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A GUIDE TO GOOD CLIMBING PRACTICE

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Background to the Arboricultural Association

Founded in 1964, The Arboricultural Association is the largest and most established UK body and authority for the amenity tree care profession. It has a membership base of circa 2000 members in government, commercial and educational employment at craft, technical, supervisory, managerial, tutor and consultancy level.

The Arboricultural Association is regarded by the Office of the Deputy Prime Minister (formerly DoE), the Royal Horticultural Society, and local government as a focal point for best practice in arboriculture, for certification and regulation of the industry, information, education and research. It is unique amongst the profession in that its body of knowledge extends across the full spectrum of arboricultural issues and can represent and advise a wide range of members from small operators to large corporate bodies, local and central government.

The Association publishes a range of technical leaflets, guidance notes and other publications concerning arboriculture, a quarterly newsletter and the Arboricultural Journal *(The International Journal of Urban Forestry).*

In its function as voluntary regulator for the arboricultural industry the Association publishes a directory of Registered Consultants and Approved Contractors, all of whom have reached standards of excellence in arboriculture and whose standards are regularly re-assessed. The Association also provides an accreditation scheme for promoting excellence in local government arboriculture and offers training through a varied programme of topical workshops, seminars, an annual Trade Fair and annual Conference.

Various grades of membership exist for professional arboriculturists, those in related disciplines and enthusiasts.

HSE

Forestry Commission

Lantra Awards

Arboricultural Association cares for trees

Preface from the Arboricultural Association

The Arboricultural Association welcomes you to this guide which gives authoritative advice on current tree climbing techniques which are both effective and safe. This edition has been produced to take into account advances in tree climbing equipment and techniques since the publication in 1999 of the AA/FASTCo Guide to Good Climbing Practice and also the requirements of new legislation including the Work at Height Regulations (2005). It also incorporates guidance on aerial rescue and therefore replaces both the AA/FASTCo Aerial Rescue Guidance Notes (1997) and the AA/FASTCo Guide to Good Climbing Practice (1999).

The Arboricultural Association is particularly grateful to technical authors Mick Cottam, Liam McKeown and Chris White and for input from other arborists too numerous to mention. Their willing participation in a project that benefits all practitioners is valuable and most appreciated.

The Arboricultural Association is also grateful to the Health and Safety Executive, Forestry Commission and Lantra Awards for their support during the creation of this guide. The input of their staff into practical workshops and seminars, together with their helpful comments on drafts of the guide is very much appreciated.

Supporting the production of this Guide, STIHL has once again demonstrated its focus on excellence in arboriculture, encouraging both the highest standards of equipment and the professional expertise of users. The Arboricultural Association is grateful for STIHL's commitment and support.

The Arboricultural Association commends the Guide to Good Climbing Practice to all those involved in aerial tree work. It is a concise summary of techniques and equipment and gives practitioners definitive guidance to enable them to ensure they meet up to date standards which can only enhance their safety, efficiency and professionalism.

Jonathan Hazell, *Chairman,* Arboricultural Association

Preface from the Health and Safety Executive

The Health and Safety Executive welcomes this revised guidance and has been very happy to assist in its production. It sets out techniques and systems of work that can be considered as best practice guidance in arboriculture and helps anyone in the business meet their legal obligations. It is an outcome of a number of years of close cooperation with the industry and contains valuable information from research work undertaken by HSE and others.

I commend this guidance to arborists and arboricultural businesses as a ready source of practical information that will help them operate safely.

Dr Roger Nourish, *Head of the Agriculture and Food Section,* HSE

Photography: Richard Allmond of Treevolution and Steve Peake Photography.

Contents

1.0 INTRODUCTION

This Guide provides guidance for all trained operators who are required to carry out tree climbing operations.

It should be read in conjunction with AFAG Safety Guides 401 *Tree Climbing Operations, 402 Aerial Tree Rescue* and *403 Mobile Elevating Work platforms (MEWPS).*

The Guide is not a substitute for training, but defines current industry best practice concerning tree climbing equipment and techniques.

It is aimed at the practising arborist:

- To use as a Code of Practice, enabling the climber and employer to operate inside a framework that meets current Health and Safety legislation.
- To introduce time and energy-saving techniques and equipment.
- To help make tree climbing safe.

1.1 RISK ASSESSMENT

Risk assessment under The Management of Health and Safety at Work Regulations (1999) is a legal requirement (see Appendix 2).

The purpose of the risk assessment is to establish a safe system of work. Risk assessment must be undertaken for the task, the equipment and the site for each work operation.

Tree climbing using a rope and harness should only be used where other means of access or undertaking the work e.g. using a MEWP or pole saw, are not reasonably practicable. This means that other methods are not feasible, do not justify significant additional time and expense or lead to no significant improvement in the level of risk to the climber or others.

Risk Reduction - Where tree climbing using a rope and harness is chosen as the suitable system of work, applying some basic principles and developing 'fail-safes' in the climbing system will help reduce the risk.

- All equipment used in the system must be selected allowing for a high margin of safety.
- The equipment must be regularly inspected, and any defective equipment must be withdrawn from use. In addition, under the Lifting Operations and Lifting Equipment Regulations (LOLER) 1998, all climbing equipment should be examined by a *competent person* every six months and records kept.
- All climbing and safety lines must be attached only to approved points on the harness. On no account must tool attachment points be used for attaching to the climbing system(s).
- The anchor points used to attach either climbing or safety lines must be chosen carefully and tested before climbing commences.

- All main anchor points should be load bearing.
- Climbers should have received adequate training in anchor point selection.
- Two separate points of attachment to the tree should be in place where reasonably practicable, particularly at key points during the climb such as when changing main anchor points; at the work position; and when cutting.
- When climbing, branch walking and adopting work positions the climbing rope must be kept taut to prevent the risk of a free fall and the associated arrest forces.
- Climbers should make sure that they are 'warmed up' before climbing to reduce the risk of muscular strain.
- Climbers and their groundstaff must have and maintain an effective communication method during climbing operations.

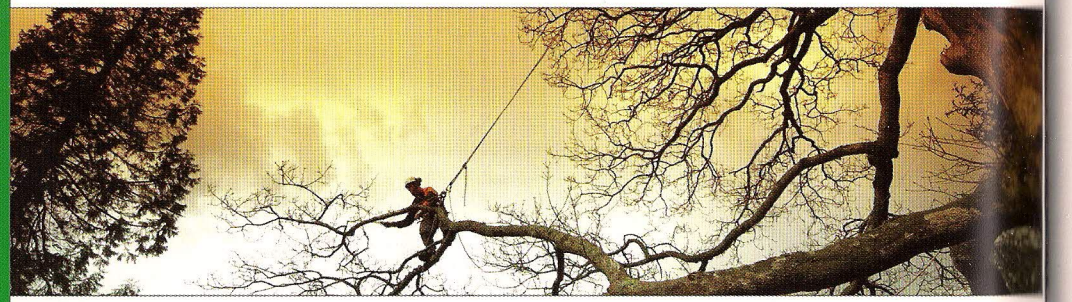


Fig. 1 Work positioning with good anchor point selection and keeping the rope taut

As well as controlling the hazards and risks associated with tree work in general, a site-specific risk assessment must be carried out for each work site.

Basic information about the site should be recorded:

- Location – address, grid reference or GPS co-ordinates
- Description of the specific tree work operation(s)
- Date(s) of operation(s)
- Emergency contacts - nearest phone, nearest Accident and Emergency Hospital
- Site-specific hazards - power lines, public access, terrain etc.
- The structure and condition of trees to be climbed

Fig. 2 Carrying out a site-specific risk assessment

(This is not an exhaustive list, but is intended to indicate the breadth of a full site-specific risk assessment).

As part of the risk assessment process, a clear plan of operations, including an effective emergency procedure, must be agreed with the workforce and others on site (see AFAG Safety Guide 802: Emergency Planning).

2.0 CLIMBING SYSTEMS

The climbing system and techniques used should take into account the size and structure of the tree and the nature of the task.

For example use of a throwline and footlocking may be the most efficient method of access to a large open tree. However in trees with dense canopies, where throwlines are more likely to get caught or there are hazards in the vicinity such as power lines, body thrusting may be more appropriate.

2.1 WORK POSITIONING TECHNIQUES

Under the Work at Height Regulations (2005), the majority of climbing techniques described in this guide will fall within the definition of work positioning. Work positioning techniques are accepted as safe, effective and efficient for tree work.

Work positioning systems support the climber when accessing the crown of the tree, working in the tree or descending from the tree.

Work positioning systems for tree climbing usually consist of a rope and harness, friction hitch(es) and karabiner(s). A means of changing anchor points while still attached to the tree is required. This is usually an adjustable lanyard or a 2nd climbing system (which may be on the other end of the rope).

When using work-positioning techniques, the attachment point of the harness should never be more than 250mm above the anchor point. The climbing rope should be kept taut. Potential vertical falls should be carefully avoided. Any potential vertical fall, for example when branch rolling, must not exceed 500mm, to prevent injury from a free fall and the associated arrest forces.

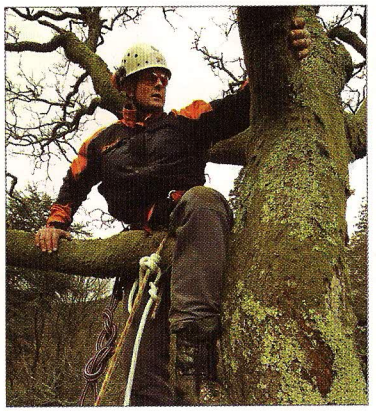


Fig. 3 Work positioning – branch rolling to seated position (<0.5m potential fall)

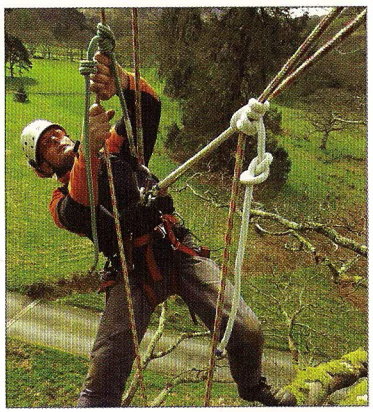


Fig. 4 Work positioning - correct change of anchor point

2.2 ROPE ACCESS TECHNIQUES

Systems consisting of at least two separately anchored lines (a working line and a back-up safety line) are required when working at height using rope access techniques under the Work at Height Regulations (2005).

However, as described above, the majority of working techniques described in this guide are work positioning techniques rather than rope access techniques.

Footlocking and Single Rope Techniques (SRT) for accessing the crown of the tree are defined as rope access techniques and consideration should be given to the use of a back up system when using these techniques.

Back-up systems can give rise to additional hazards of entanglement, crossing ropes, confusion at the harness anchor point. These hazards and the impracticalities of obtaining two separate anchor points for the ropes must be taken into account in the risk assessment. The additional risk should be evaluated against the short duration of the access method when footlocking or using SRT to access the crown of a tree.

Where the risk assessment identifies that the use of two ropes would create a higher risk, single rope systems may be used so long as other measures to ensure safety are taken *(for example using equipment and anchor points with a high margin of safety).*

2.3 FALL ARREST

Fall arrest equipment, which comprises a full body harness with thoracic attachment (dorsal or sternal) together with an energy absorber, is commonly used in other industrial rope access work and sometimes in seed collection from trees.

The tree climbing techniques identified in this guide all adhere to work positioning and rope access principles and negate the need for fall arrest equipment.

3.0 CLIMBING EQUIPMENT

Climbing equipment for tree work is subject to a number of legal requirements.

- As "work equipment", it is subject to the Provision and Use of Work Equipment Regulations 1998 (PUWER) and the Work at Height Regulations 2005.
- As "lifting equipment", the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) apply.
- As "PPE", it will also be subject to the Personal Protective Equipment (PPE) at Work Regulations 1992.

See Appendix 2 for a summary of the key legal requirements.

All new climbing equipment should be sold with a Declaration of Conformity and carry a relevant CE mark.

All climbing equipment must be used and maintained in accordance with the manufacturer's instructions and no structural alterations should be made to such equipment.

Climbing equipment must only be used for its intended purpose. All tree climbing equipment used for PPE should have a minimum breaking strength (MBS) of 22kN.

During storage and in transit, climbing equipment and PPE must be protected from damage and/or contamination.

Fig. 5 Example of CE mark on a harness

3.1 INSPECTION OF CLIMBING EQUIPMENT

Climbing equipment must be checked before use. For example, your climbing rope and lanyard must be given a close visual and tactile inspection along their complete length looking for:

- Cuts
- Frays
- Glazing
- Condition of eye splices
- Contamination
- Any other defects

Check other equipment for excessive wear or damage, for example:

- Check a harness for damaged stitching, cuts or fraying, and the condition of the anchor points and tool attachment points.
- Check the general condition and stitching on friction savers and tape slings.
- Check the condition of friction hitch cord, particularly the splices or knots and areas that are subject to high levels of wear.

- Check the general condition of karabiners and that the gates are kept clean and function properly.
- Check all climbing aids for general condition and serviceability.

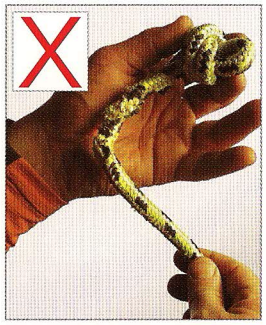


Fig. 6 Rope damaged by cuts and frays

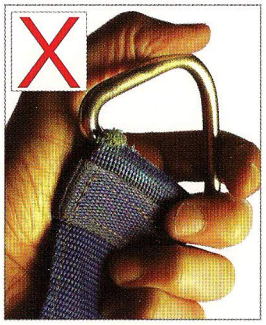


Fig. 7 Frayed attachment point on a harness

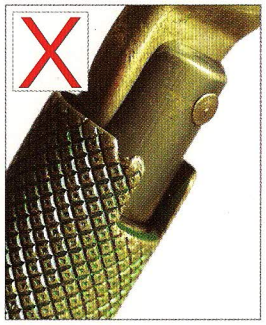


Fig. 8 Damaged gate on a karabiner

In addition to pre-use checks, LOLER requires that a weekly inspection of items subject to high wear and tear (for example friction hitch cord) should be recorded, and that climbing equipment should be marked with a unique identification mark or code and 'thoroughly examined by a competent person' every six months (see appendix 2: LOLER). It is essential that weekly inspections are taken seriously and carried out by someone who has the necessary experience and authority, for example the senior person in the climbing team.

Any equipment that is, or becomes defective must be rectified or withdrawn from use and the details recorded.

3.2 HARNESSES

Harnesses for tree climbing are generally sit harnesses or full body harnesses.

Sit harnesses comprise a waist belt and leg loops with a pelvic attachment point. Some may also have a sit strap. Sit harnesses are restricted to work positioning and rope access situations.

Full body harnesses comprise a waist belt, leg loops and shoulder straps. Some may also have a sit strap. Full body harnesses may have a pelvic and/or chest attachment point.

A pelvic attachment point is more ergonomically suitable for tree climbing than a chest attachment point. Tree climbing techniques also require a great deal of manoeuvrability while wearing the harness and most climbers prefer to use sit harnesses for these reasons.

Fig. 9 A sit harness

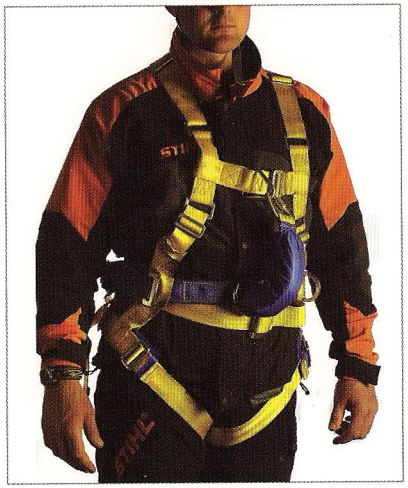


Fig. 10 A full body harness

Some harnesses have the facility for dual or multiple front attachments. These can provide more options for dealing with different techniques or situations.

3.3 ROPES

Tree climbing ropes should have a minimum diameter of 10mm. However ropes of 12 – 13mm diameter are more user-friendly and generally preferred.

Low stretch braided ropes designed for arborist use are recommended. Ropes manufactured to BS1891 Type A are most appropriate (BS1891 Type B ropes are acceptable but do not give the same performance and require greater care in use).

Generally, low stretch ropes are more compatible with tree climbing techniques and climbing aids such as ascenders and descenders.

Some braided ropes may need to be 'milked' when new to settle the braid over the core of the rope. Excess braid should be removed, and the end re-sealed (in accordance with manufacturer's instructions).

Climbing ropes may be stored in rope bags, both on the work site and in transit, in order to prevent damage and contamination and improve rope management.

Fig. 11 An arborist rope

3.4 KARABINERS

Each karabiner that is used to connect the harness to the lifeline should have a spring-loaded self-locking gate that requires at least three distinct movements to open it (triple action auto-locking karabiners). It must fully close and lock reliably.

Every time the karabiner is opened during climbing, the climber must check it fully closes and locks properly. This should be a visual and physical check on the locking mechanism.

Remember that the weakest point of a karabiner is the gate. In addition, rope or branch contact with the locking mechanism can open the karabiner. For these reasons, karabiners must be kept in correct alignment (i.e. loaded along their spine) when in use. Karabiners must not be 'chain linked' which can easily lead to twisting and associated pressure on the gate. See also section 3.11 Knots and Splices.

On some types of harness a 'Maillon Rapide' is required to complete the front fastening of the harness, in addition this helps to prevent a three-way loading of a karabiner.

Some harnesses have soft eye attachments for karabiners instead of D rings. These may help to keep karabiners in correct alignment.

Other means of keeping a karabiner in alignment may include:

- Use of captive-eye karabiners
- Use of clips or bands that hold one end of the karabiner captive
- Use of a small spliced eye in the end of the rope (where the loop is just large enough for the karabiner)
- Use of a larksfoot to attach the loop in the end of the rope to the karabiner

Fig. 12 Triple action auto-locking karabiners

Fig. 13 Karabiner loaded correctly

Fig. 14 Karabiner incorrectly loaded

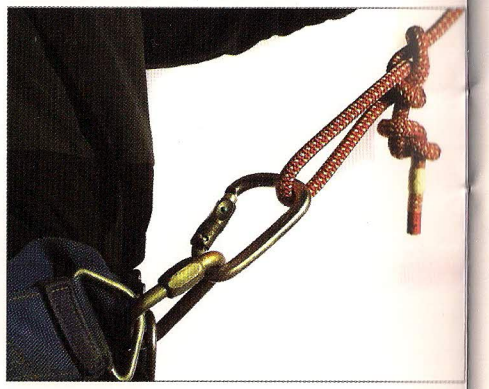


Fig. 15 Karabiner used with a 'Maillon Rapide'

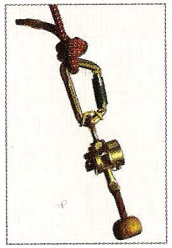


Fig. 16 Karabiner used with a clip/band to maintain alignment

Fig. 17 Karabiner with a larksfoot to rope to maintain alignment

Karabiner maintenance is important. The locking mechanism can easily become clogged and should be cleaned regularly to ensure that the auto-locking mechanism functions correctly. The gate and locking mechanism can be cleaned with warm soapy water and/or lubricated by using a lubricant recommended by the manufacturer as necessary. Excess lubricant on the surface of the karabiner should be wiped off.

3.5 FRICTION HITCHES

Friction hitches are generally used by climbers to move up and down the rope. The friction hitch must control both ascent and descent and be self-locking.

Rope or cord used for friction hitches must be of a suitable strength and type and have a minimum diameter of 8mm. Friction hitches may be subject to high temperatures and friction hitch cord with a high melting point should be used. A minimum diameter of 10 mm is more suitable for normal commercial use. Friction hitch materials are subject to high levels of wear and should be inspected and replaced regularly.

Climbers must be fully aware of the characteristics and use of any knot, hitch and/or friction system. They should also be aware of how they perform in combination with other aids, e.g. a micro pulley.

A number of friction hitches are used by tree climbers, the most common being the Prusik Knot and the Blake Hitch. Other friction hitches such as the Distel Knot, French Prusik (and its variations) and Helical Hitch are smoother but may require closer attention in use. Some mechanical devices such as the 'Lockjack' are available.

Climbers must receive adequate training before using newer, more complex knots or mechanical devices.

Fig. 18 Prusik knot

Fig. 19 Blake hitch

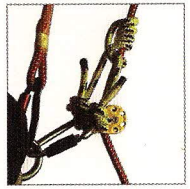


Fig. 20 Distel knot

Fig. 21 A variation on the French prusik (Valdotain tresse)

Fig. 22 Helical hitch

Fig. 23 Lockjack

3.6 MICRO-PULLEYS

A micro-pulley allows a number of benefits when attached below the friction hitch:

It can be used to lift the friction hitch, making it self-tending.

For a micro-pulley to act as an auto-lift/self tender satisfactorily a friction saver should be installed at the main anchor point. (Ref. 3.9).

It can act as a 'fair lead' to keep the running end of the climbing rope in line with the friction hitch. When used in this way, it also allows the friction hitch to be advanced with one hand when the climber is returning from branch extremities.

Fig. 24 Micro-pulley as a fair-lead

When a micro-pulley is used in conjunction with a friction hitch it can provide an efficient means of hauling a chainsaw or other equipment into the tree. By lowering a loop to the ground, the groundperson can clip the equipment in and pull on the tail end of the rope to send it up to the climber (equally a karabiner may take the place of a micro-pulley for this).

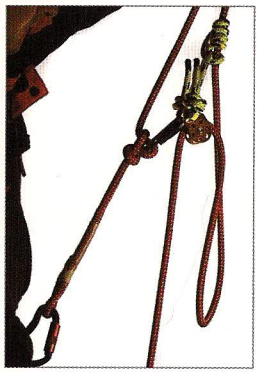


Fig. 25 Micro-pulley used to haul chainsaw in to tree

3.7 ADJUSTABLE LANYARDS

Lanyards (or strops) are generally used when changing anchor points or as a supplementary anchor point when working in the tree.

Connectors for lanyards must be either triple action auto-locking karabiners or auto-locking double action 'snaps'.

Lanyards should be adjustable to provide sufficient support and not subject the climber to the possibility of a fall as a result of slack in the system. Adjustment is usually by a friction hitch or a mechanical adjuster. A stopper knot should be tied in the end of the lanyard.

Lanyards may be attached to the front attachment point of the harness or, more commonly, to the side attachment points on the harness. The side attachment points are designed for support (for example where the feet are on a branch or other part of the tree) but not free hanging. Consult the manufacturer's instructions for the harness if there is any doubt. The lanyard must not be attached to one side of the harness alone.

Fig. 26 Lanyard attached to side 'D's – feet supported on the stem

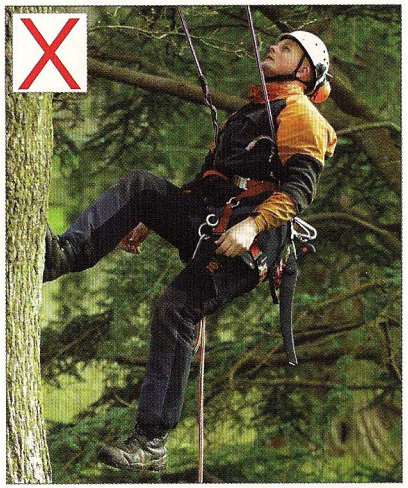


Fig. 27 Avoid free hanging with the lanyard attached to the side D's (feet unsupported on the stem)

3.8 MECHANICAL ADJUSTERS

Mechanical adjusters (e.g. micro-adjuster, Grillion or Gibbs Ascender) can facilitate easy one-handed take-up of slack in the climbing lanyard.

If a steel-cored flip-line is used in conjunction with a mechanical adjuster, some form of webbing or rope sling must be used between the harness connector (karabiner or double action locking snap) and the mechanical adjuster. This is essential in case the climber needs to be rescued and the sling needs to be cut. Without this the strop will not be easy to release when under tension, as these mechanical devices lock under load.

3.9 FRICTION SAVERS

Fig. 28 A friction saver in use

Anchor devices known as, 'friction savers', 'cambium savers' or false anchors are used to protect the bark, cambium and climbing rope from friction. This reduces damage to the equipment and to the tree. The reduced friction in the system can make climbing easier.

Friction savers may be installed and retrieved from the ground.

They can be double wrapped around the stem where no suitable branch fork exists.

Fig. 29 Installation of friction saver from ground

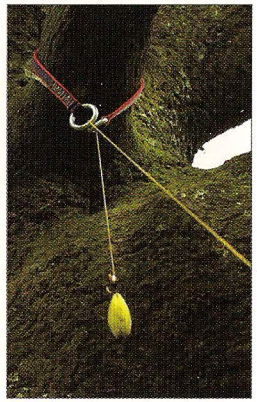


Fig. 30 Installation of friction saver from ground

Friction savers may be lowered from the tree using a throwline to prevent damage to equipment and snagging in the tree.

3.10 USE OF TAPE SLINGS

Stitched tape slings (such as rock climbing slings) are widely used as a climbing aid in a number of situations. Tape slings for tree climbing should be rated to 22kN MBS. A tape sling of 0.6m in length is suitable for most situations.

- By larks-footing it round a stem or branch it can create a foothold where none exists.
- It can be used as part of a re-direct.
- It can be used to extend the length of a work-positioning lanyard.
- By larks-footing it round a branch to be removed by handsaw, it can be used to provide extra grip for hand held sections.
- They can also be used for rigging small diameter branches, being much quicker than tying the rigging rope directly on to the branch. **Rigging slings must be kept completely separate from climbing slings.**

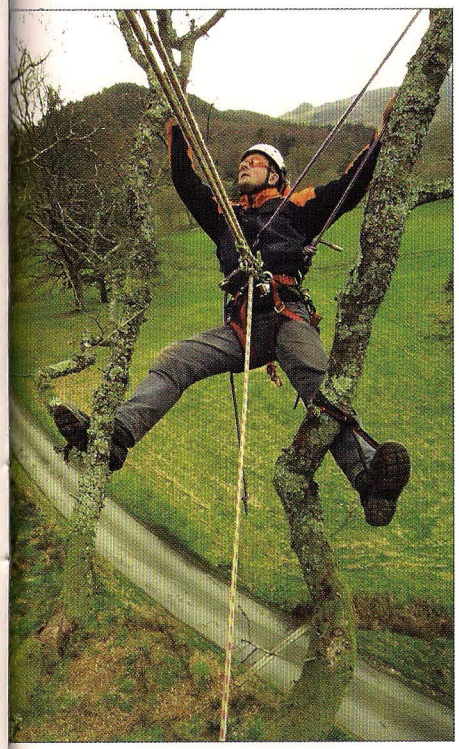


Fig. 31 Tape sling used to create a foothold

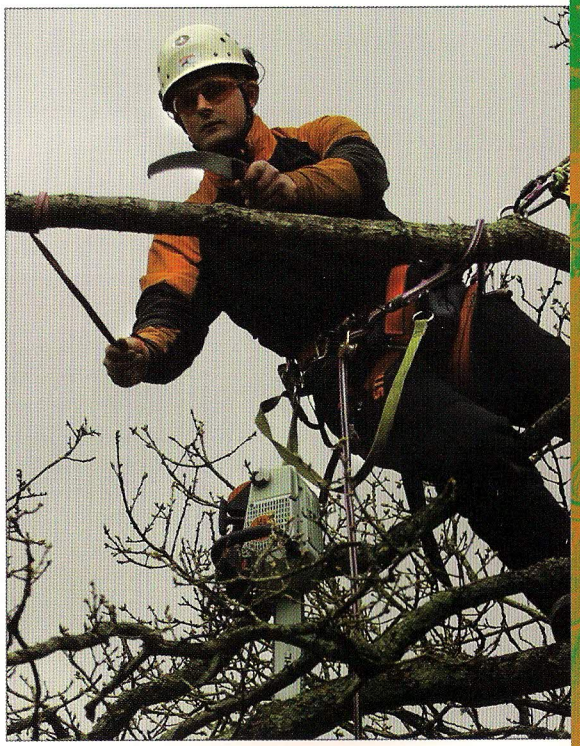


Fig. 32 Tape sling used for hand held sections

3.11 KNOTS & SPLICES

A loop is needed in the end of the rope to attach it to the harness via a karabiner. The loop may be created by a spliced eye or a knot. Spliced eyes should be made by someone who has received appropriate training.

Alternatively, various knots may be used to attach the rope to the harness. The main knots currently used are bowline (in conjunction with a stopper knot such as an overhand knot or single figure-of-eight knot), double figure-of-eight knot, buntline hitch, and single fisherman's knot.

Tying the stopper knot round the rope rather than leaving it free hanging will keep it out of the way.

The latter two knots will tighten up against the karabiner and help keep it in correct alignment. If a spliced eye, bowline or double figure-of-eight knot are used, the loop can be left large enough to larks-foot it on to the karabiner to help maintain the alignment of the karabiner.

Fig. 33 Climbing rope with a spliced eye

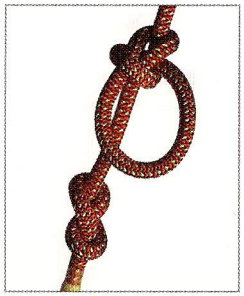


Fig. 34 Bowline & stopper knot

Fig. 35 Buntline hitch

Fig. 36 Single fisherman's knot

3.12 STORAGE OF EQUIPMENT

All tree climbing equipment should be checked, maintained and stored in accordance with manufacturer's instructions.

Wet equipment should be dried thoroughly prior to storage. Equipment should be dried in a well ventilated environment away from any direct heat source and sunlight.

4.0 CLIMBER'S PRE-CLIMB INSPECTION

The site-specific risk assessment should be referred to before any pre-climb inspection is carried out.

The visual pre-climb inspection is vital in order to:

- Assess whether the tree is safe to climb
- Select the most appropriate system for safe working
- Choose the most appropriate method of access
- Identify suitable and safe anchor points

Inspect the rooting area for signs that might lead to instability of the tree, for example:

- Fungal fruiting bodies
- Mycelium and Rhizomorphs
- Evidence of movement or heave of the root plate, i.e. soil cracking or lifting
- Evidence of root pruning/severance, e.g. recent trenching/excavation works within close proximity of the main stem
- Any other visible defects

The visual pre-climbing inspection of the tree should also assess the stem and crown for signs of decay or weakness, for example:

- Fungal fruiting bodies, cavities, cankers and poor vigour
- Major dead wood and hanging branches
- Asymmetry of the lower main stem
- Open wounds
- Potential structural weaknesses that may be indicated by included bark in forks, weak branch union, abrupt bends and epicormic growth
- Damaged stems and/or branches with cracks or splits
- Evidence of previous work, for example: "topping" and "lopping", branch regrowth from a stub which may have a weak branch union because of decay
- Any other visible defects

The diagram on the following page, taken from Forestry Commission leaflet *'The Recognition of Hazardous Trees'*, illustrates a range of common tree defects that can cause potential weaknesses in the tree and should be checked for prior to climbing.

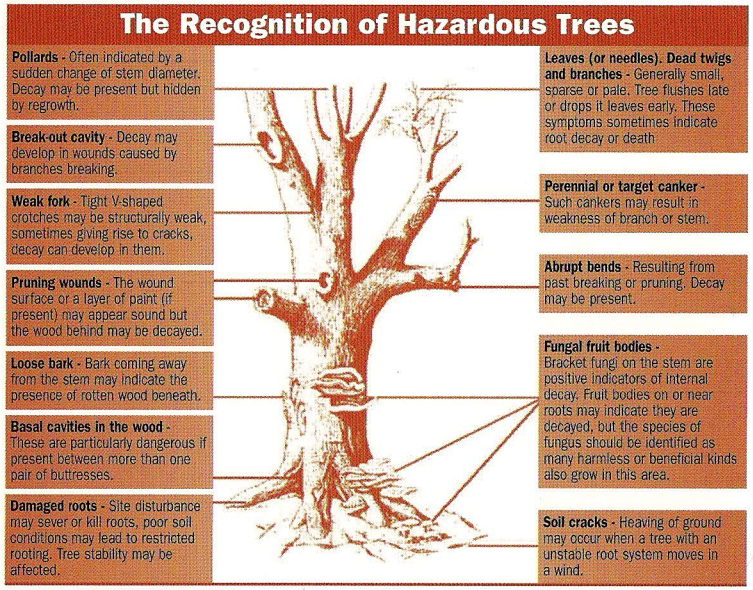


Fig. 37 Recognition of Tree Hazards

The lists are not exhaustive but indicate the need for a broad understanding of basic tree science and an assessment of the tree as a mechanical structure before climbing commences.

Allowances must also be made for:

- The tree species and timber characteristics: some are weaker, more prone to splitting or are more brittle than others.
- Trees covered in ivy, which can make it difficult to assess the strength and condition of anchor points.
- The site terrain and location.
- Weather conditions, especially strong winds, lightning, rain, snow and ice, as well as very hot weather.
- The possible presence of bees or wasps.
- Any surrounding hazards, such as; vehicular and/or pedestrian traffic, utility services, buildings, structures and other landscape features.
- Environmental considerations, e.g. bat roosts and nesting times for birds.

It is important that this visual assessment is continued while climbing so that any other hazards in the crown that were not visible from ground level, can be identified and appropriate control measures applied, particularly when selecting anchor points.

4.1 UTILITY SITES

When working adjacent to overhead powerlines, work must be carried out under local Electricity Company guidelines. The climber should have specialist training in working near overhead powerlines and give consideration to the additional risks of climbing near overhead powerlines:

• **Use of throwlines**	Throwlines must not be thrown near overhead lines if there is any danger of them coming into contact with electrical apparatus.
• **Use of ladders**	Ladders must be approved by the electricity company. Approved ladders are generally constructed from wood or fibreglass.
• **Anchor points**	Anchor points chosen for 'live line' working must not be directly above the electrical equipment. The anchor should be selected to take the climber away from the electrical apparatus in the event of a fall or pendulum swing.
• **Ascending and descending**	Wherever possible the tree should be ascended and descended on the side away from the electrical apparatus.
• **Working in the crown**	The climber and his equipment must not infringe the vicinity zone of live electrical apparatus. Particular attention must be paid to the tail end of the climbing rope. This should be routed down the side of the tree away from the electrical apparatus.

The Electricity at Work Regulations apply and any work in proximity to live conductors requires detailed justification.

5.0 ANCHOR POINTS

Whatever method of climbing or ascent is used, anchor points must be selected carefully, inspected for suitability and weight tested before use. Climbers must have received training in anchor point selection. See also section 7.2 'Use of supplementary anchor points' and section 7.6 'Use of tools in the tree'.

Fig. 38 Suitable anchor point selection

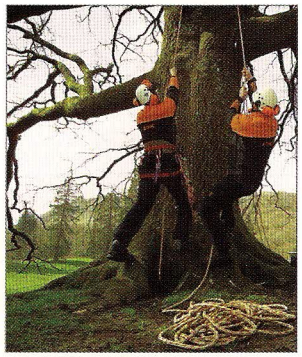


Fig. 39 Testing an anchor point – from ground

Choosing an anchor involves assessing the timber characteristics, size, strength, potential defects and suitability for use.

Correct anchor point selection should take into account the following priorities:

- All main anchor points must be proven as load bearing or comprehensively assessed before committing to them.
- A main anchor in the tree must be strong enough to withstand significant lateral (i.e. sideways) force as well as supporting the weight of the climber.

Fig. 40 Anchor point over branch & round main stem

The main anchor point for the climbing rope should be installed in a branch fork next to the stem of the tree. Anchoring the rope over a branch some distance away from the stem will increase the load on the branch.

If in doubt about the strength or suitability of a lateral branch, the climbing rope, lanyard or false anchor should be passed around the main stem.

When an anchor point is established high in the tree with a throwline it can be difficult to see if the branch is suitable. In this situation the anchor point must be tested by applying the weight of two climbers or 'bouncing' on the climbing line. If in doubt about the suitability of the anchor point, remove the line and start again.

5.1 CHANGE-OVERS

One of the main hazards when climbing is changing anchor points, either during the ascent to pass branches and establish higher anchor points or to achieve a better work position. The following can help reduce the risks associated with change-overs:

- At the point of changing anchor points there should always be two proven load bearing anchor points (i.e. the previous one and the new one) before committing to any single one of those.
- The climber's weight must be fully transferred to the newly established rope system before releasing the previous set-up.
- When changing anchor points, a physical and visual check should be made that the newly established rope system is correctly connected to the harness.
- As an additional safeguard, the climber can adjust and retain the previous climbing system as a back-up while moving higher. This will ensure that two anchor points are maintained for as long as practicable.

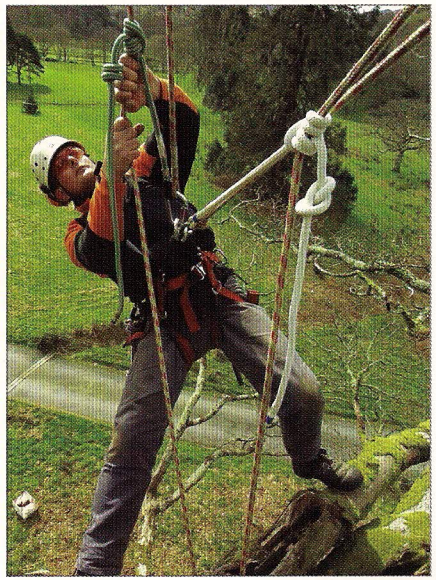


Fig. 41 Change-over – transferring weight to new system

Fig. 42 Change-over – extending the previous system

6.0 METHODS OF ACCESS

6.1 USE OF LADDERS

Ladders can provide a simple and effective method of accessing the crowns of trees. Ladders should only be used where more suitable work equipment is not justified, see the Work at Height Regulations 2005 (Schedule 6). Where ladders are to be used, the following points can help reduce the risk:

- Ladders should be set as per manufacturer's instructions.
- A rope may be installed, for example, with the use of a throwline, to safeguard the climber's ascent of the ladder.

- The climber must tie into the tree and test the anchor point before leaving the ladder.
- If throwing to a higher anchor point from the top of a ladder, the climber should be secured to the stem or suitable branch by a lanyard or second climbing system.
- Ladders should be used as a method of access only and the ladder should be removed prior to work.
- The climber should avoid working from the ladder.

Fig. 43 Ladders – lanyard round stem while throwing to a higher anchor in the tree

6.2 BODY THRUST

A rope may be thrown over a branch and a 'body thrust' technique used to climb, i.e. pulling the moveable part of the climbing rope and sliding the friction knot to take up the slack.

Hanging free below a branch from a lanyard attached to the side attachment points of the harness is not recommended. The climber should plan the climb so that they have something to stand or sit on during change-overs.

Fig. 44 Body thrust climbing technique

Fig. 45 Throwing the rope while standing on a branch, lanyard round stem for support

Fig. 46 Avoid hanging free below a branch from the side D's while throwing the rope'

The climber may roll over the branch to a seated position in order to throw the rope higher into the tree. The climbing rope will need some slack to allow the climber to roll over the branch into a sitting position but this slack must be kept to a minimum to avoid excessive arrest forces on the climber should he/she fall.

From the sitting position the adjustable lanyard or other climbing system can be attached round the stem or another branch and/or the other climbing system can be thrown over a higher anchor point.

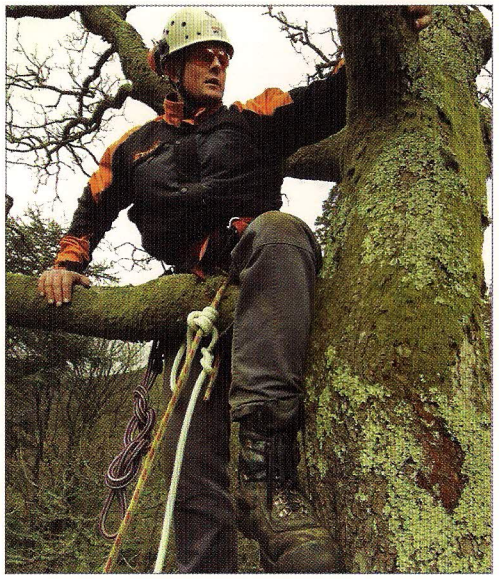


Fig. 47 Branch rolling to seated position

6.3 THROWLINES

Use of a throwline can be a very effective method of installing a climbing line high in the tree.

- The limitations of using throwlines must be recognised in terms of tree form and surrounding hazards. For example, a tree covered in Ivy or epicormic growth can cause problems with the bag becoming stuck.
- Additional risks may arise from misdirected throws, powerlines, or the recoil of a snapped line when stretched.
- Training and practice will dramatically improve accuracy and effectiveness!

Fig. 48 Attachment of bag to throwline

Different weights of bag and line are available:

- Lighter bags and lines can be thrown further and are better suited to smooth barked trees.
- Heavier bags pull the line over the branch and return to the ground more easily, particularly on rough-barked trees.
- Stronger lines can also be used to pull small hanging branches or deadwood out of the tree.

An initial throw may send the line over several branches. By using a bag on either end of the throwline, it can be manipulated so that the line is installed over a single branch and down to the ground in a direct line.

Once the line is installed, it can be attached to the climbing rope by using a karabiner or tied on, for example using a clove hitch and a series of half hitches. The latter will help keep the rope in a straight line and allow the rope to be pulled over a narrow fork or through the rings of a friction saver. The bag may not need to be removed unless the rope is being pulled through a narrow fork or the rings of a friction saver. The climbing rope is then pulled into the tree.

Fig. 49 Attaching throwline to climbing line with a clove hitch and half hitches for pulling rope through a friction saver

Fig. 50 A 'Big Shot' in action

A large catapult such as a 'Big Shot' can be used to send a throwline long distances (but requires careful risk assessment before use, especially around buildings and roads).

6.4 SECURED FOOTLOCKING

Secured Footlocking provides a fast and effective means of entering the crown of a large tree.

A double line is set as high as possible in the crown using a throwline. Footlocking is easier if the climbing line is set to hang away from the stem of the tree.

The anchor must be checked and weighted by applying the weight of two climbers or 'bouncing' on the climbing line. Where very high anchors are set, binoculars may be useful for inspecting the condition of anchor points from ground level.

A six-wrap Prusik Knot, Klemheist Knot, other friction hitch or mechanical ascenders must be used to secure the ascent up the rope. Gripping the friction hitch or placing hands above the hitch when ascending must be avoided as this could cause slippage or hitch failure.

Fig. 51 Footlock with a 6-wrap Klemheist

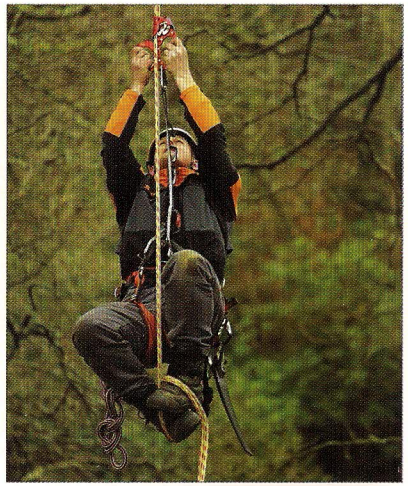


Fig. 52 Footlocking with mechanical ascenders

Care should be taken when footlocking towards the 'V' in a rope caused by the lines parting around a branch, as this can open the friction hitch and cause it to lose contact with the footlock line. Such a branch can only be approached safely up to a distance equal to five times the branch diameter. This situation can be avoided by installing a friction saver first.

Fig. 53 Using friction saver with the footlock line to avoid 'V' in the rope' caused by a branch

If mechanical ascenders are used to secure the ascent they should not be pushed right up to the branch or friction saver. A gap of 150mm from a cambium saver or five times the branch diameter should be left to enable the ascenders to be removed when a secondary anchor has been established.

Mechanical ascenders should not be modified and should be used in accordance with the manufacturer's instructions.

Mechanical ascenders can also be used to assist ascent on a footlock line by pulling down on either rope.

The climber can also self-protect while climbing the tree by pushing the friction hitch or ascenders ahead of themselves.

The climber should not ascend a footlock line without first having the equipment and knowledge to safely descend on that line if required.

Descent from a footlock line is possible using a large rescue figure-of-eight descender or an Italian Hitch (Munter Hitch). This must be backed up by a friction hitch.

Where possible, to meet the requirements of the Work at Height Regulations (2005), a second, ideally independently anchored line should be installed adjacent to the footlock line. The climber should be attached to the second line by a mobile fall protection system. It is recognised that the second line is often difficult to establish and adds very little to the safety of the climber as long as the duration of access is short, the anchor point carefully selected and no other work is carried out from the rope access system. However in some circumstances the second line is appropriate and should be considered when planning the work.

A footlock line can be kept in the crown of a large tree while the work is undertaken. This can provide easy access at any time including emergencies.

Fig. 54 Assisted ascent using mechanical ascenders

Fig. 55 Climbing the tree while advancing the ascenders

6.5 SINGLE ROPE TECHNIQUES (SRT)

It is possible to footlock up a single line, however this can be difficult and SRT may be more effective. The line may be secured by either using a running bowline chokered to the anchor or by passing the line over the fork and securing it back to the base of the stem. Climbers should be aware that the latter system can double the load at the anchor point and this should be taken into account when selecting the anchor point for this system.

A single rope may be ascended efficiently using a handled ascender with a foot-loop and a chest ascender. Ergonomically, this method of access can save a great deal of energy where dense crown foliage prevents easy installation of double lines. Both the chest and handled ascenders must be attached to the main attachment point on the harness.

Where possible, to meet the requirements of the Work at Height Regulations (2005), a second, ideally independently anchored line should be installed adjacent to the SRT line. The climber should be attached to the second line by a mobile fall protection system. It is recognised that the second line is often difficult to establish and adds very little to the safety of the climber as long as the duration of access is short, the anchor point carefully selected and no other work is carried out from the rope access system. However in some circumstances the second line is appropriate and should be considered when planning the work.

Descent from an SRT line is possible using a figure-of-eight descender or an Italian Hitch (Munter Hitch). This should be backed up by a friction hitch.

Fig. 56 Single rope technique – rope secured to base of tree

Fig. 57 Single rope technique attachment of ascenders

6.6 CLIMBING IRONS

Climbing Irons (spikes) should only be used when sectional felling or in exceptional circumstances, such as aerial rescue.

When a tree is safe to climb and is to be removed, climbing irons are often the most effective method of access, particularly in conifers or on stems with few or no sound lateral branches.

The climber ascends the tree on their spikes supported by a flip-line round the stem. A lanyard or normal climbing system can be used for change-overs to pass branches on the way up.

A steel-cored adjustable flip-line is normally used when spiking up a tree since this is easier to 'flip' up the back of the stem. The steel core will also reduce the risk of cutting through the flip-line when working close to the anchor point.

Where the flip-line has a mechanical adjuster it must be used in conjunction with a short rope or webbing sling so that there is a point at which the system can be severed in the event of an aerial rescue.

On very thin stems, when using a flip-line attached to side D-rings, safety and stability can be increased by crossing the flip-line in front of the stem or double wrapping it around the stem. The flip-line will immediately bite on the stem and grip firmly in the event of a slip.

Fig. 58 Steel-cored flip-line with a 'soft link' when using a mechanical adjuster

Fig. 59 Crossed flip-line on a narrow stem

7.0 WORKING IN THE CROWN

Working at height carries with it inherent risks. An error or oversight in climbing technique or a failure of equipment is potentially fatal. The Work at Height Regulations (2005) apply to all tree climbing operations and should be adhered to at all times.

7.1 BRANCHWALKING

The climber uses the tree structure and the rope and harness to move around the tree. The climber must be securely anchored to the tree by the climbing system(s) at all times. When branch walking and adopting working positions the climbing line must be kept taut to prevent the risk of a significant freefall and the associated arrest forces.

When changing position the climbing rope must be re-routed as necessary and placed in a safe position.

When branch walking the climber should lean away from the anchor point(s) and use the rope for support. Keeping low to the branch will help maintain balance. One hand should be used to work the friction hitch with the other hand on the branch or side branches for support and balance. The adjustable lanyard may be passed around the branch or a suitable lateral if there is a risk of a pendulum swing.

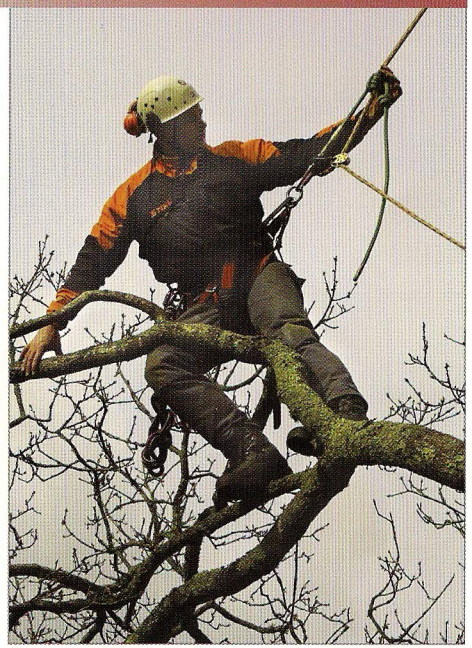


Fig. 60 Branch walking technique

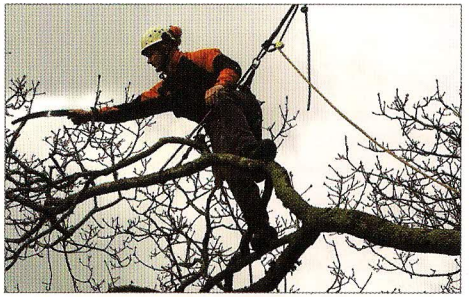


Fig. 61 Lanyard use at branch extremities to prevent a pendulum swing

Fig. 62 Triangulation from two climbing lines

In large, broad crowned or forked trees, it is often possible to install two main anchors a reasonable distance apart and two main rope systems (this may be using both ends of the same rope). Whilst it may not be possible to use both systems throughout the work, the improved positioning by triangulation from two anchors can help improve stability when branch walking and at the work position and reduce the lateral stresses on each anchor point.

However, it is not good practice to maintain two high anchor points in this way during dismantling operations as this system can introduce significant additional hazards that the climber should be aware of:

- There is increased risk of accidental removal of the second high anchor with the section being removed. This would have catastrophic consequences for the climber.
- The availability of rigging points that are separate to the climber's high anchors is reduced.
- There is greater confusion of ropes within the crown.
- There is a much greater chance of lowering ropes running across climbing lines

7.2 USE OF SUPPLEMENTARY ANCHOR POINTS

A supplementary anchor point should be used in conjunction with the main anchor to improve work positioning and/or increase security of the climber.

Supplementary anchor points may be achieved by a short adjustable lanyard, a steel-cored adjustable flip-line or a complete secondary rope system attached to the tree.

Fig. 63 Supplementary anchor (load-bearing) when cutting away from lines

Once in the tree a load bearing supplementary anchor should be installed wherever practicable to ensure that your safety is not put at risk. This is particularly important in the following instances:

- Where there is a risk of the climbing rope being cut.
- Where the strength of the main anchor point may be compromised.
- Where there is the risk of a pendulum swing.

Fig. 64 Two anchors allowing freedom to move

When moving around the crown, a load bearing supplementary anchor to prevent a pendulum swing may not always be available and an alternative supplementary anchor may need to be chosen. This should be strong enough to prevent the climber taking an uncontrolled swing and used until a better choice of anchor point becomes available. See also section 7.6 for guidance on supplementary anchor points when using tools in the tree.

If the risk assessment identifies the need for the climber to be able to move quickly (for example, where there is a risk of the cut section striking the climber), the use of supplementary anchors to hold the climber closely to the work position may not be appropriate. In this instance consideration should be given to the use of two main anchor points so that the climber can still move quickly but is supported by two lines.

7.3 USE OF A RE-DIRECT

The climber may also be able to use a re-direct to improve support. A re-direct consists of a webbing or rope sling passed over a branch with two karabiners attached. The climbing line passes through the re-direct to improve the angle of support for the climber and reduce the possibility of a pendulum swing from branch extremities.

Consideration must be given to the additional side loading that may be put on the main anchor point when using a re-direct away from the main stem. Consideration should also be given to the strength of the branch used for the re-direct.

The higher the re-direct is in relation to the main anchor point, the greater the load on the branch used for the re-direct and the higher the side-loading on the main anchor point. When properly configured, a re-direct can help spread the load of the climber across a number of parts of the tree. When poorly configured, a re-direct can increase loads at anchors and pull anchors in a direction to which they are poorly adapted. Consideration should be given to these factors when installing a re-direct.

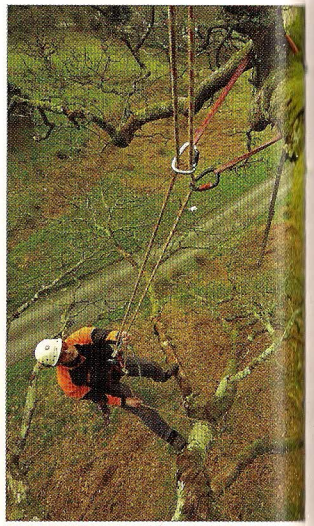


Fig. 65 Retrievable re-direct

Using two different sized karabiners on the re-direct, one for each side of the rope, allows the re-direct to be retrieved at the end of a climb.

A re-direct does not perform the function of a supplementary anchor point as the climber is still only attached to one rope system.

7.4 WORKING AT THE TOP OF THE TREE

When working in the crown it is sometimes necessary to carry out work above the main anchor point. In some situations it may be possible to use a pole saw to reach higher into the crown.

Another method is to establish supplementary anchor points above, and in addition to, the existing main anchor point. The purpose of these 'high supplementary anchor points' is to give temporary support for work in a small area of the crown. Two high supplementary anchor points can help improve stability and share the load between each.

Fig. 66 Working at the top of the tree with a polesaw

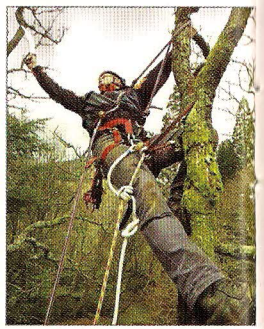


Fig. 67 Working at the top of the tree with a high supplementary anchor point

On completion of the work, the climber should return to climbing from the original anchor points.

7.5 WORKING IN THE CROWN WITH CLIMBING IRONS

Climbing Irons should only be used when dismantling or sectional felling unless in exceptional circumstances, such as aerial rescue.

When using climbing irons, observe the principle of work positioning and the use of two load bearing anchor points to prevent the risk of a free fall and safeguard against failure of any one rope system.

Fig. 68 Working from climbing irons – steel-cored flip-line backed up by climbing system

When sectional felling with a chain saw, use a strop around the stem that resists cutting e.g. a steel-cored adjustable flip-line. It should be noted that steel-cored flip-lines can still be severed by chainsaws.

Both the steel-cored flip-line and the climbing rope should be used and attached to load bearing anchor points on the tree. The steel strop resists cutting by the chain saw and provides the main anchor point. The climbing rope gives a better grip on the stem, can facilitate immediate descent in an emergency and provides the second anchor point to safeguard in case the wire strop fails.

For increased stability, the flip-line will normally be attached to the two side D rings on the harness. However, both sides of the flip-line should be attached to the central point on the harness if there is any risk of the stem splitting as the cut section falls. In this instance care should be taken not to subject the karabiner to a three-way loading.

7.6 USE OF TOOLS IN THE TREE

The following risk assessment hierarchy gives guidance on safety considerations in relation to using tools in the tree. It reinforces the need to use load bearing anchor points wherever practicable and also reinforces the fact that poor work positioning is not an excuse for cutting close to yourself or any part of the climbing system.

Risk hierarchy for Load-bearing supplementary anchor points and use of tools in the tree

Wherever practicable a handsaw should be chosen in preference to chainsaw use.

↓

Wherever possible use load bearing supplementary anchor points to achieve a good work position.

↓

When using a chainsaw or a handsaw, a work position must be achieved where there is no risk to the climber's ropes, i.e. the chainsaw/handsaw must be used away from the climbing ropes, and in the case of the chainsaw, on the opposite side of the body to the climber's ropes.

↓

Where there is a risk of cutting the climber's ropes a load bearing supplementary anchor must be achieved.
This supplementary anchor must be set so the possibility of cutting both primary and supplementary systems is remote.

↓

If there is a risk of cutting the climber's ropes with a chainsaw and no second load bearing supplementary anchor can be achieved, another system of work must be used, e.g. use a handsaw, change work position, use a pole saw or access from a MEWP.

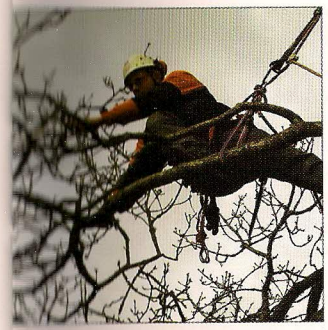


Fig. 69 Use of a handsaw for pruning

Fig. 70 Load bearing supplementary anchor point used when cutting

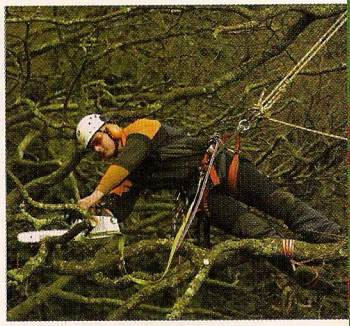


Fig. 71 Use of chainsaw, work position cutting away from body and ropes

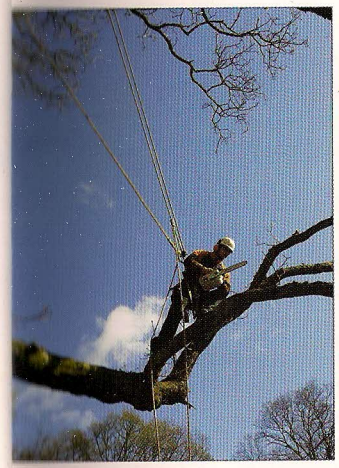


Fig. 72 Use of chainsaw, cutting away from the climber's ropes using a load bearing supplementary anchor

Fig. 73 Risk of cutting ropes with chainsaw

The risk hierarchy indicates priorities for the work system relating to use of tools in the tree. It should be remembered that the choice of access method should already have been determined in section 1.1 Risk Assessment but as the risk hierarchy demonstrates, that decision may need to be re-assessed in extreme circumstances.

The risk hierarchy serves to remind the climber that ultimately, not all chainsaw work in the tree is necessarily possible with a rope and harness.

8.0 DESCENT

The route for descent should be planned taking into consideration the position of tools and equipment and how the rope(s), friction saver etc. will be retrieved once the climber is on the ground.

Before descending, the climber must check the climbing system is of a suitable length. This can be checked by holding the end of the rope to see if the loop made by it reaches the ground. A stopper knot can be placed on the end of the climbing line to safeguard against sliding off the end of the rope.

The descent from the tree must be at a controlled speed to prevent excessive heat build up in the friction hitch. Excessive speed (or deceleration) will load the anchor point unnecessarily.

The heat generated by friction may cause glazing damage to many types of rope and the contact surfaces of the friction hitch.

9.0 GROUNDSTAFF

Groundstaff play an important role in tree climbing operations. A good groundperson will make the climber's job easier and safer and can improve efficiency of the task by the following actions:

- Plan the job with the climber before the work starts and be aware of the tasks involved.
- Maintain effective communication with the climber(s).
- Maintain concentration and watch the climber(s). Anticipate their needs, passing up tools and other equipment.
- Provide an extra pair of eyes for the climber and advise where appropriate on the correct route of ascent, work position and anchor point selection.
- Keep climbing and work ropes on the ground free of knots, kinks, tangles, debris and branch wood, and clear of machinery, for example woodchippers.
- Keep the work site in an orderly condition to avoid trip hazards
- Keep ropes in safe positions away from obstructions, vehicles, equipment and colleagues.
- Ensure the precautions taken to exclude the public and traffic from the work area are maintained while work is in progress.
- Keep tools and equipment not in use away from the immediate work area or drop zone.
- Control working ropes and lowering systems, but take care not to wrap a rope around any part of the body to gain extra grip or purchase.
- Assist with emergencies and facilitate rescue.

10.0 AERIAL RESCUE

The consequences of poorly managed tree climbing operations are potentially life threatening. It is important that climbers receive thorough training in climbing techniques and aerial tree rescue methods. Provision for aerial rescue is a requirement of the Work at Height Regulations (2005), the Management of Health and Safety at Work Regulations 1999 (reg. 9) and other Health and Safety legislation.

This section aims to give guidance on basic methods of aerial tree rescue without the need to use specialised equipment. The techniques require competence in the use of harness, friction hitch, rope and lanyard systems.

Aerial tree work normally involves the use of chainsaws and other tools off the ground, which may lead to further hazards for the rescuer.

Climbers may be at risk of serious injury from a number of hazards such as:

- Damaged rope or climbing system(s)
- Falls
- Becoming unconscious
- Becoming stuck/frightened, e.g. inexperienced climbers
- Cutting themselves with a chainsaw or handsaw
- Pendulum swing
- Severed or falling wood
- Contact with electrical conductors

When carrying out aerial tree rescue it is vital to ensure that other members of the rescue team are not put at risk. Therefore before undertaking recovery of the casualty, the rescue team should make a risk assessment to select a procedure which avoids endangering themselves. All climbers should be trained in first aid and all team members should be able to promptly call for assistance from appropriate specialists.

Under no circumstances should anyone attempt to perform an aerial rescue of a climber who is in contact with, or is located within the vicinity zone of live electrical apparatus. The electrical apparatus must be proven to be de-energised before a rescue is attempted.

Aerial rescue should be practised regularly (once every 3 months is suggested), so that all members of the team are familiar with the techniques and are kept aware of the guidelines given by general risk assessment of aerial tree rescue operations together with specific advice in AFAG Safety Guides:

401 Tree Climbing Operations
402 Aerial Tree Rescue
802 Emergency Planning
804 Electricity at Work Forestry and Arboriculture

10.1 COMMUNICATION

It is important that the location of the nearest telephone is known to all staff on site, and noted down. Mobile telephones are now widespread, with varying levels of reception. Check the mobile phone has a signal and functions on the work site and that all staff can use it and know its number in case you have to be called back.

Operators should ensure that they can quote their location accurately, i.e. either a grid reference/GPS co-ordinates or street names/post code, to be able to give the emergency services adequate details of site access points.

When necessary a rendezvous point should be agreed, together with arrangements to conduct emergency services to the site.

Emergency communication details should be recorded on the site-specific risk assessment.

10.2 EQUIPMENT REQUIRED

The following equipment is considered essential for aerial rescue and must always be available at the work site.

- Climbing rope long enough to complete rescue
- Friction hitch system and adjustable lanyard.
- Harness and a minimum of 3 karabiners for the rescuer's climbing system
- First Aid Kit, sharp knife and whistle.
- Appropriate Personal Protective Equipment for climbers and groundstaff (helmet, boots, high-vis clothing etc.)
- At least 2 additional karabiners and an additional prusik loop/friction hitch or tape sling for the rescue

ADDITIONAL ITEMS

The following equipment may also be of use:

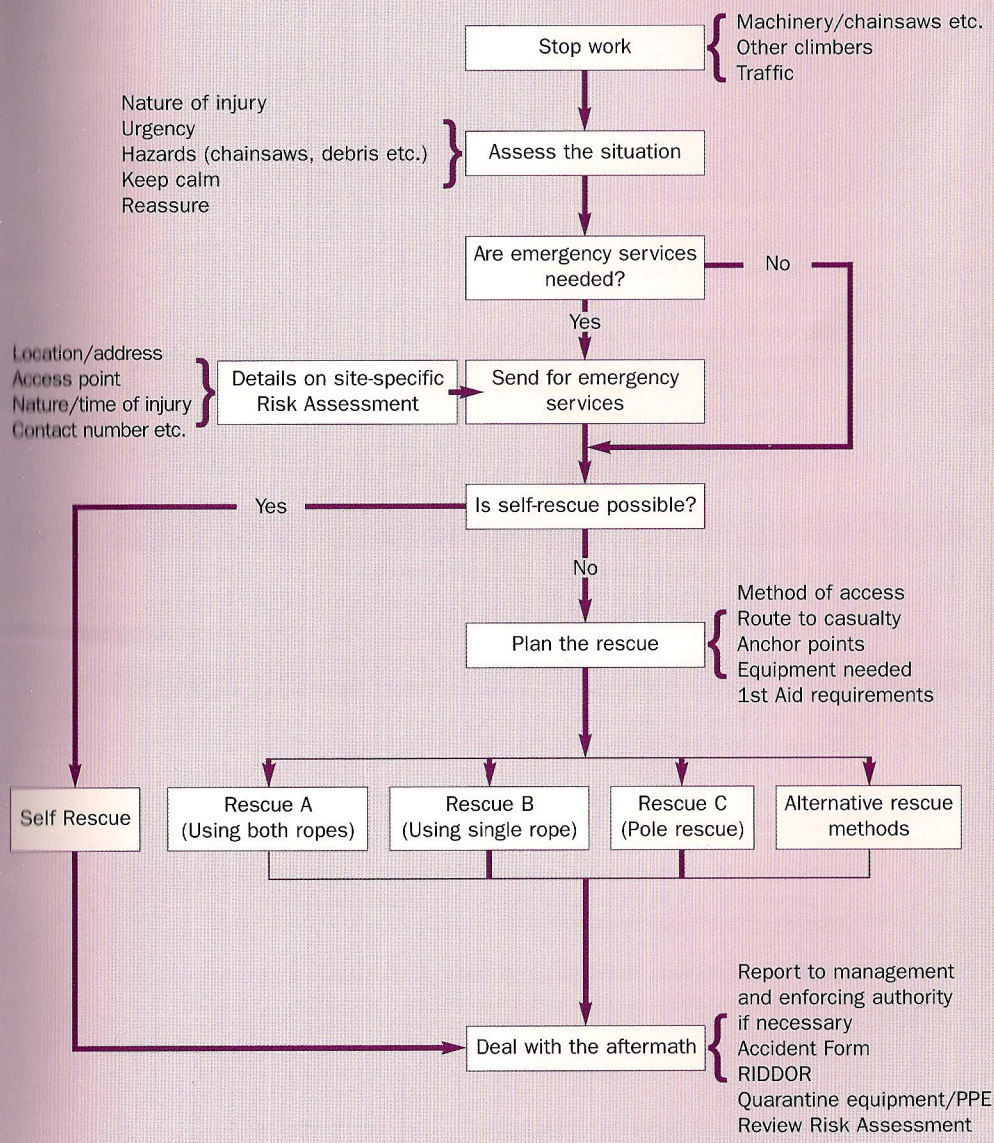
- A (second) pair of climbing irons (for faster access and pole rescue)
- 'Topping down strop' or appropriate alternative (for pole rescue)
- Any additional climbing aids which may be available and which the rescue team has been trained to use e.g. ladders, mechanical ascent and descent equipment.

In large trees or trees difficult to access, it may be useful to install a separate access line which can be left in the tree while the work is carried out and provide rapid access in the event of an emergency.

Consideration may be given to the practicality of using two or more climbers in a given tree. Response times can be greatly improved if another climber is already present in the tree.

10.3 EMERGENCY PROCEDURE

Although each situation will be different, the following flow chart shows the general procedure to be used in the event of an emergency.



10.4 PRINCIPLES OF AERIAL RESCUE AND FIRST AID

- Do not move the casualty until you have assessed his/her condition thoroughly.
- If spinal injuries are suspected do not move the casualty until specialist help arrives.
- Secure the casualty to the tree if required.
- Remove any immediate hazards, e.g. chainsaws and/or tools.
- Check the casualty's condition and apply primary first aid.
- If necessary, attach chest harness/strop to support casualty's upper body.
- If possible, encourage the casualty to move about in their harness, especially their legs, whilst awaiting rescue. Even short periods of inactivity whilst suspended can increase the risk of suspension trauma. The results of this are life threatening.
- Lower the casualty to the ground as quickly as possible giving constant reassurance.
- Put the casualty into the recovery position and keep warm and dry, using an exposure bag/space blanket or spare jackets, etc. Do not give him/her anything to eat/drink.
- Wait for medical assistance or remove the casualty to hospital continuing to monitor, record condition and reassure the casualty.

11.0 RESCUE METHODS

The choice of rescue method will depend on the nature of the situation, competence of the rescuer(s), extent of the injuries and available help on the ground.

11.1 RESCUE METHOD A

Two or three person team where casualty's rope is undamaged and long enough to descend on.

Climb to the nearest suitable anchor point above the casualty which is capable of supporting the weight of both the climber and the casualty.

Descend to the casualty, assess and make safe any hazards that threaten the casualty or would impede the rescue, e.g. chainsaw, other equipment/tools, tree debris.

Attach the casualty to the main attachment point of the rescuer's harness to protect and aid descent and prevent separation of casualty and rescuer.

Assess the casualty's condition and administer first aid if appropriate.

Fig. 74 Aerial rescue method A – controlling both friction hitches

Fig. 75 Aerial rescue method A – use of a pulley above the casualty's friction hitch

The rescuer operates his/her own and the casualty's friction hitch to give a controlled descent whilst guiding the casualty through branches. Alternatively a pulley can be installed above the casualty's friction hitch to give hands-free control of the casualty's friction hitch.

If the casualty is conscious then the rescuer should be aware that the casualty may be in a position to help during the rescue, this keeps the casualty occupied and aids rescue.

The casualty can be carried away from the tree whilst still attached to the rope, if assistance is available.

11.2 RESCUE METHOD B

Two or three person team where casualty's rope is damaged, trapped or too short to descend on without re-tying into a lower anchor point

Climb to the nearest suitable anchor point above the casualty which is capable of supporting the weight of both the climber and the casualty.

Descend to the casualty, assess and make safe any hazards that threaten the casualty or would impede the rescue, e.g. chainsaw, other equipment/tools, tree debris.

Attach the casualty to the main attachment point of the rescuer's harness.

Assess the casualty's condition and administer first aid if appropriate.

Connect the casualty to the rescuer's rope and transfer the casualty's weight to the new connection, taking up any slack to prevent the casualty falling any distance when his/her rope is cut/disconnected.

An additional friction hitch, tied to the static side of the rescuer's rope and connected to the main attachment point on the casualty's harness, can make lowering a casualty on a single line easier for the rescuer.

Fig. 76 Aerial rescue method B – showing connections to the casualty

Slacken the casualty's friction hitch to test the rescue system and then disconnect the casualty's original climbing system or sever it using a knife (cut the casualty's friction hitch).

The rescuer descends with the casualty attached to his/her own harness and climbing system.

If the casualty is conscious then the rescuer should be aware that the casualty may be in a position to help during the rescue, this keeps the casualty occupied and aids rescue.

The casualty can be carried away from the tree whilst still attached to the rope, if assistance is available.

11.3 RESCUE METHOD C

Two or three person team rescue from a pole.

Climb to just above the casualty (using climbing irons and a flip-line or other suitable means of attachment) and make a false anchor to which the rescuer's climbing system or a separate belay rope can be attached.

Assess and make safe any hazards that threaten the casualty or would impede the rescue, e.g. chainsaw, other equipment/tools.

Assess the casualty's condition making safe where necessary and administer first aid if appropriate.

Fig. 77 Aerial rescue method C – a pole rescue

Attach the casualty to the rescuer's harness as in rescue B or to a belay rope as in alternative rescue methods.

Transfer the casualty's weight to the rescue system and disconnect or sever the casualty's lanyard/climbing system and spikes.

The casualty is lowered to the ground by the rescuer or by the belay rope. If the casualty is conscious then the rescuer should be aware that the casualty may be in a position to help during the rescue, this keeps the casualty occupied and aids rescue.

11.4 ALTERNATIVE RESCUE METHODS

A number of alternative rescue methods may be suitable to a given situation. The following examples indicate some of the options that may be considered:

RESCUE USING A BELAY ROPE

The rescuer can climb to a suitable anchor point above the casualty taking the belay rope up with him/her (or an access line can be used as the belay line). The belay rope is passed over a suitable anchor point, attached to the casualty and then belayed from the ground to lower the casualty.

Fig. 78 Aerial rescue using a belay rope and Gri-Gri

The groundperson can use a suitable belay device such as a Gri-Gri or friction hitch attached to a suitable anchorage (tree, vehicle, etc). This must have sufficient friction to control the descent. **The belay system must always fail-to-safe.**

Clear communication between rescuer and groundstaff is essential at all times throughout this rescue.

RESCUE USING A THROWLINE ASSIST

If the casualty can be relied upon to assist the rescue it may be possible to install a belay rope using a throwline. The belay rope can be attached by the casualty to himself or herself and belayed from the ground (Caution - a casualty suffering from shock may not be able to make rational decisions).

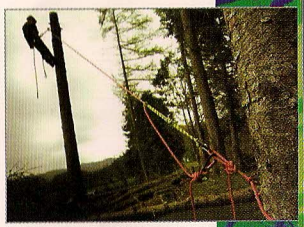


Fig. 79 Aerial rescue using a belay rope – fail-to-safe belay and back-up arrangement on the ground

Clear communication between groundstaff and casualty is essential at all times throughout this rescue.

RESCUE FROM A FOOTLOCK LINE

Fig. 80 Using the footlock line as an anchor point for the aerial rescue

Fig. 81 Aerial rescue from a footlock line – back-up knot below friction hitch or ascenders

The friction hitch or mechanical ascenders used for footlocking can be used to create a false anchor to carry out an aerial rescue.

In this instance the friction hitch or ascenders should be backed-up in case of slippage (for example, by putting a marlin spike hitch and karabiner below the friction hitch or ascenders).

APPENDIX 1 GLOSSARY

Anchor point	A position in the tree, usually a fork or branch junction, from which the climbing rope or lanyard is suspended to support the climber.
Ascender	A mechanical device that will slide forwards on a rope but will grip when pulled in the opposite direction.
Belay rope	A 'safety' or 'control' rope used to safeguard the climber, usually controlled by a third party (the belayer).
D rings	The points on a climbing harness designed for the attachment of the climbing line and/or lanyard
Descender	A mechanical device using a smooth cam, roller or other friction system to control descent.
Eye splice	A small loop spliced into the end of a rope or strop.
Fair-lead pulley	A small lightweight pulley which, when integrated with a friction hitch, improves the take up of slack in the rope when ascending or branch walking, and maintains alignment between the rope and friction hitch (see micro-pulley).
Flip-line	A steel-cored adjustable lanyard (usually used in conjunction with climbing irons) that is less flexible than a climbing line, allowing easier manipulation of the flip-line around the stem.
Foot locking	Various methods used to ascend a single or double rope, using the feet to grip the rope.
Friction hitch	Various knots or hitches that can be used to control ascent or descent on the rope but will self-lock when released.
Friction saver	An assembly installed at the anchor point which reduces friction damage to the tree, as well as reducing friction in the climbing system.
High supplementary anchor	An anchor point set above the main anchor to allow temporary access to the upper reaches of the crown.

Karabiner	A connector used to link rope to harness, with a spring-loaded, locking gate. Karabiners with a spring loaded, self-locking gate that require at least three distinct movements to open are recommended for tree climbing.
Lanyard	A short length of climbing rope with an adjustment system to allow change-overs and provide a supplementary anchor.
'Maillon Rapide'	A brand name for a connector that will take a multi-directional loading, with a non-hinged gate operated by a hexagonal, threaded sleeve.
Main anchor	The anchor point in the tree that provides the optimum strength and accessibility for the work to be carried out. There may be more than one main anchor in the tree.
Micro-adjuster	A lightweight ascender/rope grab
Micro-pulley	A small diameter, lightweight pulley. (See 'fair lead pulley')
PPE (Personal Protective Equipment)	This term applies to any equipment designed to protect the operator at work, e.g. chain saw safety clothing. In tree climbing operations it also applies to the equipment used to protect the operator from falling, i.e. Rope, harness, karabiners, lanyard etc.
Re-direct	A method of re-routing of the climber's line in order to achieve an improved work position (Does not achieve a supplementary anchor).
Split tail	A short length of climbing rope used to connect the climber's harness and rope system using a Blake hitch or other friction hitch.
Supplementary anchor	An anchor point used in conjunction with the main anchor to improve work positioning and/or increase security of the climber (see lanyard).
Throwline	A lightweight line that can be thrown over a suitable high anchor point in the tree and used to install the climbing line.
Work positioning system	An assembly of components or equipment to protect the individual whilst working at height (including gaining access/egress from the working position), which normally includes a body holding device connected to a reliable anchor, to support the user in tension or suspension in such a way that a fall is prevented or restricted.

APPENDIX 2 LEGISLATION AFFECTING PROFESSIONAL TREE CLIMBING

The following is a list of the current main legislative requirements in relation to tree climbing and working in a tree. The site-specific risk assessment should identify any other relevant statutory provisions. Information concerning these legal requirements can be obtained from HSE Infoline – 08701 545500

LEGAL REQUIREMENTS

- Health and Safety at Work etc. Act 1974 (HSWA)
- Management Of Health And Safety At Work Regulations 1999 (MHSWR)
- Work at Height Regulations 2005
- Provision And Use Of Work Equipment Regulations 1998 (PUWER)
- Lifting Operations And Lifting Equipment Regulations 1998 (LOLER)
- Personal Protective Equipment At Work Regulations 1992 (PPE)
- Manual Handling Operations Regulations 1992
- The Control Of Substances Hazardous To Health Regulations 1994 (COSHH)
- Noise at Work Regulations (1989)

Also applicable Under Certain Circumstances:

- Construction (Design And Management) Regulations 1994 (CDM)
- Electricity at Work Regulations 1989
- The Electricity Safety, Quality and Continuity Regulations 2002

SUMMARY OF KEY LEGAL REQUIREMENTS FOR ARBORICULTURE

The Health and Safety at Work etc. Act 1974 places general duties on employers, the self-employed and employees to ensure the health, safety and welfare of persons at work and for protection of other people who may be affected by the work activity. Various sets of regulations are made under The Health and Safety at Work etc. Act and spell out more clearly the specific duties for those in control or managing work activities.

The Management of Health and Safety at Work Regulations 1999 as amended, require risk assessments to be carried out to identify the measures necessary to comply with health and safety legislation. In particular the assessments should cover risks to the health and safety of employees, the self-employed and others who are not at work i.e. Members of the public. They also require arrangements for managing the work to be put in place and for control measures to be used to reduce the risks to an acceptable level. These regulations also detail requirements for employees to be suitably trained.

The Work at Height Regulations 2005 apply to all work at height where there is a risk of injury in the event of a fall. The Regulations set out arrangements required for the effective management of work at height. They cover selection, installation and use of work equipment and techniques for working at height. In addition to the general measures, tree climbing using a rope and harness has to meet specific requirements set out in Schedule 5, parts 1, 2 & 3 are relevant *(depending on the work being done).* Ladder use is covered in Schedule 6.

The Provision and Use of Work Equipment Regulations 1998 apply to all work equipment used in arboriculture including ropes, harnesses, strops etc. The Regulations require the selection of suitable work equipment bearing in mind where it is to be used and the purpose for which it is to be used. The Regulations also set out requirements for instruction, training and supervision of those using the work equipment.

The Approved Code of Practice to the regulations states that anyone working with chainsaws on or in trees is now expected to hold a recognised certificate of competence or a national competence award relevant to the work being done.

The Lifting Operations and Lifting Equipment Regulations 1998 apply to arboriculture. Detailed guidance is given in 'LOLER: How the Regulations Apply to Arboriculture.' Agriculture Information Sheet No 30. Available free from HSE Books- 01787 881165.

Climber's ropes, harnesses and other parts of the climbing system are defined as lifting equipment. The main aim of the Regulations is to ensure all lifting operations (including arboricultural operations) are properly planned, appropriately supervised and carried out in a safe manner.

LOLER requires matters such as strength, stability and installation to be addressed as well as setting out how equipment should be marked and thoroughly examined at prescribed intervals. It requires that suitable devices be used to prevent the carrier (a term used to describe the means of holding the person, i.e. the harness) from falling.

The Information Sheet AIS 30 states that:

- Supplementary anchors should be used where practicable
- Ropes and anchoring strops should have a high margin of safety
- The main climbing rope and associated equipment should be inspected every day by a competent person (i.e. the operator)

In addition to the daily inspection of climbing equipment by the operator, there are requirements under LOLER for:

- Written weekly record of inspection for equipment that is '...subject to high levels of wear and tear' (for example friction hitch cord)
- Thorough examination of lifting equipment by a competent person who has genuine authority and independence to make an objective decision about whether the equipment remains in use or not.
- Equipment that is being used for lifting people must be thoroughly examined every six months.
- Other equipment, such as rigging equipment, needs to be examined every 12 months

The Personal Protective Equipment Regulations 1992 require employers and others to carry out an assessment to determine whether PPE is required and if so what type is required for the job to be done. All PPE should be properly maintained and appropriate information, instruction and training should be given to those using the equipment so they know how to use it.

In Arboriculture, the PPE regulations will apply to chain saw clothing, helmets, safety boots, hi-visibility waistcoats etc. The Regulations may also apply to climbing equipment such as ropes, harnesses, lanyards etc, where these items are not comprehensively covered by other regulations, e.g. PUWER and LOLER.

APPENDIX 3 CONTACTS FOR HELP AND ADVICE

Arboriculture and Forestry Advisory Group (AFAG) Safety Guides
Available from the HSE website at:
http://www.hse.gov.uk/pubns/forindex.htm

The Arboricultural Association (AA)
Ampfield House
Ampfield
Near Romsey
Hampshire
SO51 9PA
Tel: 01794 368717
Fax: 01794 368978
E-mail: admin@trees.org.uk
http://www.trees.org.uk/

Health and Safety Executive (HSE)
Please contact your local HSE office.
The address is in the phone book.
HSE Infoline 08701 545500
HSE Books 01787 881165
http://www.hse.gov.uk/

Lantra Awards
LANTRA House
Stoneleigh Park
Kenilworth
Warwickshire CV82LG
Tel: 02476 419703
Fax: 02476 411655
http://www.lantra-awards.co.uk/

NPTC
Stoneleigh Park
Kenilworth
Warwickshire CV8 2LG
Tel: 02476 857300
Fax: 02476 696128
E-mail: information@nptc.org.uk
http://www.nptc.org.uk/

International Society of Arboriculture (ISA) – UK & Ireland Chapter
148 Hydes Road
Wednesbury
West Midlands
WS10 0DR
Tel/Fax: 0121 556 8302
E-mail: enquiries@isa-uki.org
http://www.isa-uki.org/

Tree Care Industry Association
Leigh Road
Eastleigh
Southampton SO50 9PD
Telephone: 023 8064 9756
E-mail: TCIA@langdowns.co.uk

Forestry Commission
Safety Training and Operational Standards
Silvan House
231 Corstorphine Road
Edinburgh EH12 7AT
Tel: 0131 3146210
Fax: 0131 3164344
E-mail: james.dewar@forestry.gsi.gov.uk