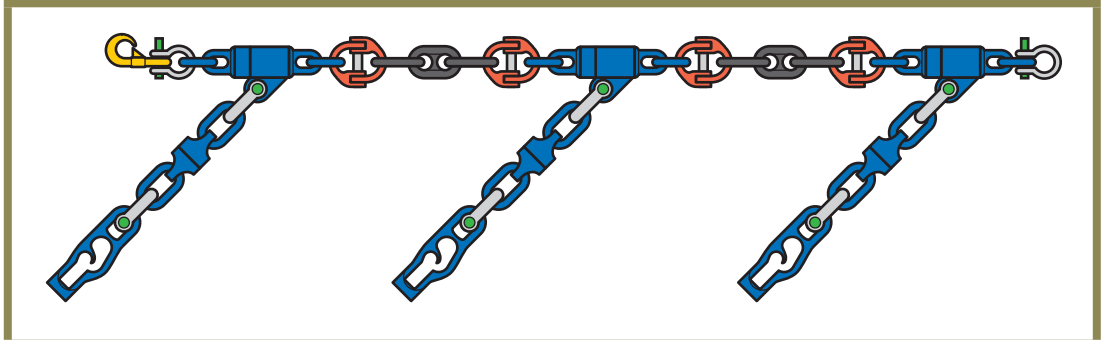


FIGURE 21 Butt rigging



11. RIGGING SPAR AND TAIL TREES

11.1 Climbing equipment

Climbing equipment should:

- be selected, used and maintained according to AS/NZS 1891.1:2007: *Industrial fall-arrest systems and devices - Harnesses and ancillary equipment* or an equivalent standard
- comply with the manufacturer's recommendations for maintenance, inspection, routine testing and storage
- only be used for the purpose for which it was designed
- be regularly inspected, and
- examined by a competent person before being used.

The climber should be equipped with a climbing assembly with a breaking strength of 2500 or more kilograms. This equipment should include:

- a safety belt or harness with double D rings
- steel spurs which are long and sharp enough to hold in trees in which they are used
- a climbing rope which should:
 - be laced to the climbing belt or harness and pass through at least three D rings which are secured around the belt or harness
 - have an eye splice at one end of the rope, and
 - after passing around the climber and around the tree, have the standing end passed through the eye and secured with a catspaw—sheet bend—knot or by a suitable mechanical rope adjusting device.

Lineman hooks should not be used as climbing spurs.

Tools used by the climber, including the chainsaw, should be safely secured when not being used.

Whenever a chainsaw is used the climber should be secured to the tree with a high quality steel safety chain which is 5 mm size or a steel-cored wire rope strap which is 8 mm size or larger.

When chainsaws are used for topping or limbing standing trees, the size and weight of the saw should be considered.

11.2 Passlines, chains and blocks

Drums used for passlines should have enough flanges to prevent the passline from running off the drum.

Passline chains should be:

- not less than 8 mm alloy or 6 mm high test chain and should not contain joins
- attached to the end of the passline with a screw-pin shackle, a slip-pin shackle with a nut and molle, or a ring large enough to stop it going through the pass block, and
- fitted with links or rings to stop the climber from being pulled into the passline block.

Pass blocks should:

- have the shells bolted under the sheaves
- have the bearing pin securely locked and nuts keyed or the block be of the type which positively secures the nut and pin, and
- be equipped with sheaves 15 cm or more in diameter.

When a climber goes up a vertical metal spar passlines, chains and blocks should be provided. Climbing equipment should include a safety harness. The rigging rope should be capable of being passed around the climber and being firmly secured in position.

11.3 Climbing

Topping, rigging-up or stripping down should not be carried out in bad weather conditions or when visibility is poor.

An extra set of climbing equipment should be available at the worksite. A person with climbing skills who is able to help the climber in an emergency should be available in the immediate area.

A competent person should be assigned to transmit the climber's signals. The person should be in a safe area where he or she cannot be hit by falling objects.

Noisy equipment should not be operated around the area where a climber is working if it will interfere with the climber's signals.

Ropes attached to a tree in which a climber is working should not be moved except if signalled by the climber to do so.

The climber should give a warning when equipment or material is in danger of dropping, or is to be dropped deliberately.

Climbers should select the place for hanging rigging before topping a tree. There should never be less than 1 metre of the topped tree extending above the top guylines.

Loose equipment, rigging or other material should either be removed from the tree or securely fastened.

11.4 Tail trees

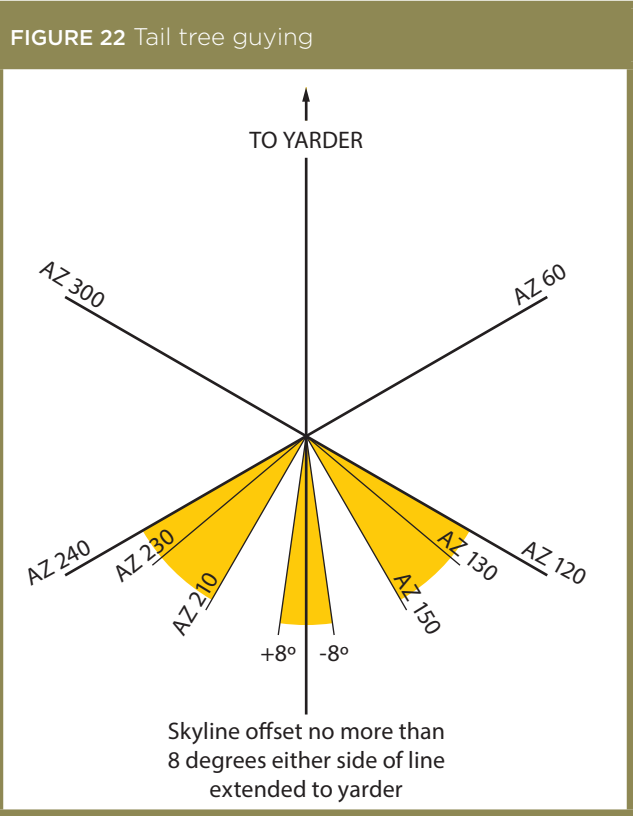
When stress is placed on the working lines by a turn everyone within reach of the tail tree should be in a safe area.

Tail trees should be supported by guylines whenever rigging is more than 3 metres from the highest ground point.

Guylines on tail trees may be anchored to standing trees if there is no danger of the anchor tree entering the work area if it is pulled over.

Where necessary, tail trees should be supported by at least two guylines.

Guylines on tail trees or lift trees and intermediate supports are the only guylines which should be attached to anchors using 'U bolt' clamps.



Increase guying location for guyline opposite the direction of offset by 10 degrees.

Table 3 Minimum specifications recommended for tail tree guylines for uphill yarding when rigged

SKYLINE DIAMETER (MM)	SKYLINE BREAKING LOAD (TONNES)	SKYLINE BREAKING LOAD (TONNES)	BACK GUYLINE DIAMETER (MM)	TAIL TREE VERTICAL LOAD (TONNES)
10	6.4	5	8	10.8
12	9.3	6	9	15.7
13	10.9	6	10	18.4
14	12.6	7	11	21.3
16	16.5	8	12	27.8
18	20.8	9	14	35.1
19	23.2	9	16	39.1
20	25.7	10	16	43.3
22	31.1	11	18	52.4
24	37.0	12	19	62.5
26	43.5	13	20	73.3
28	50.4	14	22	84.9

11. RIGGING SPAR AND TAIL TREES

SKYLINE DIAMETER (MM)	SKYLINE BREAKING LOAD (TONNES)	SKYLINE BREAKING LOAD (TONNES)	BACK GUYLINE DIAMETER (MM)	TAIL TREE VERTICAL LOAD (TONNES)
32	65.9	16	26	110.1
35	78.8	18	28	132.8
38	92.9	18	29	156.6
40	103.0	19	32	173.6
44	124.0	22	34	209.0

Notes:

The above recommendations are based on the worst case loadings within the recommended rigging configuration of this Guide.

For downhill yarding, guylines should be the same size as the back guylines recommended in Table 3.

11.5 Positioning tail tree guylines

FIGURE 23(a) Positioning guylines at BACK of tree

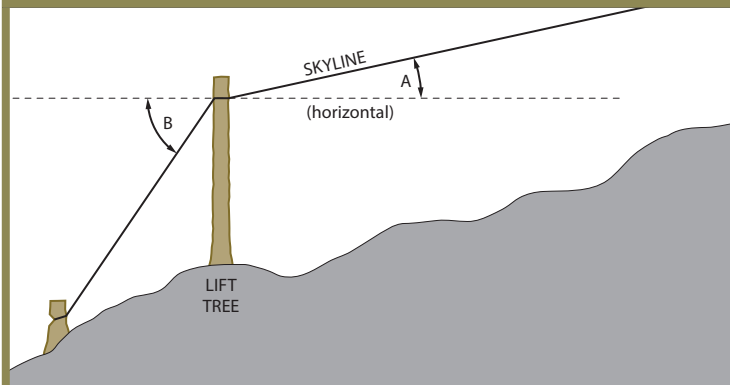
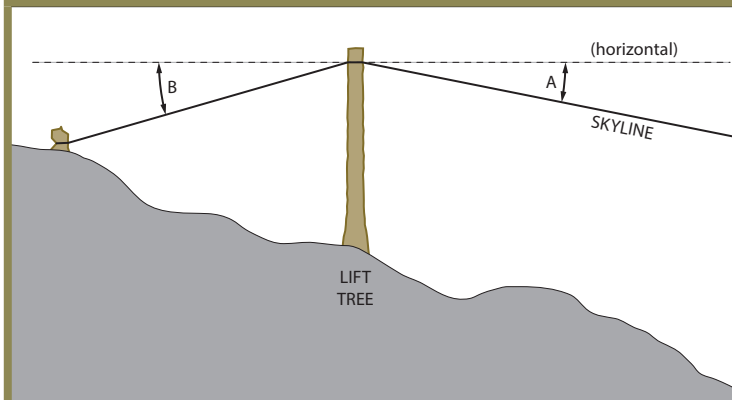
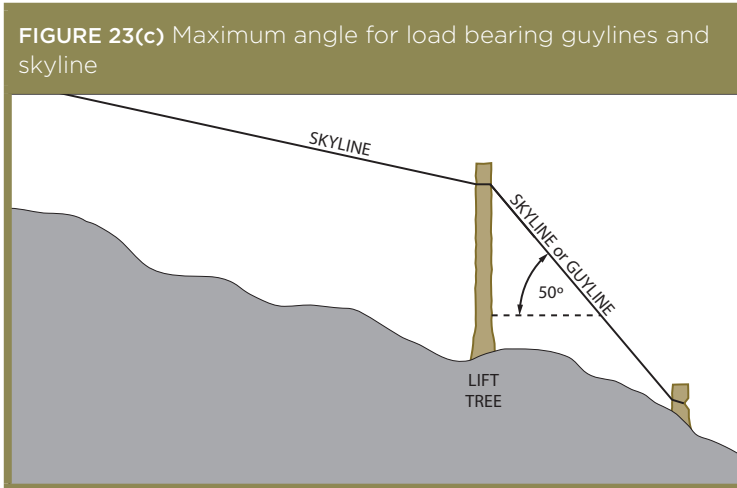


FIGURE 23(b) Positioning guylines in FRONT of tree





When the angle between the horizontal and skyline coming into the tree (angle 'A' in Figure 23(a)), is less than the angle between the horizontal and the skyline leaving the tree towards the anchor point (angle 'B' in Figure 23(a)), the guylines should be at the back of the tail or lift tree (see Figure 21).

If angle A is greater than angle B, the guys should be placed in front of the tail or lift tree. This usually occurs when a tail or lift tree is used during downhill yarding as shown above. Placing the guys on the uphill side only helps to pull the tail or lift tree over.

If a suitable anchor is not available within a specified shaded zone as in Figure 21, two guylines may be used in place of a single guyline, provided one of the guylines is placed on either side of, and as near as possible to, the affected shaded zone.

Tail and lift trees should be supported by extra guylines, if necessary, so the tree remains stable.

12. THINNING

12.1 Guyline anchors

Standing trees may be used as guyline anchors where:

- there is no danger the anchor tree will enter the work area if pulled over
- the selected trees are of satisfactory size, firmly rooted, sound and not hazardous, and
- they are tied back to other suitable anchors.

12.2 Tail trees

Chapter 7 sets out how rigging should be set up and used for tail trees.

A tail tree should be guyed for operations using a clamping, slack pulling carriage and a skyline of 19 mm or less unless the:

- skyline is anchored 8 degrees or less off-line from its rearward projection
- angle of the skyline as it leaves the tail tree is 50 degrees or less, and
- maximum heights set out in Table 3 are followed.

Table 4 Maximum rigging height for non-guyed Tasmanian Oak tail trees*

SKYLINE ANGLE CHANGE	Tree Diameter (cm) - D.B.H.U.B. (Diameter Breast Height Under Bark)		
	30 cm	35 cm	40 cm
	Rigging Height in Metres		
10	10		
15	7.5		
20	6	9	
25		7	10
30		6	8.5
35			7
40			6

* E. regnans, E. obliqua, E. delegatensis.

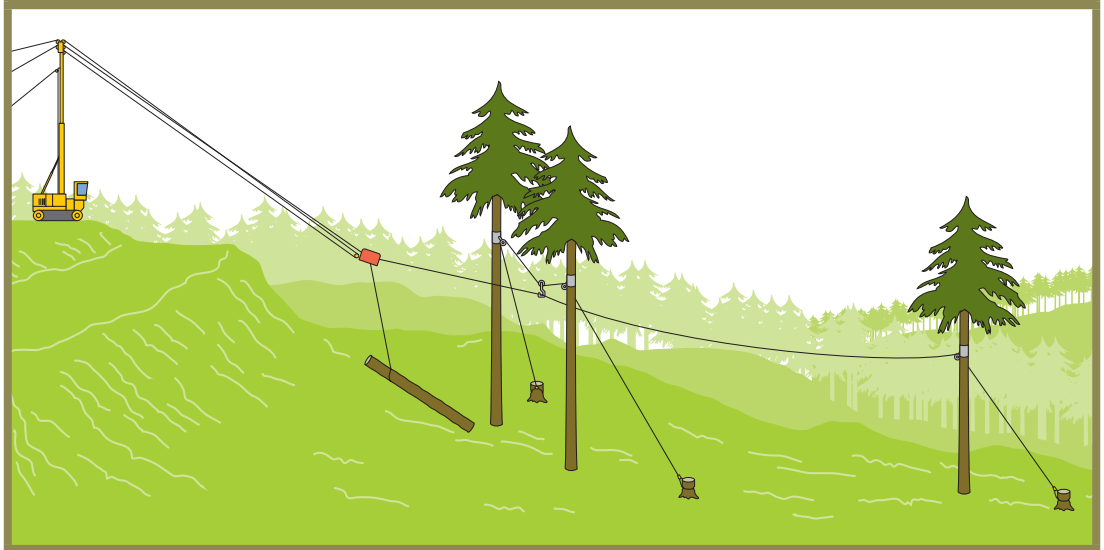
Note: The skyline angle change is illustrated in Figure 15 and is the difference in the angle at block level between the horizontal plane and the skyline on both sides of the tree.

13. MULTISPAN SYSTEMS

Intermediate supports are normally rigged mid-span to provide lift over a ridge or hold the belly out of a long span. Jacks are often rigged and the skyline rests in the jack allowing the line to slide freely over it. A special carriage should be used to pass over the jack.

Intermediate supports should allow horizontal clearance for the carriage and also allow a turn of logs to pass the base of the tree. Generally, there are three systems used: a single tree, a leaning tree or a double tree.

FIGURE 24 Example of a multispan system



Standing trees may be used for intermediate supports if:

- the trees are firmly rooted, sound and straight from the ground at the point where the block is attached, or
- the trees are generally of equal distance from the skyline but not necessarily opposite each other—see Figures 25(a) and 25(b).

Support trees used in an intermediate support hanger system should be rigged with a single rope with breaking strength equal to or greater than the mainline. As in Figures 25(a) and 25(b), the anchor pointers should be at greater than right angles to the skyline so the strain is against the line of pull.

The angles of the hanger support line into and out of support trees should be equalised, if possible, so the vertical forces are directed down the trees.

The angle into and out of the support trees should be between 40 and 80 degrees.

The vertical angle of each loaded support line segment between the support jack and block should be between 25 and 50 degrees.

The angle the strap makes with the centreline of the support tree should not be more than 10 degrees in any direction.

The loaded support trees should not displace laterally more than 60 cm at the rigging attachment point.

FIGURE 25(a) Standing trees as intermediate supports – Front view

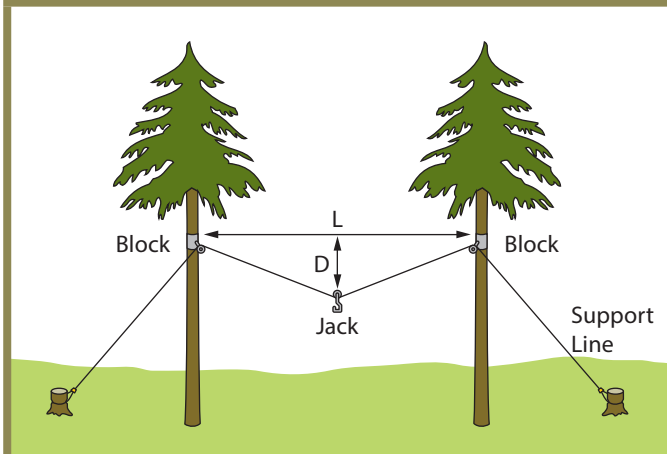
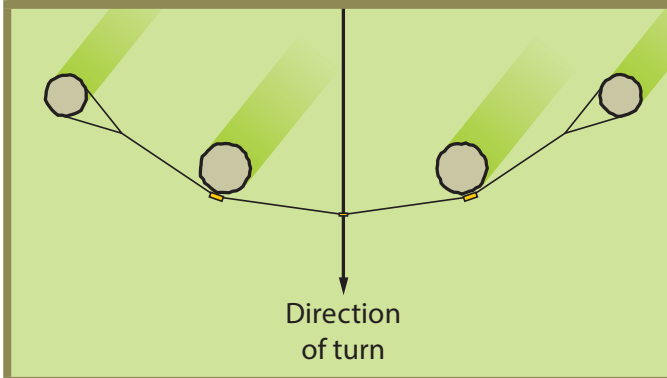


FIGURE 25(b) Standing trees as intermediate supports – Plan view



Single tree intermediate supports should be prevented from moving by:

- retaining 20 percent of the stump diameter in holding wood, or
- other suitable rigging arrangements consistent with this Guide.

A loaded single tree intermediate support should not lean more than 50 degrees at the point of block attachment (see Figure 26).

FIGURE 26 Leaning tree intermediate support with hanger system

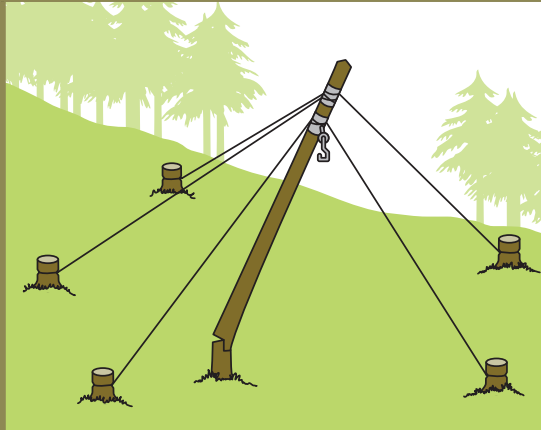
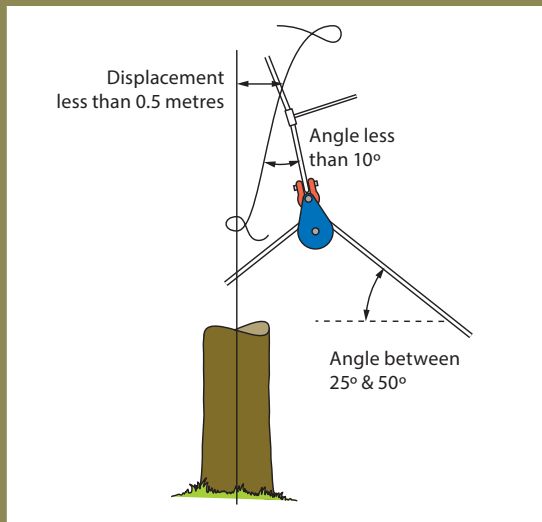


FIGURE 27 Single tree - Intermediate support system



To allow the carriage to pass the hanger, the angle change in the skyline at the support should not be too severe. This should not be more than 20 degrees for uphill yarding.

Straps used for suspending blocks from intermediate support trees should have at least one wrap of the strap around the trunk. The bark does not need to be removed.

IMPORTANT: Guyline anchors for support trees should be within specific guy zones to offset the load, like guyline anchors for the yarder.

14. SIGNALLING AND SIGNAL SYSTEMS

Standard yarding system whistle signals should be used in cable logging operations. Workers should be trained to use the signals and know and understand them. They should be alert to the signals and should always follow them.

A new signal may be created for an unusual or new situation not covered in the standard signals. To avoid confusion the new signal should only be used for the specific situation. Workers should be trained and assessed for competency to use the new signal.

Audible signals like whistles or horns should be used whenever noise, distance, restricted visibility or other factors prevent clear understanding of natural and unassisted oral signals. The basic whistle signals are shown in Table 5.

Table 5 Basic whistle signals

SIGNAL	MEANING
1 short	Stop all moving lines
2 short	Ahead on tail rope
3 short	Ahead on mainline
1 short, then 2 short	Ahead on skyline
3 short, then 1 short	Ahead on strawline
3 short, then 1 long	Hazardous Turn
Continuous sound	Emergency

A full set of recommended whistle signals which cover most other situations is in Appendix E.

A whistle or horn which is clearly audible and distinguishable to everyone in the coupe or harvesting site being logged should be installed on relevant machines.

The basic and alternative signal systems used on site should be posted on the yarder and at other places where crews congregate so they are readily available to people at the site.

Each unit of the signal or control system used should be tested daily and before operations begin. Audible signals used during testing should not include signals used to move ropes or materials.

Only one worker in a crew should give signals or voice communication where chokers are being set. Anyone may give a stop signal whenever someone is in danger or in an emergency.

Yarder operators should not move logs, loads or rigging unless they receive a clear and distinct signal to do so.

An audible signal should always be sounded before a rope is moved.

Note: This does not apply to grapple or other special yarding systems where people are not exposed to moving lines or logs.

Whenever two or more yarders are working near each other the signalling system should be tested to ensure there is no tone or frequency overlap.

14. SIGNALLING AND SIGNAL SYSTEMS

Adjustments, repairs and changes to signalling systems should be carried out only by qualified and competent people.

Voice transmissions can be used to move the rigging in combination with a whistle signal.

The chokerman should call the yarder operator by name to ensure proper contact is made.

The yarder operator should acknowledge the call with a whistled stop signal before the caller starts giving the voice message.

Voice transmissions should be kept brief and to the point.

After receiving the voice message, the yarder operator should acknowledge with a whistled signal the message has been received and is clearly understood.

Where an electrical signal system is used wire and attachments should be weatherproof.

Electrical signal systems should be installed and adjusted to avoid accidental signalling and maintained in safe operating condition.

Hand signals may be used instead of standard whistle system signals if:

- they are executed in plain sight of the machine operator, and
- they follow the signals in Appendix F.

The recognised hand signal meaning 'stop any moving line' and 'hold' (see Appendix F) may be used as an emergency stop signal at any time.

If voice, sound or hand signal communication becomes inaudible or not clearly understood, yarding should stop until the communication system is restored and effective.

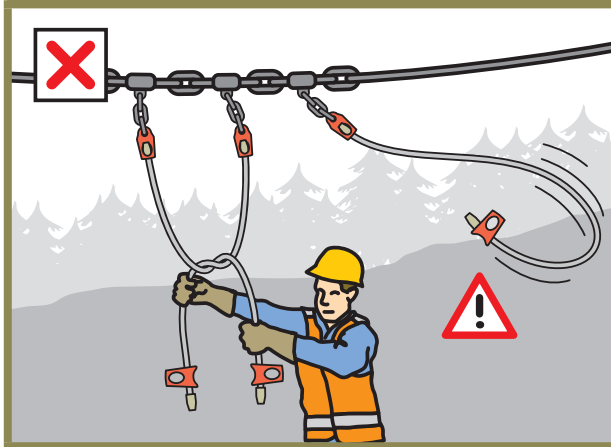
At no time should material be thrown as a signal.

15. YARDING LOGS

15.1 Selecting and choking the turn

Chokers should not be hooked or unhooked until rigging has completely stopped and chokers have stopped swinging.

FIGURE 28 Approach rigging after it has completely stopped and chokers have stopped swinging



Always approach the log and set chokers from the upper side, unless certain the log will not move.

If necessary, choker holes should be dug from the uphill side of the log.

Logs should be choked at the end closest to the yarder so they are less likely to upend or swing.

Select logs and attach the chokers so logs will pull clear of stumps, felled timber and other obstacles. If logs are piled, logs from on top of the pile should be used first.

The heaviest and longest logs should be placed in the front chokers for easier yarding and landing and to minimise strain on the rigging.

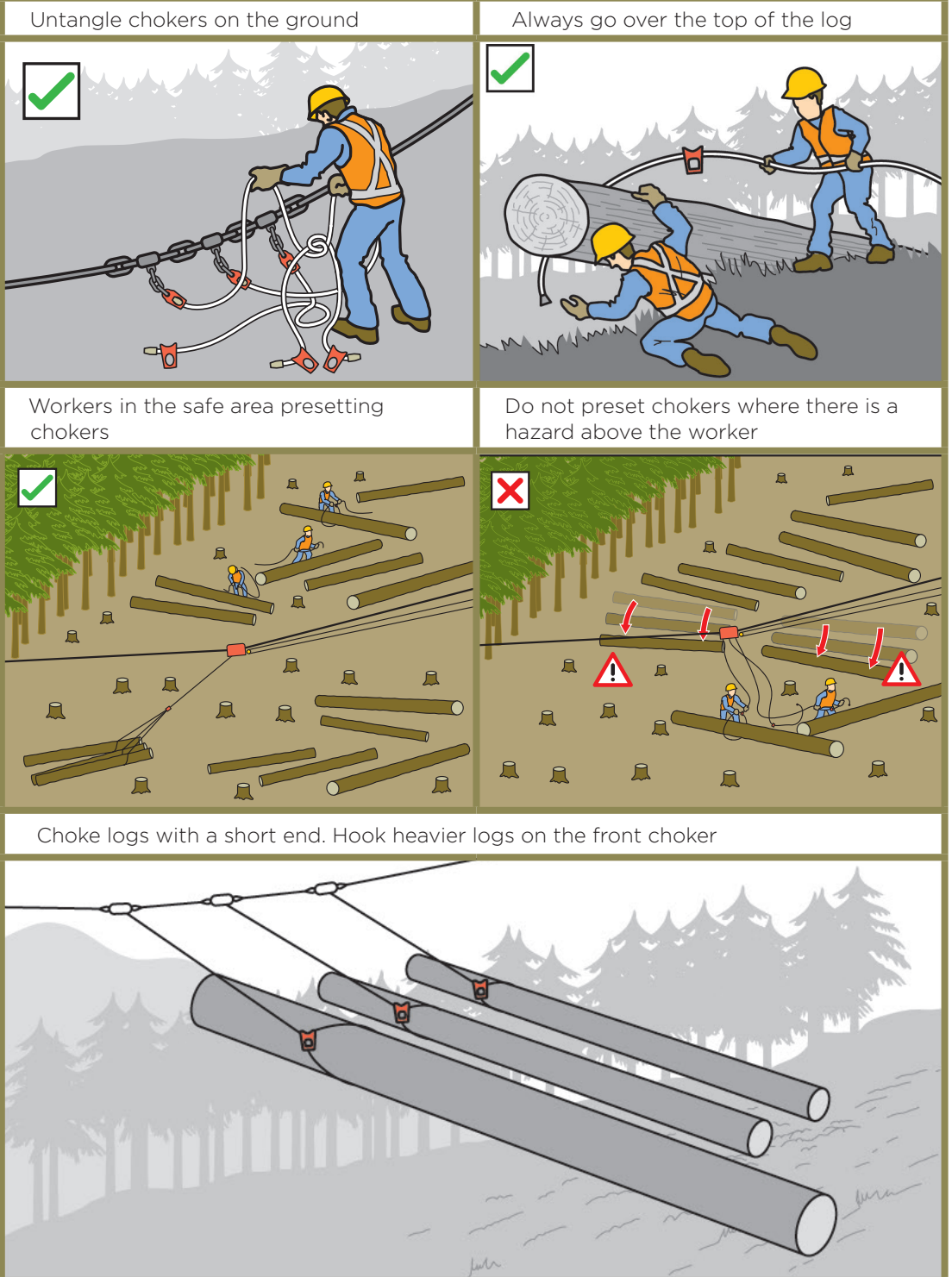
15.2 Setting chokers

When placing a choker on a log, always go over the top of the log with the nubbin.

If it is necessary to move to the other side of the log to push the knob through the log should be secured to stop it from rolling.

To minimise the risk of injury from swinging logs and to make landing the turn easier, chokers should be placed about, but not closer than, 50 cm from the ends of the logs.

FIGURE 29 Correct setting of chokers



15.3 Hang-ups

The best way to clear a hang-up is to move the carriage or choker to avoid the obstacle.

Hang-ups should only be approached after the rigging is slackened.

When approaching or working around hang-ups workers should approach them from above and be alert to the danger of logs rolling or sliding, widow makers and hazardous trees.

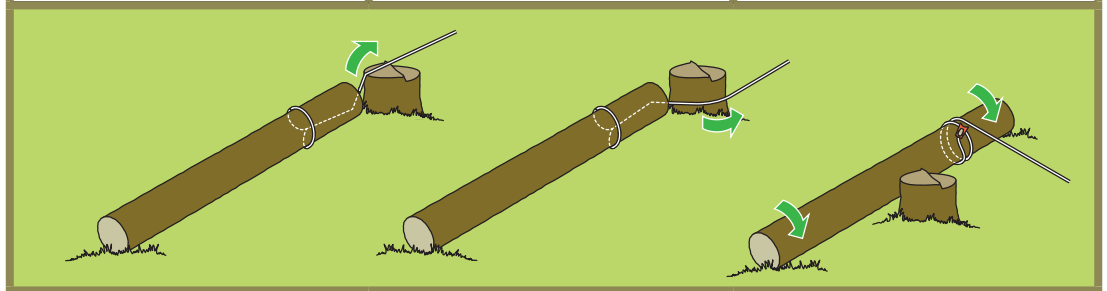
Moving the rigging can direct yarding forces to overcome obstacles. The jump, kick and roll are common solutions (see Figure 30).

FIGURE 30 Dealing with hang-ups

1. Jump – Position choker bell under log and run the line lead over the obstacle.

2. Kick – Position choker opposite the direction of pull and run the line lead around the end of the log and around the obstacle.

3. Roll – Slide the strap around the log opposite the direction of pull so the line lead wraps around the log.



15.4 Landing the turn

Everyone should be in a safe area well away from logs, root wads, chunks, rolling material and rigging before the 'go-ahead' signal is given. They should remain in a safe area until the rigging has stopped moving.

When working near a tail tree everyone should move away from the tree to a safe area before yarding starts.

During yarding the landing chute should be cleared of logs before the next turn of logs is landed unless:

- the logs are fully contained in the landing chute, or
- there is no possibility people working on or below the landing may be hit by rolling objects coming off the landing or log stacks.

Logs should not be allowed to accumulate on the landing chute so they become unstable.

To prevent escaping debris which may put choker setters at risk, slash should not be allowed to accumulate in the landing chute.

People, trucks and equipment should stay in a safe area while logs are being landed.

To determine the location and extent of safe areas a range of things should be considered, see Table 6.

Table 6 Considerations to determine safe areas

Task	Considerations
Head or senior choker setter or spotter	<p>Before moving rigging lines the head or senior choker setter should:</p> <ul style="list-style-type: none"> ■ identify a safe area for themselves and the other choker setters ■ tell the other choker setters where the safe area is, and ■ ensure all choker setters are in the identified safe area.
Choker setters and spotters	<p>Consider:</p> <ul style="list-style-type: none"> ■ logs moving unexpectedly when choked logs are pulled ■ unexpected rolling of root wads, chunks of wood, rocks and other material ■ wire ropes siwashing ■ chokers failing or slipping off logs ■ moving wire ropes throwing debris ■ choked logs becoming unhooked and rolling ■ tail hold tree falling, and ■ trees on outside edge of the coupe or harvesting site falling into the work area.
	<p>When choosing a safe area:</p> <ul style="list-style-type: none"> ■ whenever possible, stand on the uphill side of logs being snigged ■ stand clear of root wads ■ where possible stand in the area which was previously worked ■ everyone should be safe from siwashing wire ropes ■ where possible always stand so two or more tree stumps are between you and the wire ropes or logs being snigged, and ■ where possible stand at least two standing tree lengths away from a tail tree and another standing tree.
Chaser	<p>Common hazards to consider when identifying a safe area to stand while rigging is being moved include, but are not limited to:</p> <ul style="list-style-type: none"> ■ wire ropes under tension failing without warning ■ the yarder tower moving unexpectedly causing the guyline to move ■ log stack limiting visibility for workers or machine operators, and ■ log stacks moving without warning. <p>At the start of each line shift or set up—and before bringing the first turn to the landing—the hook tender and chaser should tell the chaser where the designated safe areas are.</p>

Task	Considerations
Hook tenderer	<p>When choosing a safe area it should be:</p> <ul style="list-style-type: none"> ■ out of the direct line of pull e.g. 45 to 90 degrees to the line of pull ■ on the opposite side of the yarder to the line of pull, where possible ■ a safe distance away from guylines ■ at least 1.5 times the length of a log located in a log stack ■ maintained so when working with a swing yarder it will not endanger the safety of the chaser—see the manufacturer’s safe operating instructions, and ■ well away from the operating area of mobile plant—at least the length of the longest log to be handled or the manufacturer’s specified safe working distance, whichever is the greater.

Logs should not be landed if the chaser’s location is not certain or if they are not located in the identified safe area.

Logs should be stable and secure on the landing before being approached by the chaser and before chokers are unhooked.

FIGURE 31 Standing in a safe area while logs are being yarded



APPENDIX A – OTHER REFERENCE MATERIAL

The following is a list of published technical standards providing guidance only. Compliance with these standards does not guarantee compliance with the WHS Act and Regulations in all instances. This list is not exhaustive.

AS 1353-1997 (Series): *Flat synthetic-webbing slings*

AS 1636-1996 (Series): *Tractors – Roll-over protective structures*

AS/NZS 1891.4:2009: *Industrial fall arrest systems and devices – Selection, use and maintenance*

AS 2089-2008: *Sheave blocks for lifting purposes*

AS 2294.1-1997: *Earth moving machinery – Protective structures – General*

AS 2294.1 Supp 1-2003: *Earth moving machinery – Protective structures – General – Operator protective structures fitted to plant used in the timber industry (forest operations)*

AS 2318-2006: *Swivels for lifting applications*

AS 2741-2002: *Shackles*

AS 2759-2004: *Steel wire rope – Use, operation and maintenance*

AS 3775-2004 (Series): *Chain slings*

AS 4497-1997 (Series): *Roundslings – Synthetic fibre*

AS 4987-2002: *Earth moving machinery – Tip-over protective structures (TOPS) for compact excavators – Laboratory tests and performance requirements*

ISO 8082 (Series): *Self-propelled machinery for forestry – Laboratory tests and performance requirements for roll-over protective structures*

Part 1: *General machines*

Part 2: *Machines having a rotating platform with a cab and boom on the platform*

ISO 8083: *Machinery for forestry – Falling-object protective structures (FOPS) – Laboratory tests and performance requirements*

ISO 8084: *Machinery for forestry – Operator protective structures – Laboratory tests and performance requirements*

APPENDIX B – CABLE LOGGING SYSTEMS

FIGURE 32 High lead system

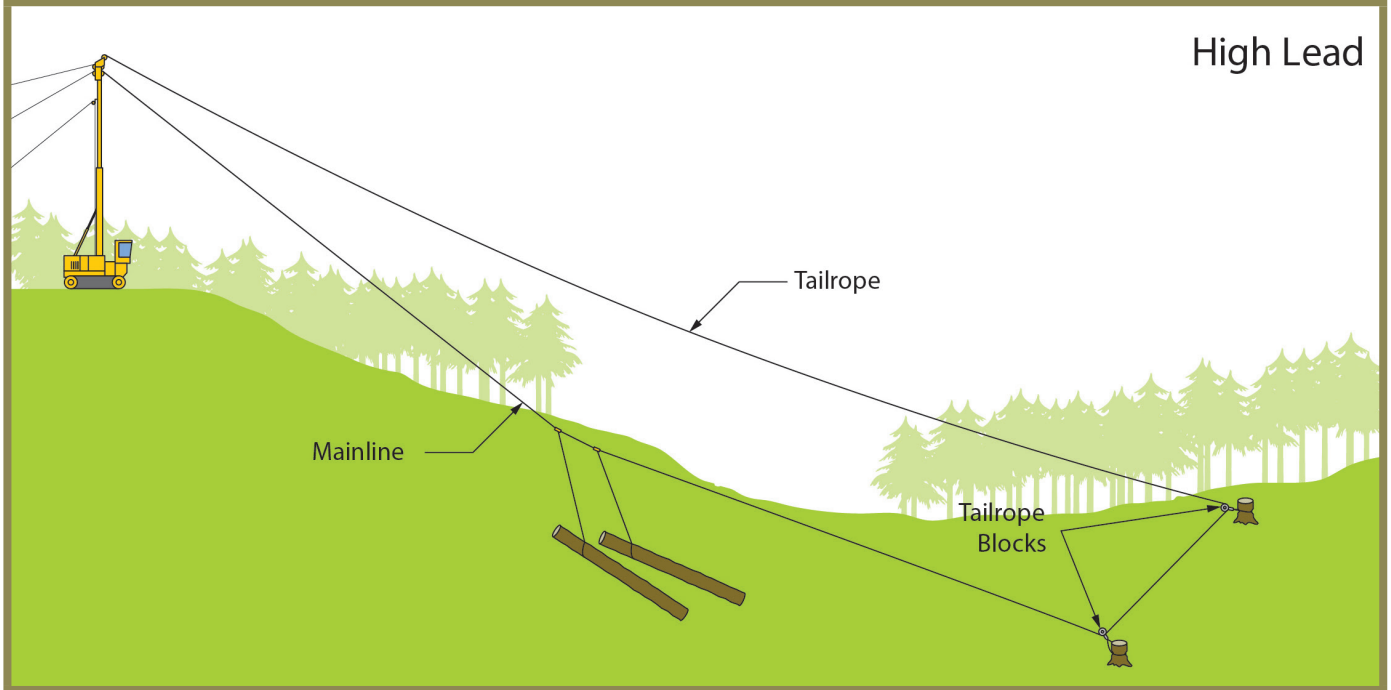


FIGURE 33 Shotgun system

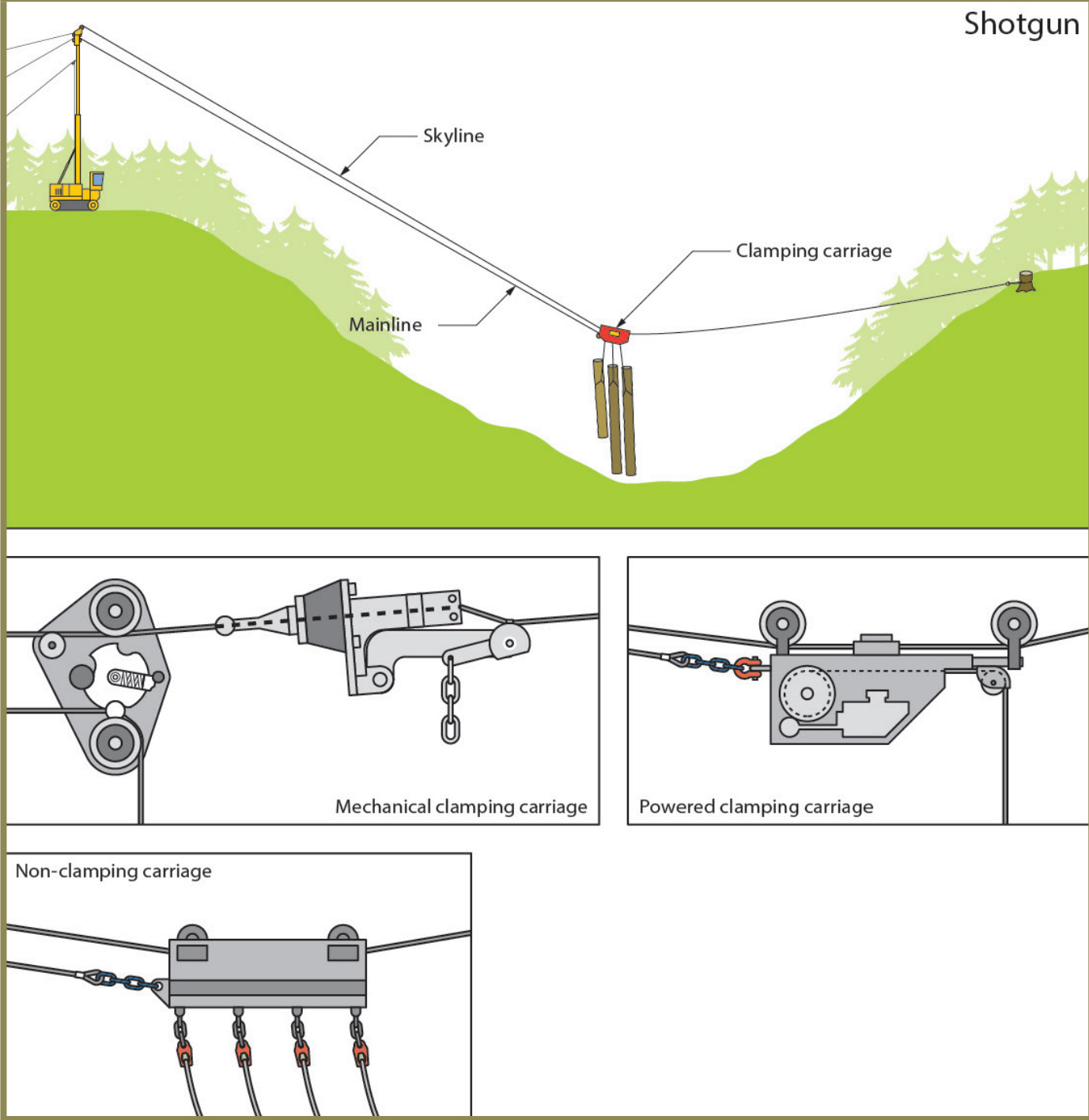


FIGURE 34 Running skyline system

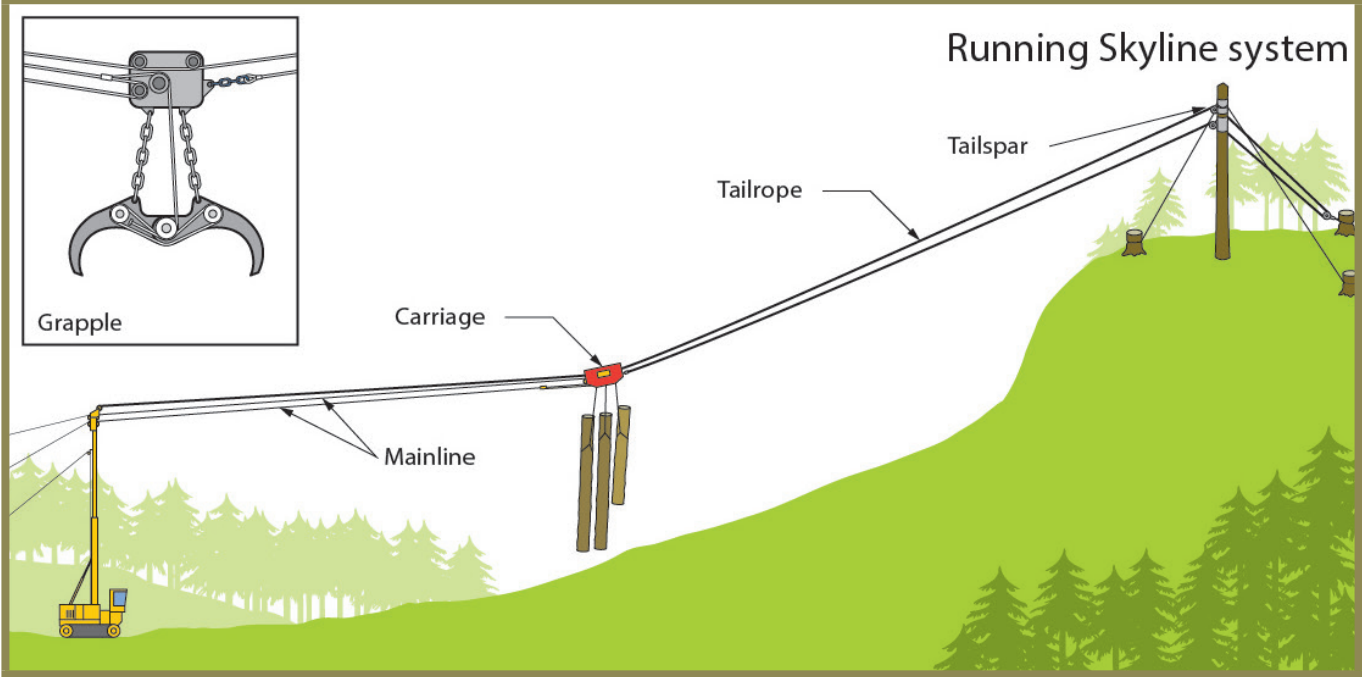


FIGURE 35 Slackline system

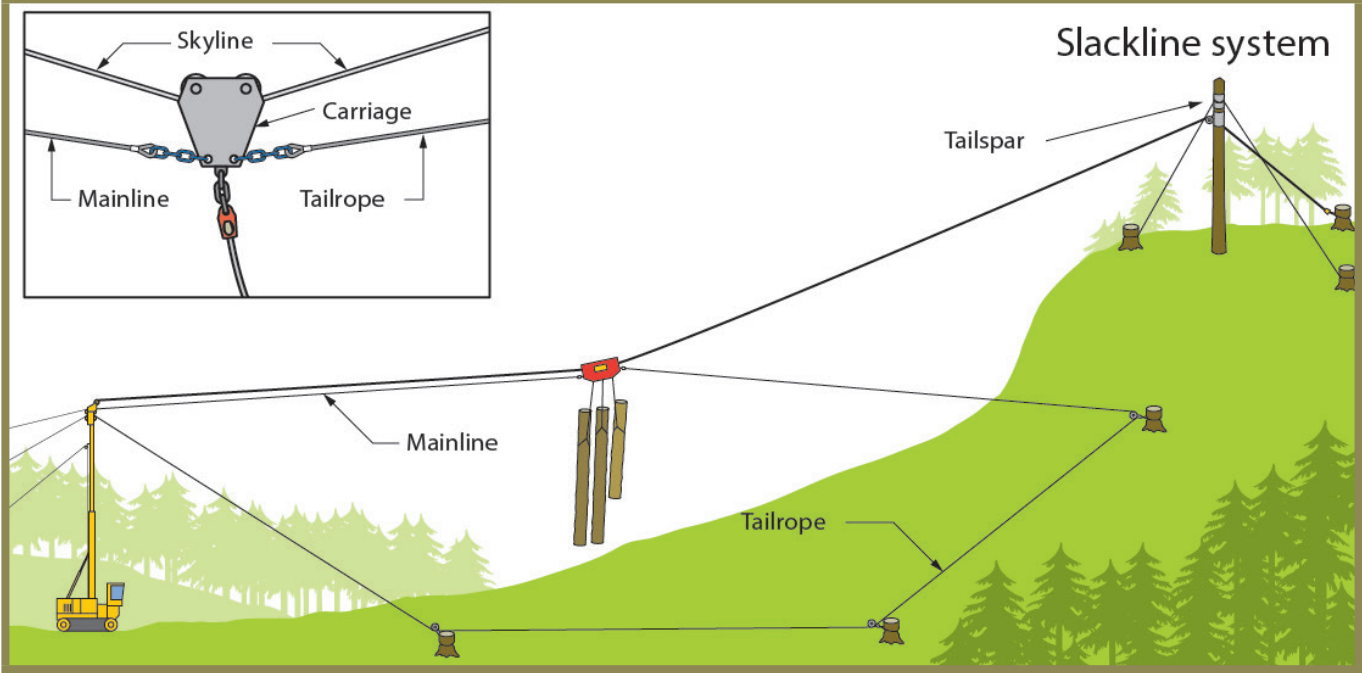


FIGURE 36 North bend system

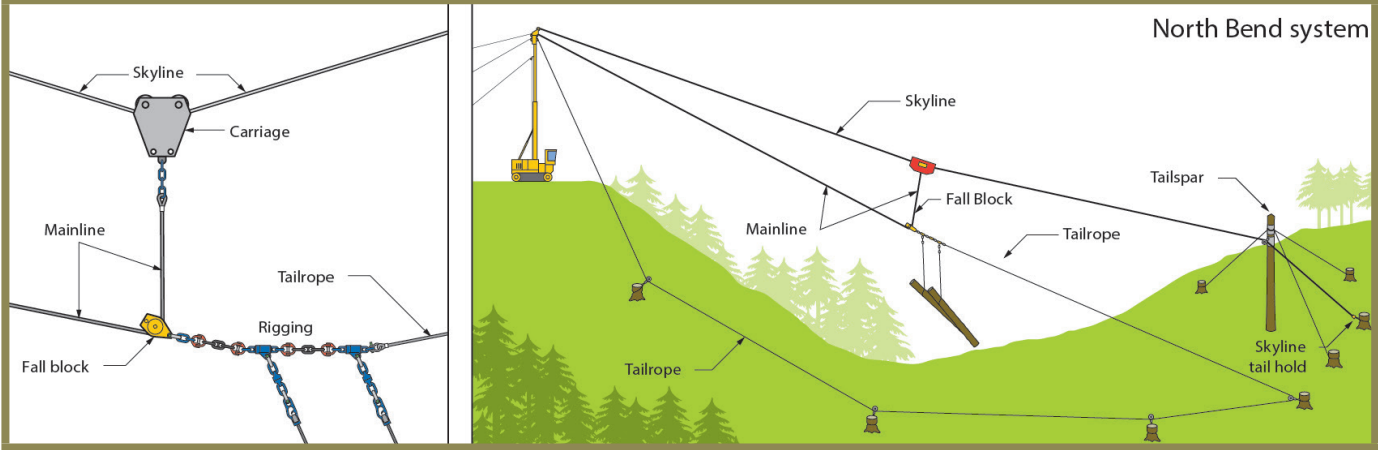
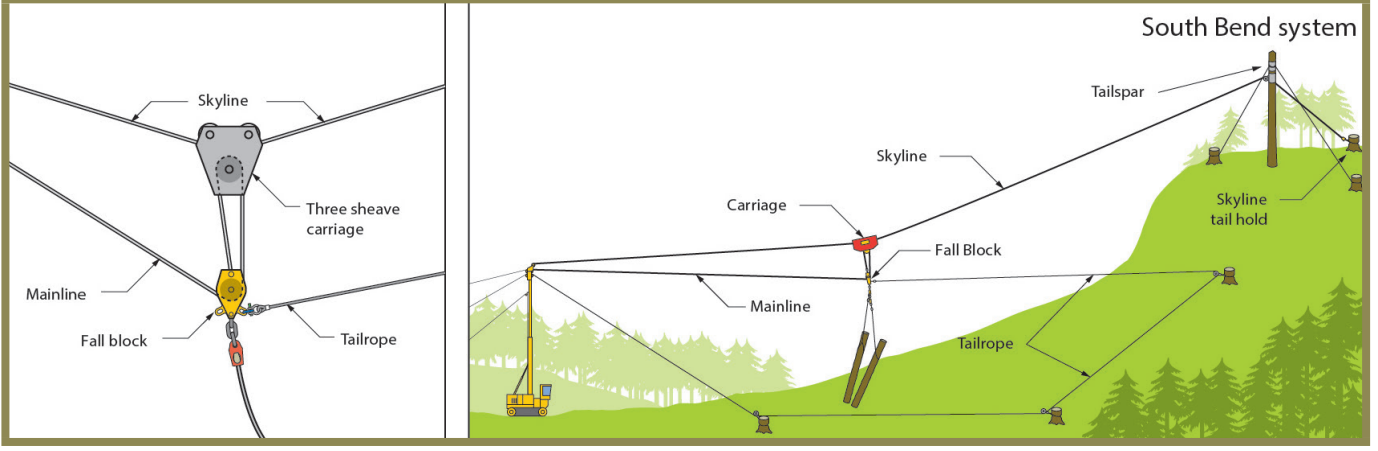


FIGURE 37 South bend system



APPENDIX C – DEFINITIONS

Alternative signal system means a system by voice or by a medium other than horn or whistle which provides a safe and reliable method of communication between crew members.

Anchor means a stump, tree, deadman, earth-anchor or other object used to secure a skyline, guyline or rigging block.

Back guy means a wire rope attached to a spar and anchored to the ground opposite to the lead of the mainline or skyline designed to take the strain when yarding logs.

Backline means the boundary of a setting furthest from the landing.

Barrel means the central portion of a winch drum on which the rope is spooled.

Bell means the component which slides on a choker—when a worker chokes a log, the bell secures the knob.

Bight means an angle between two parts of rope running through a block or around an obstruction, for example a stump.

Block means a metal case enclosing one or more sheaves to facilitate a change of direction of a rope, or to gain a mechanical advantage in transmission of power through a rope.

Breaking strength is the greatest loading a wire rope can withstand without breaking.

Bridling is offsetting the tailrope on a skyline setting to make the butt rigging move away from the skyline when it is being hauled back.

Butt rigging means a system of swivels, shackles and chains which connect the tailrope and mainline and to which chokers are attached.

Cable logging is a yarding system using a stationary machine with powered drums, spars or towers, blocks, wire rope and butt rigging to yard logs from the felling site to the landing.

Carriage means a load carrying device which travels freely on sheaves running on a wire rope used for yarding or loading logs.

Centralised landing means either a single, or a number of landings located at spaced intervals along a road.

Chaser means a worker who unhooks chokers at the landing.

Choker means a length of wire rope, chain or synthetic material with attachments for encircling the end of a log to be yarded.

Choker hook means the connector on a choker enabling a noose to be formed around the end of a log.

Choker setter means a member of the rigging crew who sets the chokers on logs.

Chute means the space in front of a yarder where logs are landed.

Climbing spurs mean strap-on metal spikes enabling a rigger to climb a standing tree.

Competent person means a person who has acquired through training, qualification or experience the knowledge and skills to carry out the task.

Continuous landing means a road or road edge where logs are decked in a continuous row.

Deadman means a solid object, for example a log, baulk, metal rail or concrete block, buried or firmly set in the ground to form an anchor for guys, blocks or yarder tie-backs.

Diameter means the diameter of a tree measured under the bark at breast height, which is 1.35m (4 ft 6 in) from the ground on the top side of the tree.

Drum means a spool on which a rope is wound.

Fairlead means a device containing sheaves or rollers used to guide rope onto a drum.

Grapple means power-operated hinged jaws which can be opened and closed and used for grabbing logs for yarding or loading.

Grapple yarding is yarding logs using a grapple instead of butt rigging and chokers.

Guyline means a line used to support or stabilise a spar, intermediate support tree, tail tree, machinery or equipment.

Headspare means the rigged spar at or near the landing.

Jack means a hanger device used to support a skyline.

Landing means a place where logs are laid after being yarded while they are awaiting handling, loading and transportation.

Landing chute means the head of the skid trail or road where logs are temporarily placed before being unhooked or swung to a deck.

Lay means the manner, direction and pitch in which the strands or a wire rope are laid around the centre of a rope, or in which the wires are laid around the centre of a strand.

Lift tree means an intermediate support for a skyline.

Log means a tree segment suitable for processing into sawn timber, pulpwood or other wood products.

Mainline means the line moving the turn of logs towards the yarder.

Mobile yarder means a trailed or self-propelled yarder on which a tower is mounted.

Mobile tailhold means a self-propelled anchor unit like a machine to which ropes and blocks are attached.

Mobile tailspar means a short spar, usually mounted on an excavator or machine used to facilitate rope shifts and improve clearance.

Molle means a short piece of wire rope which is wound around itself to form a loop – used as a temporary connection between eye splices of two ropes.

Rigger means a worker who installs the rigging on a spar.

Safe area or Safe work area means a designated area in which the likelihood of harmful physical contact is minimised. The separation distance between safe areas and work activities is usually two tree lengths from the work activity in any direction. Also referred to as a safe zone, exclusion zone or designated safe area.

Safe working load means the calculated permissible load which can be applied.

Shackle means a “U” shaped metal connector, having a removable pin or threaded bolt through its end – used for example on rigging, blocks and straps.

Sheave means a wheel, roller or pulley located in a block with a groove along its edge to hold a belt, rope or cable.

Siwashing is when rope moves sideways suddenly when put under tension.

Skyline means the line which is hung between two or more supports on which a carriage or block travels.

Slack means a section of rope which is free of tension.

Spar means a tree or pole supported vertically by guys on which blocks and rigging are hung for cable logging systems.

Splice means a section of rope woven into another piece of rope, for example a long splice, or back into itself, for example an eye splice.

Sprag means a broken wire protruding from worn or damaged rope.

Tail hold means an anchor used for making fast any line or block.

Tail rope (haulback) means a rope used to return the mainline, butt rigging and carriage or grapple to the break out point.

Tail tree means the tree at the opposite end from the headspar on which a skyline or other rigging is hung.

Tie-back means a rope used to tie-back a yarder to a stump or deadman or to tie one stump back to another stump to give extra strength.

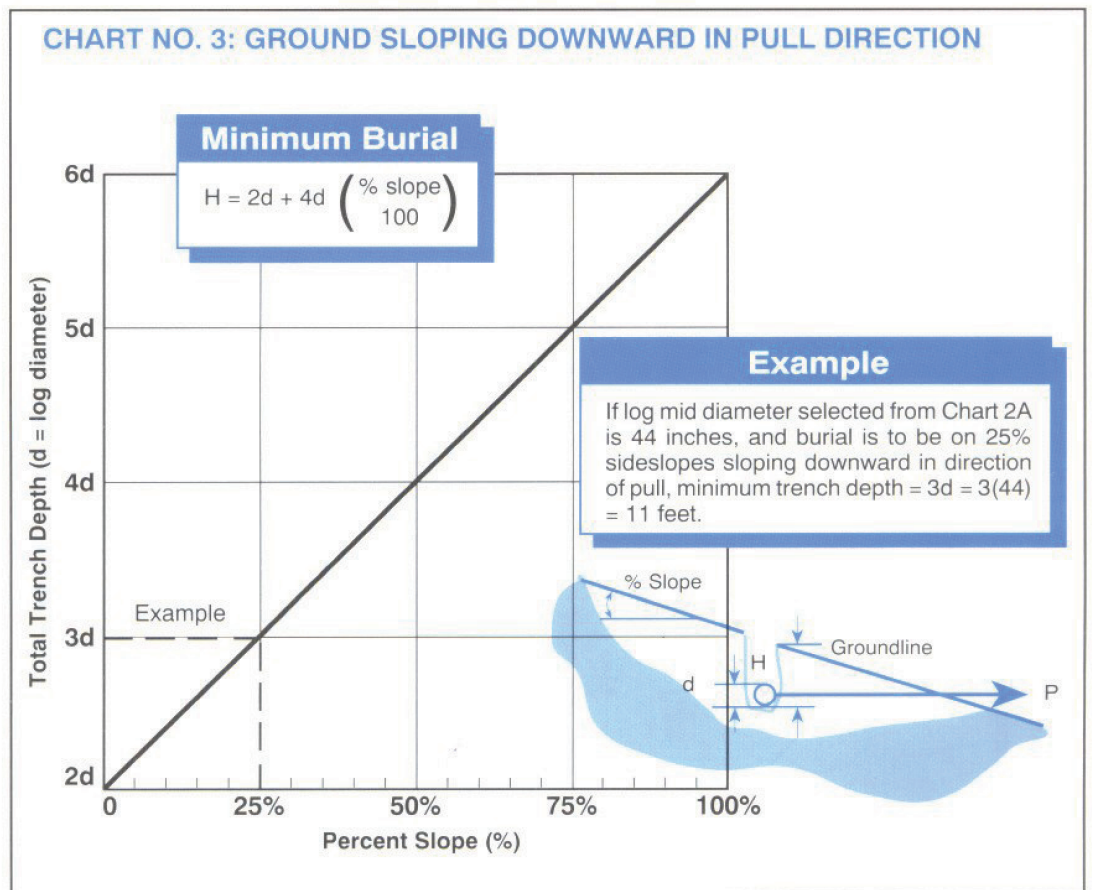
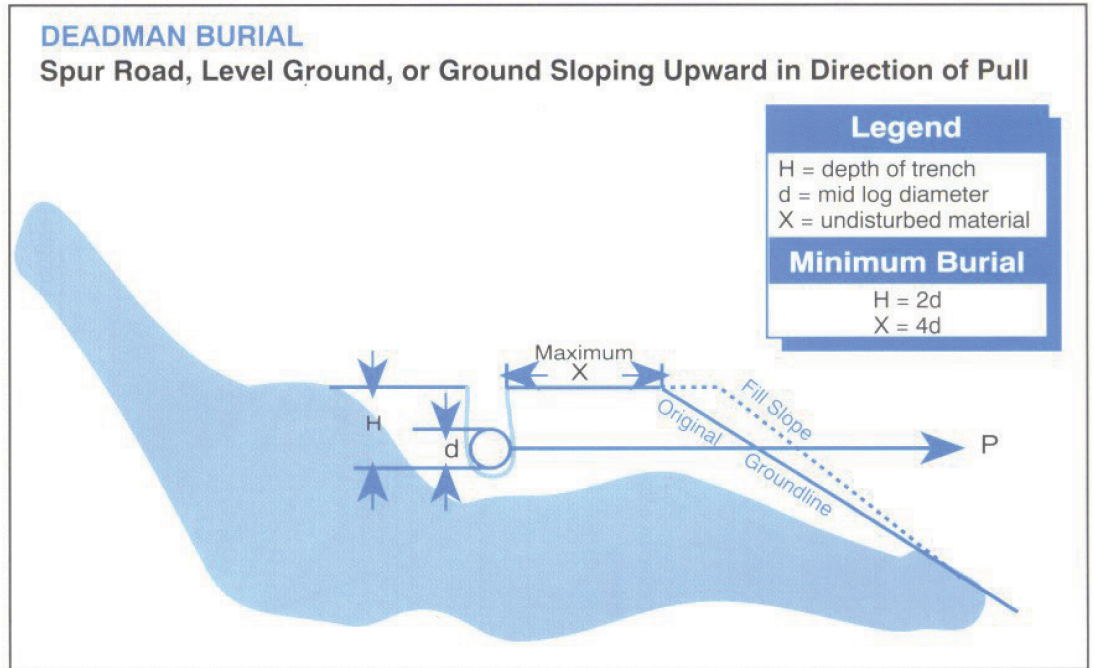
Turn means a log, group of logs or other material usually attached by chokers, grapples or other means of power and moved from a point of rest to the landing.

Winch means a powered drum used to reel in or let out rope.

Yarder means a machine with a series of drums used to yard logs.

Yarding means moving logs from the place where they were felled to the landing.

APPENDIX D – RECOMMENDED MINIMUM INSTALLATION REQUIREMENTS FOR DEADMAN ANCHORS



DETERMINING AN ADEQUATE DEADMAN

Chart No. 1 — Correction For Pull Direction

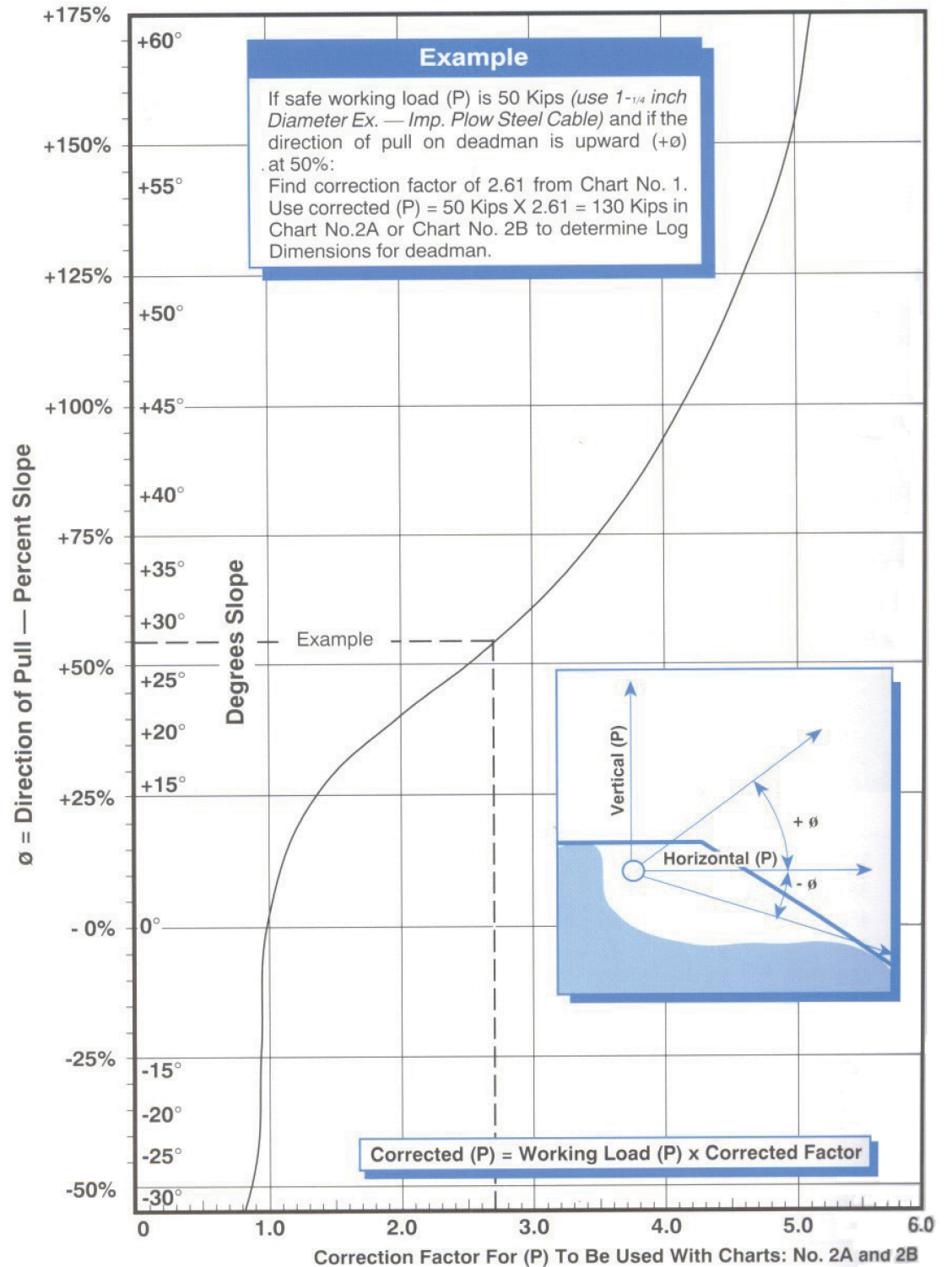


CHART NO 2A GRANULAR SOILS - (P) V.S. DEADMAN LOG DIMENSIONS

(For use with Inorganic Silt, Sand and Gravel above the watertable)

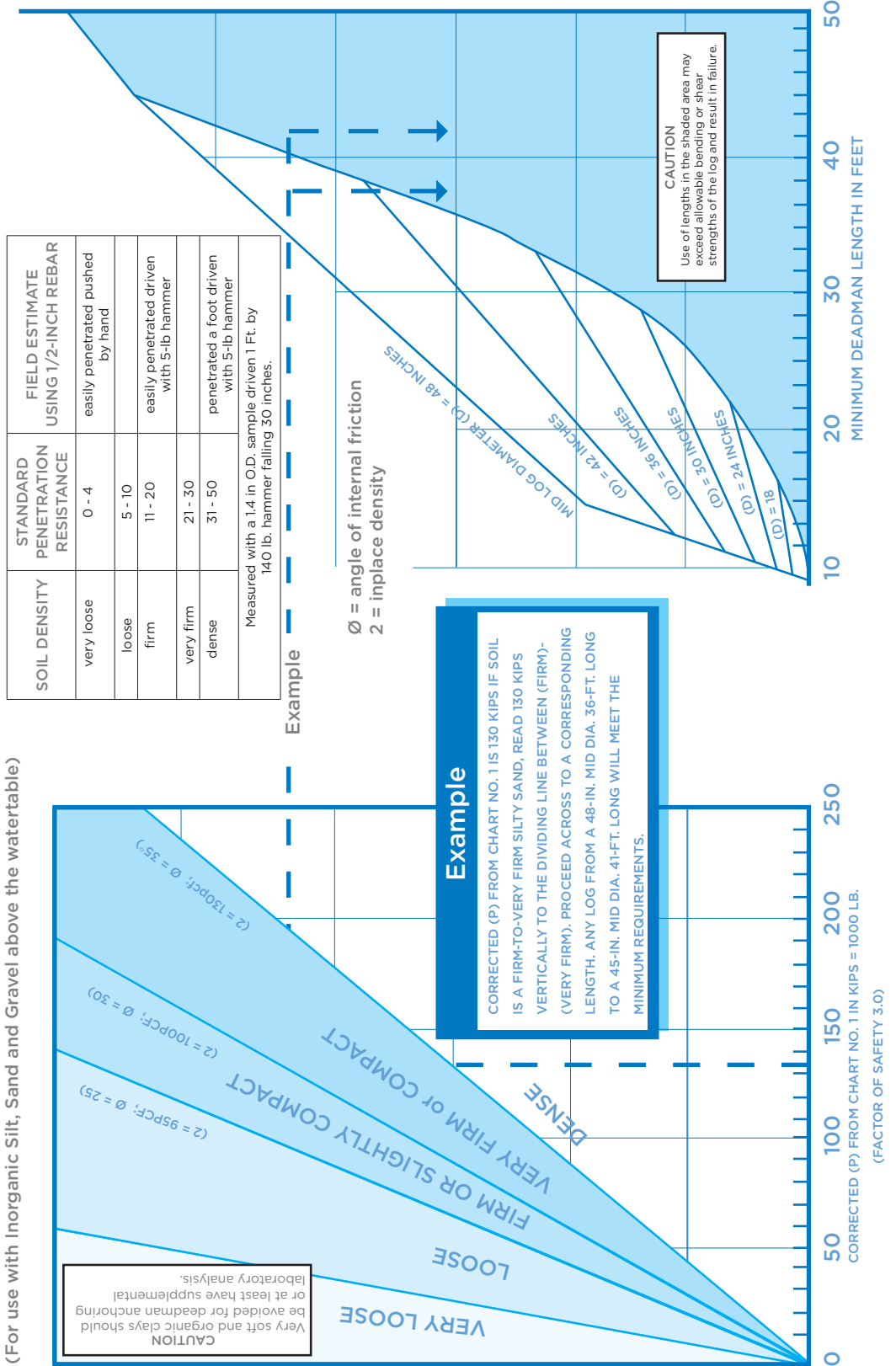


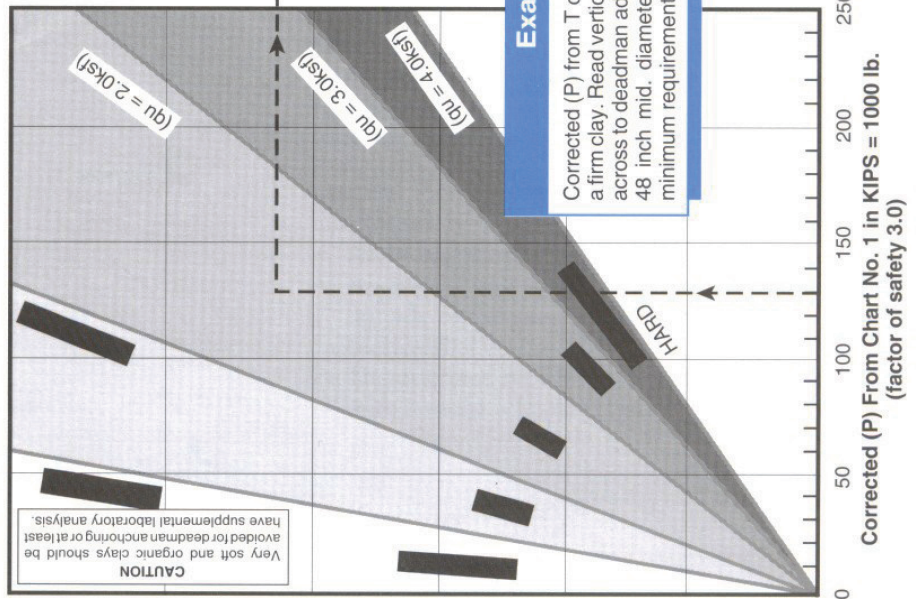
CHART NO. 2B CLAYEY SOILS (P) CORRECTED V.S. DEADMAN LOG DIMENSIONS

(For use with Inorganic Clays above the watertable)

SOIL STRENGTH	STANDARD PENETRATION RESISTANCE	FIELD ESTIMATE USING 1/2-INCH REBAR
very soft	0 - 1	squeezes between fingers when fist is closed
soft	2 - 4	easily molded by fingers
firm	5 - 8	molded by strong pressure of fingers
stiff	9 - 15	dented by strong pressure of fingers
very stiff	15 - 30	dented only slightly by strong finger pressure
hard	over 30	dented only slightly by pencil point

Measured with a 1.4 in. I.D., 2 in. O.D., sampler driven 1 ft. by 140 lb. hammer falling 30 inches.

Example



APPENDIX E – RECOMMENDED WHISTLE SIGNAL SYSTEMS

The principles in Table 7 are the building blocks to develop a signalling system. The principles follow simple, logical rules and assist in understanding and interpreting signals.

Table 7 Signalling system principles

Signal/action	Meaning
Repeat the signal once	Carry out the indicated operation slowly.
Any signal followed by 4 short whistles	Slack the line indicated by the signal.
Any signal for slack which is repeated	Slack the line indicated quickly.

The following additional signals are based on the above principles.

Table 8 Additional signals






Signal (hyphen (-) indicates a short pause)	Meaning
1 short - 2 short - repeat once	Ahead slow on skyline
1 short - 2 short - 4 short	Slack skyline normally
1 short - 2 short - 4 short -repeated once	Double slack - slack the skyline right off quickly
1 long - 1 short - 2 short - 4 short	Slack skyline slowly
3 short - 3 short	Ahead slow on mainline
3 short - 4 short	Slack mainline-usually blown as 4 short only
3 short - 2 short	Standing tight line-power to mainline and tailrope
2 short - 2 short	Ahead slow on tailrope
2 short - 4 short	Slacken tailrope
2 short - 1 short	When rigging is moving means: slacken the tailrope
2 short (running tightline)	When rigging is moving means: tighten the tailrope
1 short - 1 short	Release running tightline (Hup-Ho)
3 short - 1 short- repeat once	Ahead easy on the strawline
3 short - 1 short - 4 short	Slack strawline
1 long - 1 short	Start work or stop work
1 long - 1 short - 4 short	Stop work, crew come to the landing

APPENDIX E – RECOMMENDED WHISTLE SIGNAL SYSTEMS

Table 9 Signals when rigging is on the landing

Signal (hyphen (-) indicates a short pause)	Meaning
3 short	Strawline back on the tailrope
3 short - 1 short - 2 short	Strawline back on the rigging
3 short - plus x number of shorts	x indicates the number of sections of strawline back on rigging-usually coiled sections
1 short	Landing attendant inspects and repairs rigging
	Yarder operator should blow two short and be answered by two short from the rigging crew before returning the rigging to the bush.
2 short	No chokers back on rigging
2 short - plus x number of shorts* *Note: A longer short blown means bigger choker	x indicates the number of chokers to go back on the rigging** **Note: If the number requested is the same as what is already on the rigging, it means TO upend badly kinked chokers
2 short - 1 short	Slack tailrope and hold all lines until 2 short is blown

APPENDIX F – RECOMMENDED HAND SIGNALS FOR CABLE LOGGING OPERATIONS

	
<p>Stop any moving line and hold</p>	<p>SLACK MAINLINE OFF Arm extended at side, flipping wrist</p>
	
<p>CABLE DOWN Touch the top of head and...</p>	<p>CABLE UP raise hand up and down</p>
	
<p>AHEAD ON THE DROPLINE Cross arms in front</p>	<p>MAINLINE AHEAD SLOW Both arms raised</p>

APPENDIX F - RECOMMENDED HAND SIGNALS FOR CABLE LOGGING OPERATIONS



SLACK THE HAULBACK
Hands on front of the body
using chopping motion



SLACK STRAWLINE
Pat back of hand
with other hand



HOLD DOG DRUM OP BRAKE LEVER
Clasp one hand



TIGHTLINE
Hands over head
fingertips touching



MAINLINE AHEAD NORMAL
Raise one arm



MAINLINE AHEAD
One arm raised, Hand fluttering

APPENDIX F - RECOMMENDED HAND SIGNALS FOR CABLE LOGGING OPERATIONS



