Draft for Consultation – November 2019

Proposed AA Technical Guide 4: Safe Use of Mobile Cranes in Arboriculture

Please note this 'Draft for Consultation' document has not been set out in its final design style or format. It relates to the fourth of five Technical Guides being developed, due for publication in 2020: 'Safe Use of Mobile Cranes in Arboriculture'. It is aimed at practicing, trained arborists and their supervisors.

TEXT
The draft is intended to show the proposed text, including key photographs, flowcharts and diagrams, etc at the appropriate points, and chapters / sections in the order we intend to present them. The layout and design stages will not be added until after the consultation feedback has been incorporated.
Text highlighted in blue, e.g: Appointed Person, indicates that the word or term is shown in the glossary.

IMAGES
Please note that there are one or two photos which will be replaced with improved versions.

SUMMARY BOXES
In each section there are 'Site Check List' boxes which will be presented in the guide to:

- Summarise key points for the arborist
- Provide a supervisor check sheet for monitoring purposes.

The amalgamated content of the summary boxes will be compiled in a separate document that will be made available as 'PDF download' as an industry Safety Guide.

RESPONSE
Please read through the draft and make note of any comments. Please then complete the short '**Survey Monkey**' questionnaire, adding any extra information where requested.

If you have a longer or more complex comment or query, please email to simon@trees.org.uk with 'Draft for consultation' as the subject title.

Please submit all responses by Friday 13 December 2019.

Take the Survey

Safe Use of Mobile Cranes in Arboriculture

Working draft for industry consultation

Front cover
Verso page
Contents
1 Introductory material:
Foreword by the Association and Acknowledgements - This will be a non-exhaustive list of those individuals who have provided significant contribution to the project.
1.1 Introduction:
Why the technical guide came about, development history and intended use.
1.2 Structure:
Clearly defining how the technical guide is framed into several parts and how these parts relate to each other.

Note:

Cranes are not specifically designed for the raising and lowering of people in a tree climbing harness. The raising and lowering of an arborist by the crane to access the tree during tree work operations should only be carried out where it is not practicable to access the crown of the tree using a MEWP and following the completion of a risk assessment which fully justifies the plan.

Contents

2.0 Technical Guidance

2.1 Scope of the Guide

This document provides guidance on the safe use of mobile cranes in arboriculture. It applies to the use of a self-powered, vehicle mounted mobile crane which by means of a jib, hoist and cables, facilitates a vertical lift.

A type of crane typically used in tree work is illustrated below.

Excluded from the scope of this guide

Whilst some of the following guidance may be useful to a practitioner, lorry loaders (such as a Hiab), vehicle mounted telescopic lifting arms, forestry harvesters, forwarders, excavator mounted hydraulic shears, excavators and telehandlers are beyond the scope of the guide.

2.1.1 The Decision to Use a Crane

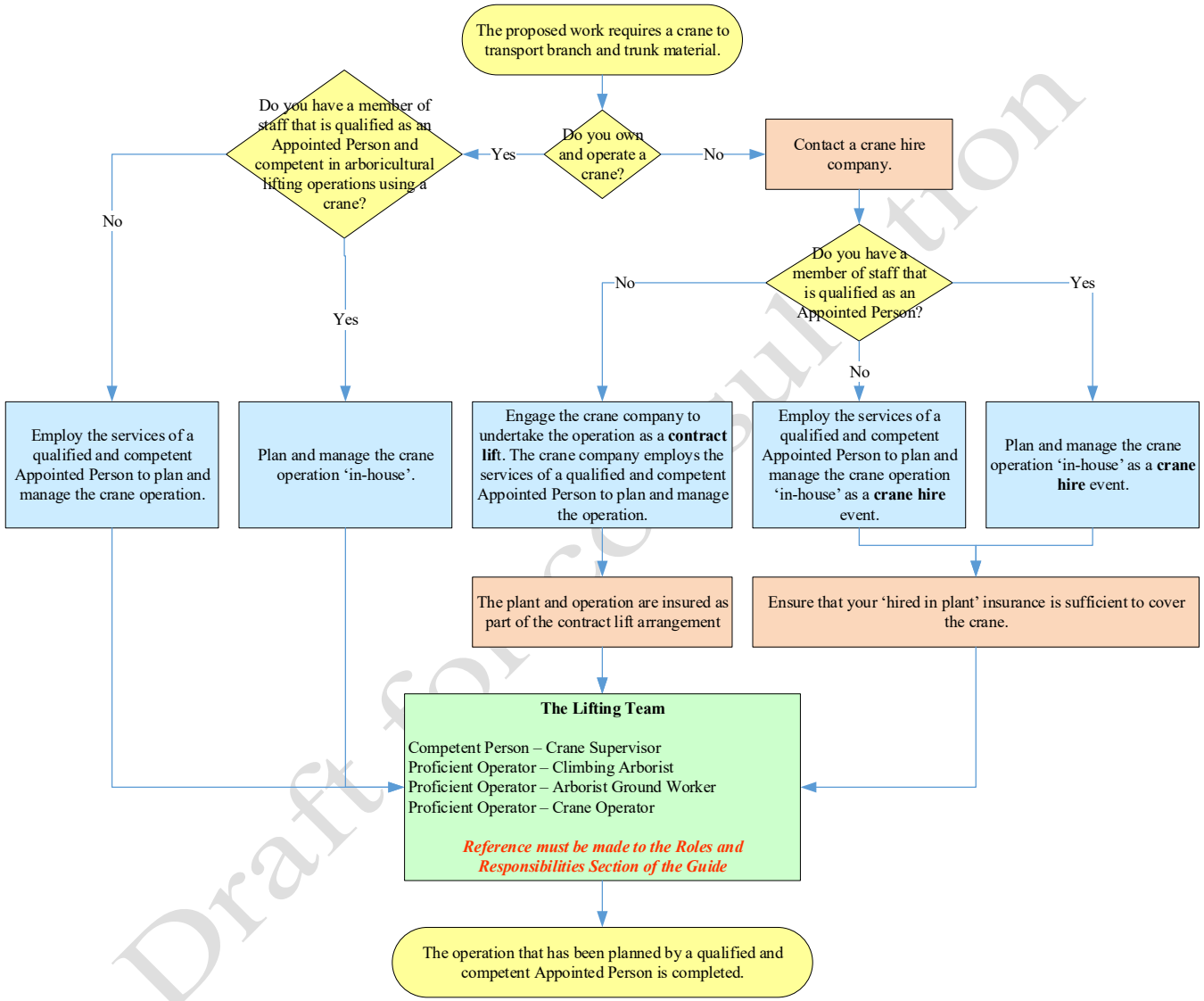
An arboricultural contractor has many options available to them when assessing proposed work.

Operations such as the removal of large branches or the complete removal of the tree can be completed using a variety of techniques ranging from free fall to aerial tree rigging but in certain situations the use of a crane can yield significant safety and efficiency benefits.

Scenarios that might benefit from the integration of a crane are:

1. Using the crane to access the tree, climber transferring into the tree using standard climbing techniques.
2. Using the crane as an anchor point when pruning a tree. Care must be taken to ensure that the crane is only subject to a vertical load if used in this way.
3. Sectional dismantle using a crane whilst the climber is anchored into the tree.
4. Sectional dismantle using the crane to lift cut sections while accessing the cutting position from a MEWP.
5. Sectional dismantle using the crane hook as an anchor point while slinging tree sections and then using an anchor point in the tree when the crane is lifting a cut tree section.
6. Using the crane hook as an anchor point for a climber to sling tree sections before either descending to the ground on their climbing system or moving to an anchor point in the tree. Another climber would cut the sections from an anchor point in the tree and remain in the tree.
7. Using the crane as an anchor point when dismantling dead/unstable trees, the climber remaining on the hook at all times.
8. Using the crane as an anchor point when dismantling dead/unstable trees, whilst using a second crane to lift the tree sections.
9. Using the crane as an anchor point when dismantling dead/unstable trees, whilst using an adjacent tree as an anchor for standard rigging techniques
10. Using the crane for aerial rescue.
11. Using the crane to move branch and stem material that has been previously felled.
12. Using the crane to assist moving and planting a mature tree with a heavy root ball.

If you intend to use a crane, a series of decisions must be made so that the operation is correctly planned and managed. Flowchart 1 illustrates these decisions.



Flowchart 1.

2.1.2 Roles and Responsibilities:

Crane operations are at the highest end of technical, practical arboriculture. It is essential that the team operates with a high degree of teamwork, coordination, and professionalism when undertaking arboricultural lifting operations using a crane.

All members of the team should be aware of the limits of their knowledge and experience about lifting operations, and, when conditions exceed these limits, further advice should be sought.

All personnel involved in arboricultural lifting operations using a crane should be appropriately trained and competent in their respective roles

The Industry Code of Practice for Managing Tree Work at Height (ICoP) uses the specific terms to describe roles and responsibilities on an arboricultural worksite.

Responsible Person	An individual who is ultimately legally responsible for all activities under their control.
Competent Person	Individual(s) responsible for ensuring operations are managed and undertaken safely and that the work environment is controlled.
Proficient Operator	A skilled, knowledgeable and experienced operator able to perform specific tasks.

Ultimate responsibility for the safe system of work lies with the Responsible Person and during arboricultural lifting operations using a crane the responsible person may also be undertaking the duties of the competent person or the proficient operator.

The crane industry also has specific names for the various roles in the lifting team. The following table clarifies the interaction of the terminology used by each industry and suggests the qualifications and experience required by each role.

Table 1	**Appointed Person** (ICoP - Competent Person) The person appointed by the employing organisation to plan and have overall control of the lifting operation.	**Crane Supervisor** (ICoP - Competent Person) The person who controls the lifting operation on site if the Appointed Person is not on site.	**Arborist Ground Worker** (ICoP - Proficient Operator)	**Climbing Arborist** (ICoP - Proficient Operator)	**Crane Operator** The person that operates the crane under the control of the designated signaller.
Responsibilities on the arboricultural worksite.	• Responsible for planning the safe system of work • Responsible for the selection of an appropriate crane • Produces the Lift Plan • May if present on site, undertake the role of the Crane Supervisor See the notes on all responsibilities below.	• Responsible for ensuring that the operation is undertaken in accordance with the safe system of work as defined in the Lift Plan. • Instructs the team members on the contents of the Lift Plan prior to the operation commencing • Authority to stop the work if there any safety concerns. • May also undertake the role of slinger/signaller and directing the crane operator to ensure safe movement of the crane and tree section when designated to undertake this role on site.	• Undertaking the role of ground based slinger/signaller and directing the crane operator to ensure safe movement of the crane and tree section when designated to undertake this role on site. • Controlling the movements of the tree section if required using a tag line. • Attaching a tree section that has previously been landed on the ground to the crane. • Detaching the tree section from the crane and ensuring that the hook does not swing once released.	• Undertaking the role of slinger/signaller and directing the crane operator to ensure safe movement of the crane and tree section when designated to undertake this role on site. • Attaching and detaching the load to and from the crane. • Cutting the tree section using appropriate techniques to avoid shock loading and side loading the crane jib	• Operating the crane in accordance with the manufacturer's instructions and within the safe system of work, as defined in the Lift Plan • The crane operator is responsible for undertaking all pre-use checks including ensuring that the warning and safety systems on the crane are fully functional prior to work.
Auditable evidence of appropriate training in the duties of an Appointed Person. (BS7172-1: 2016 – Annex A)	Essential Including experience in the type of lift to be undertaken				

Table 1 continued	**Appointed Person** (ICoP - Competent Person) The person appointed by the employing organisation to plan and have overall control of the lifting operation.	**Crane Supervisor** (ICoP - Competent Person) The person who controls the lifting operation on site if the Appointed Person is not on site.	**Arborist Ground Worker** (ICoP - Proficient Operator)	**Climbing Arborist** (ICoP - Proficient Operator)	**Crane Operator** The person that operates the crane under the control of the designated signaller.
Auditable evidence of appropriate training in the duties of a Crane Supervisor. (BS7172-1: 2016 – Annex A)		Essential Including experience in the type of lift to be undertaken			
Auditable evidence of appropriate training in the duties of a Crane Operator. (BS7172-1: 2016 – Annex B)					Essential Including experience in the type of lift to be undertaken
Auditable evidence of appropriate training in the duties of a Slinger Signaller. (BS7172-1: 2016 – Annex B)	Essential	Essential	Essential	Essential	
Level 2 Award which includes breaking down the crown of a felled tree.			Essential		
Level 2 Award in Supporting Colleagues Undertaking Off-Ground Tree Related Operations.			Desirable		
Level 3 Award in Aerial Tree Rigging.			Desirable	Essential	

Table 1

Appointed Person

The Appointed Person with suitable and sufficient practical and theoretical knowledge and experience of the type of lifts to be undertaken, is responsible for planning arboricultural lifting operations using a crane.

The appointed person should have the training and experience to enable them to carry out their duties competently. The appointed person's duties should include:

- planning the lifting operation (including approval of all risk assessments, lift categorizations and method statements), selection of the crane(s) and lifting accessories, instruction and supervision, and consultation with other responsible bodies to ensure effective collaboration as is necessary for the work to be undertaken safely;
- specifying the maximum load weight and operating radius as part of the lift plan
- consulting with others with specialist knowledge and experience as required
- ensuring that the outcomes of the planning process are recorded in a lift plan;
- ensuring that adequate pre-operational checks, intermediate inspections, maintenance and thorough examination of the equipment have been carried out;
- ensuring that there is an effective procedure for reporting defects and incidents and for taking any necessary corrective action;
- taking responsibility for the organisation and control of the lifting operation;
- ensuring that the crane supervisor and other members of the lifting team are fully briefed on the contents, scope and limits of the lift plan;
- stopping the operation whenever they consider that danger is likely to arise if the operation were to continue;

For a complex lift (see 2.2.1), the appointed person has additional specific duties which include:

- Making a site visit as part of the planning process, to identify all significant hazards in the working area, including those areas required for access or setting up of the crane;
- ensuring that the method statement includes information about access, ground conditions, setting up, etc., as well as the specific sequence of operations when lifting the load;
- preparing a detailed drawing of the site, the crane and the load, identifying the load path, lay down areas, together with the position and extent of any significant hazards in the area, to enable the operator to position the crane accurately;
- ensuring that, where lifting people, the recommendations of BS 7121-1:2016, 20.1, and this technical guide are followed;
- being present on the site during a complex lift, unless they select a competent person to deputise in their absence.

The appointed person may decide to undertake the duties of the crane supervisor or to delegate these to another suitably qualified person with appropriate expertise for the lifting operation.

Crane Supervisor

All lifting operations should be supervised by a crane supervisor. The crane supervisor should:

- direct and supervise the lifting operation, ensuring that it is carried out in accordance with the lift plan.
- be competent and suitably trained and should have sufficient experience to carry out all relevant duties.
- have sufficient authority to stop the lifting operation if they consider it dangerous to proceed.

Crane Operator

The crane operator should

- be responsible for the correct operation of the crane in accordance with the manufacturer's instructions and within the safe system of work, as detailed in the lift plan.
- respond only to the signals from one signaller at any one time, who should be clearly identified.

NOTE: It is essential that the crane operator responds immediately to an emergency stop signal from any person.

Slinger-Signaller

The slinger-signaller should be properly trained in all aspects of slinging loads and signalling and be authorised by the appointed person.

The slinger-signaller should be responsible for:

- carrying out pre-use and post-use checks of lifting accessories;
- attaching and detaching the load to and from the crane load-lifting attachment; and
- using the correct lifting accessories and other equipment in accordance with the lift plan
- initiating and directing the safe movement of the crane. If there is more than one slinger-signaller, only one of them should have this responsibility at any one time, depending on their positions relative to the crane (see section 2.4.2)

Crane Coordinator

Where more than one crane is operating on a site, a crane coordinator should plan and direct the sequence of operations of cranes so that they do not collide with other cranes, loads and other equipment.

A Crane Coordinator may also be required where there is a possibility of collision between the crane and other plant or structures e.g. railway infrastructure features, tower cranes, loader cranes, mobile elevating work platforms (MEWPs), or other obstacles. In such

circumstances, the crane coordinator should plan the sequence of crane movements to prevent collisions and anti-collision and/or radius-restriction system should be fitted and operational.

The crane coordinator role is often taken on by one of the crane supervisors.

Climbing Arborist

An experienced arborist holding a certificate of competence in aerial tree rigging that places the slings/chains and severs the section to be removed.

Arborist Ground Worker

An arborist that holds a certificate of competence which includes breaking down crown sections once they are placed into a stable position on the ground.

An arborist that holds a certificate of competence in wood chipper operation that converts branch sections into wood chip.

NOTE: On the arboricultural worksite, it would be permissible for the arborist ground worker or the climbing arborist to undertake the role of Appointed Person or Crane Supervisor if they are trained and competent to do so.

Roles and responsibilities would be detailed in the method statement and briefed to all on site before the start of work.

Reference must be made to the ICoP 2.3.1

Site Check List

- Has the lift plan been prepared by a qualified Appointed Person who has experience of arboricultural lifting operations using a crane?
- Does the lifting team include the necessary personnel?
- Are all members of the lifting team suitably qualified and experienced?
- Do all members of the lifting team fully understand their role on site?

Human Factors

- Can everyone on site maintain 'situational awareness'; are they fit and well, physically and mentally?
- Is everyone on site aware of any individual operator's limitations?
- Does anyone on site require reduced exposure duration, or increased protection, from any particular hazard which may affect their health? If so, has this been implemented?

2.2 Planning

2.2.1 Lifting Category

All arboricultural lifting operations using a crane are complex lifts so they need the highest level of planning and preparation.

A complex lift is a lifting operation where significant hazards have been identified with the load or with the work area, the access route of the crane or if the crane is used to lift people or a complex load.

On all arboricultural worksites where a crane is used, significant load and environmental hazards, such as those listed are usually present.

Load Hazards	Environmental Hazards
Position of centre of gravity, (often unknown)	Rain
Branches falling from lifted tree section	Ice
Lifting people	Snow
No specific lifting points	Wind
Unknown weight of tree section being lifted	Railways
High surface area causing load to swing in winds	Roads
Structural integrity of the tree being worked on	Adjacent structures such as buildings
	Adjacent plant such as MEWP's
	Power lines: overhead and underground
	Public places
	Obscured load path
	Lightning
	Site personnel (consequence of failure)
	Poor ground conditions

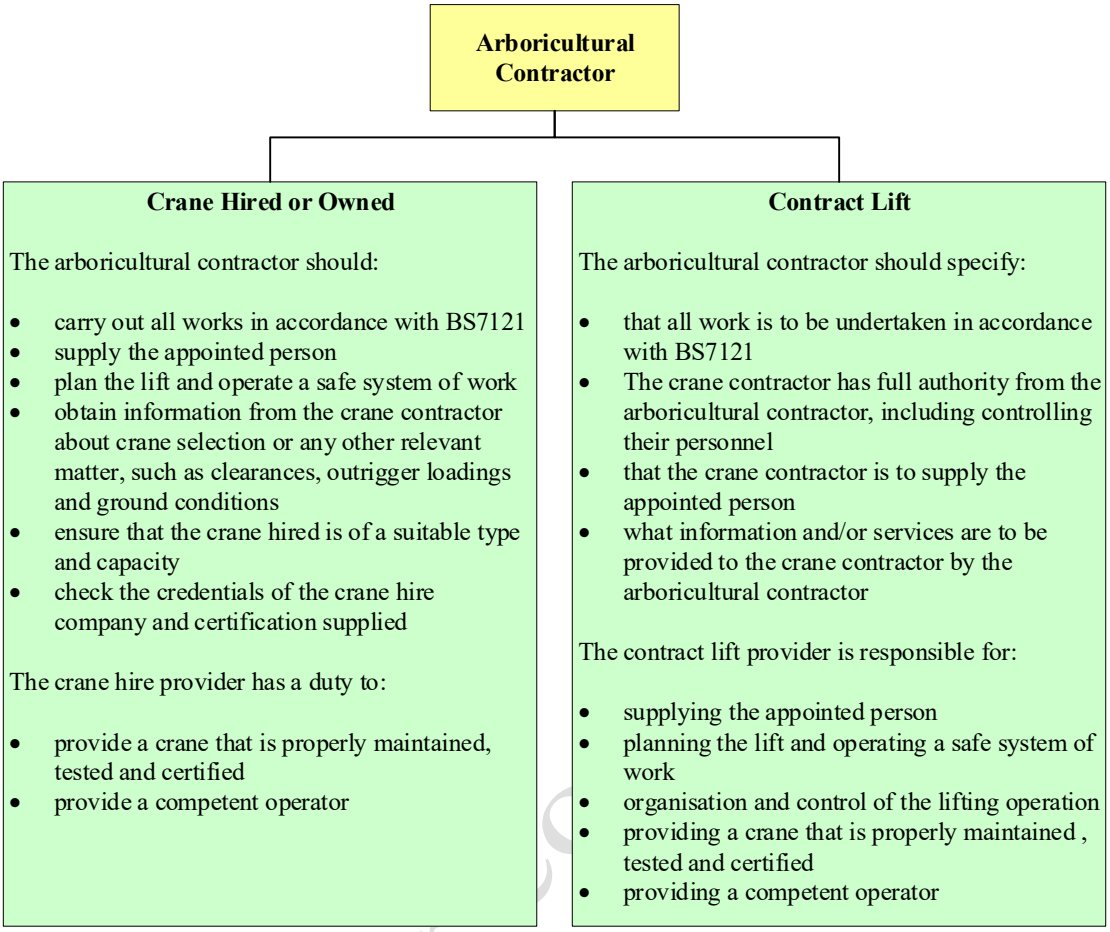
Complex lifts must be planned by an Appointed Person.

The appointed person may be a suitably qualified and competent member of staff or he/she may be supplied by a crane hire company depending upon the contractual arrangement (see flowchart 1)

Arboricultural contractors wishing to undertake tree work operations using a crane, but who do not have their own crane, have two options:

- Crane Hire – hiring a mobile crane, planning, managing and undertaking the lifting operation yourself
- Contract Lift – employing a crane contract lift provider to carry out the lifting operation

Arboricultural contractors that do not have in-house qualified expertise in tree work operations using a crane should not hire cranes but should opt for a contract lift, to ensure that the operation is properly planned.



Flowchart 2

Regardless of whether arboricultural operations using a crane are undertaken under a crane hire or contract lift agreement, the arboricultural contractor and the crane contractor must work closely together to ensure that:

- A qualified and competent Appointed Person plans all aspects of the proposed work
- all relevant information about site conditions is obtained;
- the operation is planned, and a safe system of work is followed;
- the operation is appropriately supervised;
- the operation is conducted in a safe manner in line with the lift plan;
- the crane is appropriately maintained, inspected and thoroughly examined;
- a competent crane operator is provided;
- lifting operations are carried out in accordance with this guidance

Contract Lift

The crane company may use the Construction Plant Hire-Association (CPA) **Contract Lifting Services Conditions** to define the agreement between the arboricultural contractor and the crane company for contract lift events.

Before entering into a contract lift, the arboricultural contractor should satisfy itself that the crane contractor has the necessary competence to carry out the work. This may include previous experience of planning and undertaking lifting operations involving trees.

The CPA 'Contract Lifting Services Conditions' specify that during a formal contract lift, the crane and lifting equipment, operator and other personnel supplied with the crane, such as the appointed person, crane supervisor, slinger signaller, are the responsibility of the crane contractor.

It must be borne in mind however that on an arboricultural worksite, the aerial slinging of tree sections will be carried out by a climbing arborist that is an employee of the arboricultural contractor and so the arboricultural contractor may be liable for incidents arising from that part of the operation.

The contract lift provider is responsible for all aspects of the planning and execution of the lift and should be insured for:

- Loss of or damage to plant/equipment caused solely by their negligence in the performance of the lifting contract;
- Loss of or damage to third party property caused solely by their negligence in the performance of the lifting contract

Under the terms of a formal contract lift the arboricultural contractor retains certain liabilities and should hold adequate insurance for incidents arising from:

- their own negligence;
- inadequate or unstable ground conditions;
- inadequate or incorrect information supplied in connection with the load being lifted

Crane Hire

The crane company may use the CPA **Model Conditions for the Hiring of Plant** to define the agreement between the arboricultural contractor and the crane company for crane hire events.

Before entering into a crane hire agreement, the arboricultural contractor should satisfy itself that they have the necessary competence to undertake the planning, organisation, control, and management of tree work operations using a crane.

Under the terms of a crane hire agreement, the crane and the operator are the responsibility of the arboricultural contractor once the crane has left the public highway. This includes travel on any access roads where the work site is not immediately adjacent to the public highway.

The arboricultural contractor should hold adequate insurance for:

- loss of or damage to the crane and lifting equipment;
- loss of or damage to third party property;
- injury to the driver/operator whilst under the supervision and control of the arboricultural contractor;
- continuing hiring charges whilst the equipment is unable to work because of loss or damage;

It is the responsibility of the arboricultural contractor to ensure that they have the required, adequate insurances in place under either contractual arrangement. Crane owners may, at their discretion, provide cover under their own insurance for a percentage fee of the hire costs.

All persons involved with the planning, organisation, control, and management of arboricultural lifting operations using a crane should be aware of the limits of their knowledge and experience, and, when conditions exceed these limits, further advice should be sought.

2.2.2 Risk Control Systems

Arboricultural lifting operations using a crane must be planned by the Appointed Person to ensure that they are carried out safely and that all foreseeable risks are eliminated or controlled so far as is reasonably practical. The outcome of the planning process should be a written lift plan which includes a risk assessment, method statement and supporting information, such as a site drawing and photographs. (See section 2.3.3)

The risk assessment carried out by the appointed person as part of the planning process must identify all hazards associated with the proposed lifting operation. In situations where the appointed person lacks the adequate practical and theoretical knowledge and experience of specific arboricultural aspects of the lift, then the Responsible Person for the arboricultural contractor must ensure that they provide that information and input into the risk assessment. In such cases, the Lift Plan may be an integrated document including information from the Appointed Person and arboricultural contractor.

The risk assessment should consider:

- the number of arborists on the team
- access to site for the crane and other equipment
- the site of the lifting operation including proximity hazards such as electricity cables, other plant and equipment, structures, members of the public
- the suitability of the ground to take the loads imposed by the crane during preparation for the lift and during the lift itself and other environmental conditions
- areas where the crane and/or parts of the crane and load-lifting attachments are prohibited from entering or oversailing, such as railways
- rigging and derigging of the crane
- appropriate communication system
- weather conditions, prevailing and forecast
- lifting people with the crane and aerial tree work operations
- the load, its characteristics and the method of lifting including the stability of the load when being lifted and set down
- ground based operations including chainsaws and chippers
- vehicle movements around the work site
- slips, trips and falls
- emergency procedures

The risk assessment should include an evaluation of the risks involved and the nature and extent of any measures required to mitigate those risks. The results of the risk assessment should be recorded in writing and used in the preparation of the method statement for the operation.

The format may be a site-specific document that refers to a suite of generic risk assessments. Generic risk assessments applicable to all site operations must be present on site.

2.2.3 Site Factors & Crane Selection

Selection of an appropriate crane is the responsibility of the Appointed Person.

Mobile cranes come in a variety of types and sizes and the type to be used will depend upon the location of the tree to be removed.

Key factors in the selection of the type and size of the required crane are:

- the estimated weight, physical size and characteristics of the tree sections to be lifted;
- the maximum lift radius;
- the maximum lift height;
- the crane lifting capacity at the maximum pickup and laydown radii;
- the operational speed of the crane;
- suitability and condition of access roads, including weight limits;
- ground conditions. All loads imposed on the ground by the crane should be considered, e.g. wheel, outriggers. The appointed person should obtain an assessment by a competent person as to whether the loads imposed by the crane during rigging, use and derigging can be sustained by the ground or any supplementary means of support;
- site and environmental conditions;
- space available for crane access, rigging (including associated equipment such as a ballast truck), operation, de-rigging and egress;
- the position of the crane so that the crane operator has a view of the load path and is adequately protected from crushing hazards;
- the weight of the hoist rope must be accounted for when lifting sections from a position below the base level of the crane. A test lift must be undertaken to ensure that sufficient hoist rope remains on the drum at all times to prevent the hoist rope running off the drum;
- where there are significant proximity hazards such as when working next to a railway, the crane must be equipped with working area limitation systems. These systems may include slew radius, slew angle, and boom height limiters;

Resources

Unless the risk assessment process suggests otherwise the combined arboricultural and lifting team should include at least four people.

- Appointed Person (may not be on site)
- Crane Operator
- Crane Supervisor (this may be one of the climbing arborists or an arborist ground worker)
- Climbing Arborist undertaking the aerial work (including aerial slinging/signalling)
- Climbing Arborist for aerial rescue
- Slinger/signaller (this may be an arborist ground worker with the necessary qualification and competence)
- Arborist Ground Worker(s)

Depending upon the work to be undertaken, the resources required for undertaking arboricultural lifting operations using a crane would be:

- A suitable crane (within six months of thorough examination if it is to be used to lift an arborist)
- Lifting accessories/attachments (slings/chains within six months of thorough examination)
- LOLER report of thorough examination for the crane and the lifting accessories
- Mobile elevating work platform
- LOLER report of thorough examination for the MEWP
- Chip trucks of a suitable capacity and number to handle the likely volume of chip
- Wood chippers of a suitable capacity
- Timber truck or trailer
- Handling equipment such as skid steer, tele-handler, mini articulated loader
- Arboricultural climbing and aerial rescue equipment including a suitable means to attach the climbing system to the hook of the crane
- A range of chainsaws
- Fuel and lubricants (stored within drip trays or stood on a spill mat)
- Tool maintenance equipment
- Traffic and pedestrian control equipment
- Clean up tools and equipment
- Communication equipment such as two-way radios
- First aid kit(s)
- Spill kit(s) both for the crane and the arboricultural equipment
- Fire extinguisher(s)
- Thorough examination records for all climbing and lifting equipment
- A sufficient number of ground-based operators to be able to deal with the likely frequency of material delivered to the lay down area(s)
- PPE per operator as required by their job role, industry guidance and the risk assessment

2.2.3.1 Tree Condition Assessment

The visual tree condition assessment undertaken pre-work is vital to:

- validate work at height decisions made as part of the risk assessment process;
- identify signs and symptoms within the tree which mean attachment to the tree or part of the tree is not a viable option;
- identify visible defects that may affect the positioning of the slings
- select the most appropriate system for safe working;
- choose the most appropriate method of access.

An inspection of the rooting area for signs that might lead to instability of the tree should include looking for:

- evidence of fungal activity;
- evidence of movement or heave of the root plate, e.g. soil cracking or lifting;
- evidence of root pruning/severance, e.g. recent trenching or excavation work in the proximity of the main stem; and
- any other visible defects.

Pre-work inspection of the stem and crown should assess it for signs of decay or weakness, for example:

- fungal fruiting bodies, cavities, cankers and poor health;
- major deadwood 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’, or branch regrowth from a stub which may have a weak branch union because of decay; and
- any other visible defects.

It is important that any climber involved in tree climbing operations is able to identify tree species and understand timber characteristics and seasonal variations because these may affect the structural integrity of the tree, which in turn will have a bearing on the work specification and the access technique used.

A further hazard to consider when using a crane to remove large limbs is that the operation may result in a crown which is significantly weighted to one side. If there are defects in the root plate or the stem, this unbalanced weight may result in a tree failure or place unintended loads on lifting accessories and the crane, so careful consideration must be given to the size of the section to be removed.

2.2.3.2 Other Site Considerations

Weather conditions

Certain weather conditions, for example high winds, heavy rain, snow or ice, can impose loads on a crane that may adversely affect the safety of the lifting operation. In such conditions, additional dangers are also imposed on the climbing arborists and arborist ground workers. Careful consideration during planning, should be given to the use of cranes in situations where they and the safety of all site operations are likely to be affected by the weather conditions.

Wind

A crane should not be operated in wind speeds higher than those specified in the manufacturers operating instructions. Consideration must be given to the speed of gusting wind even if the average wind speed does not exceed that stated in the operating instructions, as gusts can have an additional adverse effect on the safe handling of the load and the safety of the crane.

Tree sections often present large sail areas and even relatively light wind conditions can affect their ability to be handled safely and the stability of the crane. Extra care should be taken when handling loads presenting large wind catching areas. For example, a section of a broadleaf tree in full leaf can move in a direction which can place side loads on the jib.

The weather forecast must be checked prior to starting the lifting operation so that lifting is not started in rising wind conditions. www.windfinder.com is a useful resource.

The crane should be fitted with an anemometer located at a suitable point on the crane structure. The wind speed should be monitored with the anemometer throughout the lifting operation. Wind speed always increases with height. In some situations, a combination of an aerial and ground-based anemometer may be required.

It may be necessary to take the crane out of service at a lower wind speed than that specified in the manufacturers operating instructions, due to the type of load being lifted or difficulty in controlling the crane. The operator has the primary responsibility for making the decision, in conjunction with the appointed person or crane supervisor.

Visibility

Poor visibility can be caused by fog, low cloud, heavy rain, etc. In situations with poor visibility, a suitable means of communication should be provided to ensure the safe operation of the crane. In extreme conditions, lifting operations should be stopped until sufficient visibility has been restored to enable operations to be resumed safely.

Rain, snow, or ice

Heavy rain, snow or icy conditions can affect the intended load and the operation of the crane. They also create additional hazards for everyone involved in the lifting operation. During adverse weather conditions, the appointed person and/or the crane supervisor must

ensure that adequate precautions are taken to avoid danger when the crane, the load and the safety of personnel involved in the lifting operation is affected by rain, snow or ice.

Thunderstorms

A crane jib could act as a conductor and attract a lightning strike during a thunderstorm. If there are clear signs of an approaching thunderstorm, lifting operations should cease, the crane boom should be retracted, and all personnel should be moved out of the vicinity of the crane until the danger passes.

Temperature

In the UK, temperature is unlikely to affect the functionality of the crane.

Wildlife Disturbance

Prior to work commencing, the tree and its surroundings should be assessed for the presence of protected species.

Biosecurity

Measures should be taken to avoid transmission of pests and pathogens from tree to tree and from site to site.

Statutory Tree Protection

Trees in any location might be protected by legislation for various reasons including amenity, biodiversity or to avoid unnecessary tree loss.

Appropriate enquiries and applications must be made before undertaking tree work.

2.3 Management

2.3.1 Co-operation and Co-ordination

Crane work will often involve the co-operation and co-ordination of agencies such as the Local Authority, the Police, highways, utilities, railways, team members from other organisations, many operators, chip trucks and chippers, MEWP(S) and timber haulage operations.

Before any crane activity, relevant enquiries must be made of the appropriate authorities as part of the planning process.

Representatives from the above organisations may be present on site.

The method statement must include information on cooperation and coordination.

2.3.2 Emergency Procedures

An emergency plan must be prepared for each workplace where a crane will operate. The emergency plan should cover injuries, illnesses, environmental incidents, machine related incidents, breakdowns and other relevant emergencies.

Emergency planning should take account of:

- The hazards that could lead to an emergency situation.
- The response to an emergency.
- Ensuring the plan is clearly understood by all. (This should include the crane driver, particularly in relation to emergency situations involving a climber suspended on the crane).
- Ensuring that any amendments to the plan are recorded and communicated to all those involved in the lifting operation.

The plan should include:

- Phone Signal – Where can an adequate signal be found?
- Co-Ordinates - What are the co-ordinates of the access points and work site?
- Access – What is the access for both emergency vehicles and emergency personnel on foot?
- First Aid – Is a qualified first aider and a suitable first aid kit available?
- Rescue Equipment - Is it available and easily accessible so that an injured worker can be rescued quickly?
- Procedure to shut down the crane in the event that the operator becomes unconscious.

Training in emergency procedures should be provided and rescue scenarios practised regularly, to improve effectiveness in an actual emergency situation.

The Appointed Person must ensure that there is an effective procedure agreed for reporting defects and incidents.

This procedure should include:

- Any defects found during the daily pre-start checks.
- Defects found at any other time.
- Assessment of the severity of defects and whether or not they require the crane to be taken out of service.
- Incidents or accidents.
- Shock loads.
- Recording of action taken to rectify any defects.
- Clearance of the crane for further service.

2.3.3 The Lift Plan

Following undertaking a risk assessment, the Appointed Person must produce a lift plan. The appointed person should, when necessary, consult others with specialised knowledge and experience.

The risk assessment and the manufacturers information should be used when preparing the lift plan.

The lift plan should include:

- **Briefing Record**
    - List of the names of staff and others that have been briefed on the lift plan with dates and signatures.
- **Reference to Industry Guidance**
    - Details of the industry guidance that applies to the proposed operation and that must be available for reference on site.
- **Site Address**
    - The address of the worksite and other information that might be useful such as post code, grid reference, nearest parking etc.
- **Client Contact Details**
    - Arboricultural Officer.
    - Contracts Manager.
    - Commissioning Client.
    - Site Supervisor.
    - Etc.
- **Roles and Responsibilities**
    - Clear statement of the allocation of tasks for everyone involved
    - Refer to the roles and responsibilities matrix.

- **Scope of Works**

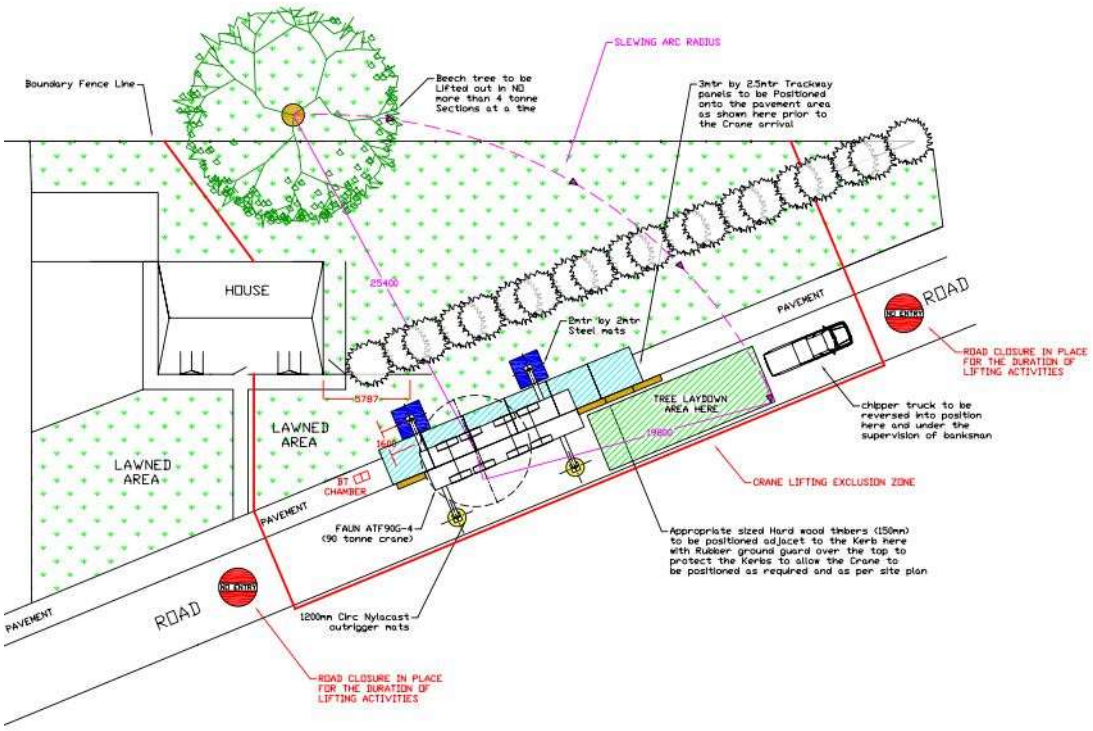
    - Description of the proposed work.
    - Description of the trees or sections to be lifted including the maximum weight.
    - The height of the lift and the maximum radius where applicable.
    - Order of the lifts.
    - Type of lifting accessories to be used and configuration.
    - Measures to be taken to ensure that the load remains stable after lifting accessories have been released.
    - Dealing with arising waste material.

- **Sequence of Operations**

    - Permits to work received if applicable.
    - Lift plan briefing (to include the risk assessment, the lift plan, site diagrams).
    - Positioning the crane considering exclusion zones.
    - Pre-start checks.
    - Rigging the crane in accordance with manufacturer's instructions and the Appointed Person's safe system of work.
    - Outrigger/stabiliser support arrangements.
    - Tree work undertaken as per the scope of work.
    - Configuration of the crane at the end of each day's work.
    - Plans for safely taking the crane out of service.

- **Site Plan**

    - Position of the crane.
    - Working radius – an arc to show the distance to the furthest picking point or the furthest lay down area.
    - Position of crane support vehicles (e.g. ballast support vehicle)
    - Position of the chip trucks and chippers.
    - Timber section lay down areas.
    - Exclusion zones.
    - Access and egress routes.
    - Overhead features.
    - Sub-surface features.
    - Proximity hazards (e.g. railways, highways)



Example Site Plan

- **Dates / Duration / Times**
    - Crane set up.
    - Start of works.
    - End of works.
    - Daily work times.

- **Access / Egress Arrangements**
    - Site security including gate lock codes or key holder details.
    - Road and gate width.
    - Road and surface suitability for heavy plant access.

- **Equipment / Plant / Resources**
    - Details of vehicles and plant.
    - Size and type of crane (as specified by the Appointed Person).
    - Substitute crane - any change to the make and model of crane by the owner must be assessed before the lifting operations start.
    - Configuration of crane to be used.
    - Lifting accessories.

- **Personnel and Contact details**

    - Names
    - Job roles
    - Contact numbers or callsigns

- **Hazards Identified**

    - Weather conditions including visibility, rain, snow, wind speed and the possibility of thunder storms. The weight of the load must be reduced to take account of the effects of the weather especially in windy conditions.
    - Ground conditions – the suitability of the ground to take the loads imposed by the crane during preparation and during the lifting operations.
    - Underground features.
    - Overhead features.
    - Proximity hazards (e.g. railways, highways)
    - Environmental protection.
    - Slips, trips and falls.
    - Work related upper limb disorder and other vibration / ergonomic disorders.
    - Use of plant and equipment.
    - Laceration and cutting.
    - Working at height.
    - Contact with substances that may be hazardous to health.
    - Contact with energised power lines.
    - Working in the proximity of water.

- **Controls to minimise risk to members of the lifting team and members of the public**

    - Traffic Management.
    - Pedestrian Management.
    - Site Security.

- **Welfare Arrangements**

    - Arrangements for access to toilet and washing facilities.
    - Details of locations and timings for breaks.

- **Information on weight of timber**

    - Refer also to the rigging guide.
    - Explanation of weight estimation procedure and the lift weight record

- **Communication**

    - Hand signals.
    - Radios.

- **Working at height arrangements**
    - To include aerial rescue arrangements
- **Waste management arrangements**
- **Biosecurity arrangements**
- **Emergency planning**
    - Aerial rescue plan
    - Emergency Contact Details
    - First aid
    - A&E location
    - Fire safety
    - Spill control
    - Action in the event of a mechanical breakdown

2.3.4 Communicating the Lift Plan

The appointed person, or in their absence, the crane supervisor should ensure that every person involved with the arboricultural lifting operation using a crane is briefed on the specific aspects of the operation at the start of the job. The briefing should be based on a review of the lift plan, which will include the site risk assessment, method statement and site diagrams.

Members of the lifting team should be encouraged to raise any issues or to seek clarity on the lift plan.

A copy of the lift plan and any associated supporting documents must be available to all those involved in the operation.

If a change of site personnel occurs, new team members must be briefed on the lift plan and any other relevant issues before starting work on site.

The Appointed Person or the Crane Supervisor giving the briefing must ensure that all site personnel fully understand it. This may require the briefing to be given using a language common to all site personnel or the use of a translator.

All site personnel must sign a briefing record to acknowledge their presence at and understanding of the briefing.

Any deviations from the plan or site changes must be referred back to the appointed person before the lifting operation proceeds.

2.4.2 Communication

Reference must also be made to section 2.3.5.4 of the ICoP for Tree Work at Height.

Clear communication is essential to the safe use of cranes in on an arboricultural worksite and a communication system should be established prior to starting any work on site.

If clear lines of communication cannot be established, lifting operations should not proceed.

If, at any time during lifting operations, the communication system breaks down, then all work must stop until it is satisfactorily restored, and all parties have agreed that it is safe to proceed.

The person directing crane movements (slinger signaller) should always be easily identifiable to the crane operator, for example by wearing high-visibility clothing or by using radio call signs.

It is likely that on an arboricultural worksite, more than one person will be responsible for directing the movements of the crane at different times. For example, the climbing arborist may direct the crane to position the lifting gear for attachment to the tree section and the arborist ground worker may then direct the crane to position and lower the tree section on to the lay down area.

If there is more than one slinger-signaller, only one of them should have responsibility for directing the safe movement of the crane at any one time, depending on their positions relative to the crane.

If, during the lifting operation, responsibility for directing the crane and load is to be transferred to a different slinger-signaller, this should be clearly explained to the crane operator and, the slinger signaller to whom responsibility is being transferred, clearly identified. Furthermore, the crane operator and the slinger signaller should clearly indicate that they accept the transfer of responsibility.

The communication system should be agreed and briefed to all site personnel by the appointed person and/or the crane supervisor, prior to starting work. The briefing should include:

- the method of communication to be used (hand signals, two-way radios, or a combination of both);
- identification of the person or persons responsible for directing the crane during the arboricultural lifting operation;
- call signs for each radio operator, if radios are to be used
- the testing of the communication equipment

Site Check List

- Has a detailed risk assessment been completed and communicated to the lifting team?
- Has a visual tree condition assessment been undertaken?
- Site considerations such as weather conditions, wildlife, biosecurity and tree protection have been assessed and actioned?
- Do all members of the lifting team understand the emergency plan?
- Have all members of the lifting team signed the risk assessment and the lift plan to confirm their understanding?

2.4.3 Selection of Equipment

The specification of a suitable crane is covered in section 2.2.3

This section covers lifting accessories used during crane operations.

2.4.3.1 Slings

The appointed person should plan how the load is to be slung. Details should be recorded in the lift plan.

The slings must have a capacity margin well in excess of that needed for their proportioned load.

Only slings for which a current report of thorough examination has been issued within the previous six months (LOLER) should be used.

Slings must:

- be clearly identified and marked with the working load limit (WLL).
- be visually inspected on each occasion before and after use.
- only be used for lifting loads
- not be dragged along the ground or floor.
- stored appropriately to prevent damage or deterioration.

Textile slings must:

- be protected from damage caused by slipping during the initial tensioning stage of the lifting operation, as this is when the material of the sling is most susceptible to wear or damage.
- be checked carefully each time before attachment to, and after removal from, the load.
- withdrawn from use immediately if there are any signs of cuts or fraying in the fabric.

Under no circumstances:

- should textile slings be knotted.
- should chain slings be joined by means of bolts or wire and, when shackles are used, the correct pins should be fitted.

Multi-leg chain sling

Chain slings are available with 1, 2, 3 or 4 legs.

Note the length adjustment hooks at the top of each leg and the latch on the safety hook.

Advantages

- Most likely supplied by the crane company along with evidence of thorough examination.
- Can be used for every kind of lift required by tree work operations.
- Easy to adjust the length of each leg.
- Durable and not easily damaged.

Disadvantages

- Heavy.
- Risk of 'struck-by' injury if the legs hang up in the crown above the arborist or if allowed to swing by the slinger signaller on the ground.
- May not choke immediately around the timber section until loop of chain bites into the timber.
- Requires thorough examination (LOLER) by a competent person with experience of this lifting accessory. This is unlikely to be an arborist.

Textile ‘Dead-Eye’ Slings

Available in many strengths and lengths.

A securely locked shackle is used to connect the sling(s) to the hook of the crane.

A timber hitch or other appropriate knot is used to tie the leg(s) of the sling(s) to the branch.

The slings must be the same size and type.

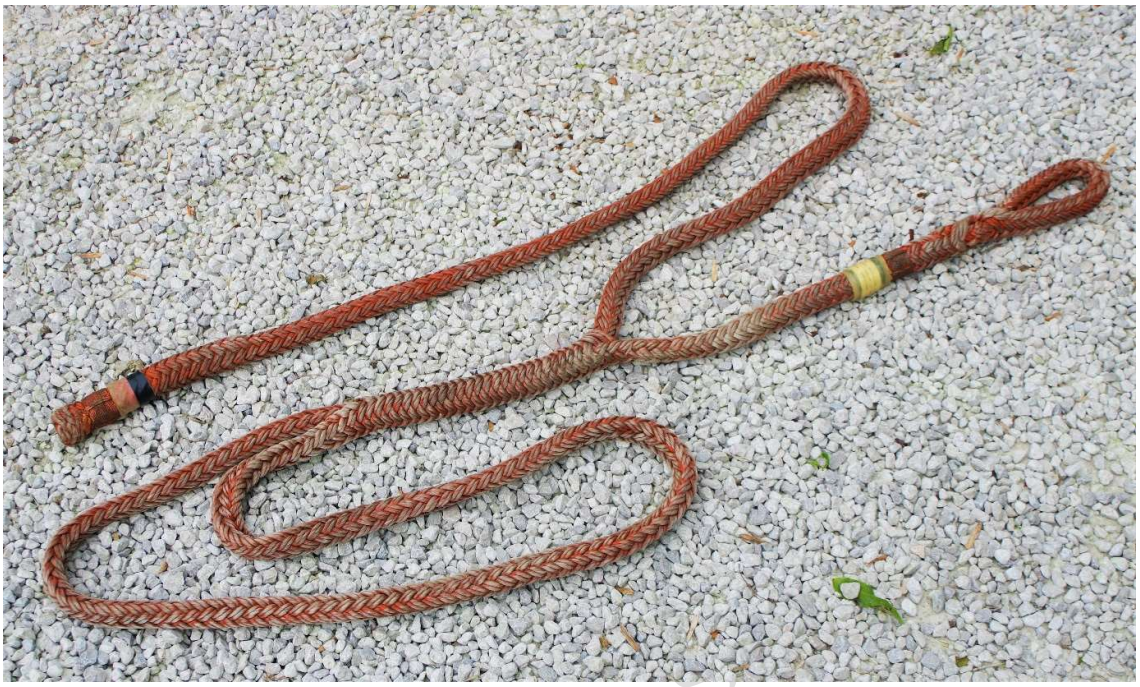
Advantages

- Particularly useful for branch sections.
- Very adjustable.
- Easy to adjust the length of each leg using a timber hitch.
- Lower risk of a ‘struck-by’ injury if the sling hangs up in the crown above the arborist.
- Lighter to handle than a chain sling.
- If the sling has a protective outer cover and the eyelet is large enough, it can be connected directly into the hook without a shackle.

Disadvantages

- Not a strong as chain slings.
- Easily damaged.
- Incorrectly tied or set knots may fail.

Textile Adjustable Slings



Available in many strengths and lengths.

A securely locked shackle is used to connect the sling(s) to the hook of the crane.

A lark's foot (choke hitch) or other appropriate knot is used to tie the leg(s) of the sling(s) to the branch.

The slings must be the same size and type.

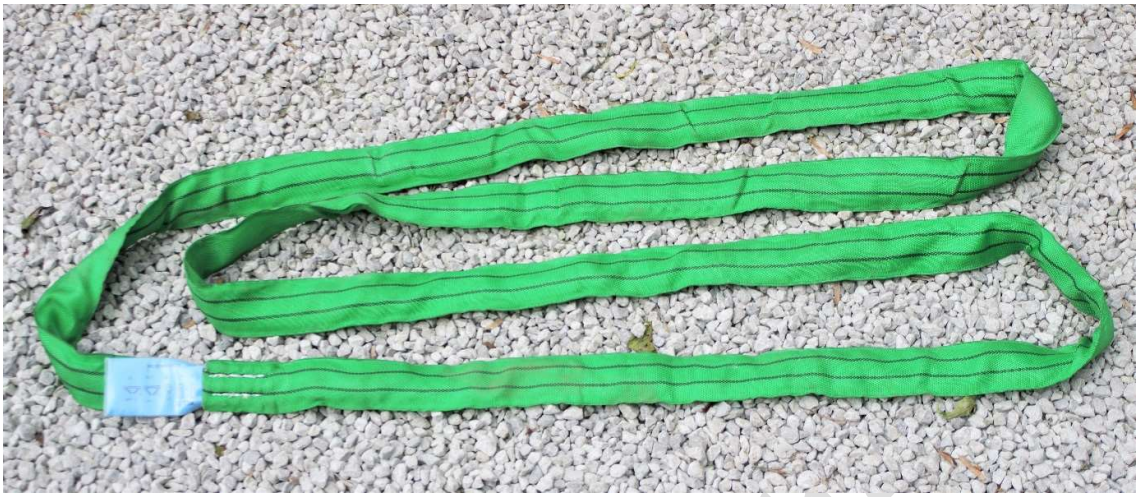
Advantages

- Particularly useful for branch sections.
- Very adjustable.
- Easy to adjust the length of the sling.
- Lower risk of a 'struck-by' injury if the sling hangs up in the crown above the arborist.
- Lighter to handle than a chain sling.
- If the sling has a protective outer cover it can be connected directly into the hook.

Disadvantages

- Not a strong as chain slings.
- Easily damaged.
- Lengths of timber must be used as bearers for the placement of the cut section to avoid the slings becoming trapped.

Polyester ‘Round Sling’ also known as an ‘endless sling’



Available in many strengths and lengths.

The sling is choked around the branch using a ‘lark’s foot’ (choke hitch) configuration.

Two slings can be used to achieve a horizontal lift of branch material.

The sling is connected directly into the hook of the crane as it has a protective outer cover.

Advantages

- Can be used for branch and stem sections.
- Lower risk of a ‘struck-by’ injury if the sling hangs up in the crown above the arborist.
- Lighter to handle than a chain sling.

Disadvantages

- Not a strong as chain slings.
- Not adjustable.
- Easily damaged.
- Lengths of timber must be used as bearers for the placement of the cut section so as to avoid the slings becoming trapped.
- Requires detachment from and re - attachment to the main hook when attaching to the tree section

Textile Flat Webbing Slings

Available in many strengths and lengths.

A lark's foot (choke hitch) or other appropriate knot is used to tie the leg(s) of the sling(s) to the branch.

The slings must be the same size and type.

Advantages

- Lighter to handle than a chain sling.
- If the sling has a protective outer cover it can be connected directly into the hook.

Disadvantages

- Not a strong as chain slings.
- Easily damaged.
- Lengths of timber must be used as bearers for the placement of the cut section to avoid the slings becoming trapped.

2.4.3.2 Certification and Conformity

Arboricultural lifting operations using a crane must not be undertaken unless the following supporting documents are present and have been checked.

- **Rated capacity charts –** Readily understandable rated capacity charts applicable to the various specified operating conditions of the crane, should be available to the crane operator in the cab.
- **Instruction manuals –** Operating instructions in the appropriate language(s), containing adequate information on the rigging, use, alteration, and de-rigging of the crane, should be kept with the crane.
- **Reports of thorough examination** – All current reports of thorough examination for any crane and lifting accessories carried on the crane should be kept with the crane. The LOLER report of thorough examination for the crane must be within 6 months if it is intended to use the crane to lift a person. Lifting accessories must be within 6 months of examination.
- **Reports of thorough examination** – All current reports of thorough examination for any climbing and lifting accessories must be available on the worksite.
- **Maintenance records** – Crane maintenance records should be available to confirm that the crane has been maintained in accordance with manufacturers' instructions.

2.4.3.3 Compatibility of Lifting Systems

The arborist must ensure that all components in the lifting system are compatible in terms of shape, size, construction and materials used; with (where applicable) the nature and mode of connection; with the technique and structural constraints.

Site Check List

- Has the Appointed Person specified an appropriate crane?
- Is the crane and all lifting equipment within the required test period?
- Have suitable slings been selected?
- Does the crane have a safety hook with a latch?
- Is the equipment provided suitable for the task, has it been thoroughly examined (where applicable), and have pre-use checks been completed?
- Does everyone on site have the correct PPE and is it in good condition?

Equipment Inspection, Care, Storage and Maintenance

- Have you received training in climbing equipment inspection, maintenance and record keeping?
- Do you understand manufacturer's recommendations for product lifespan, maintenance, storage and use?
- Are you keeping adequate records of issue, inspection, withdrawal and disposal?
- Have you completed a visual and tactile pre-use inspection?

3 Carrying Out the Tree Work using a Crane

3.1 Setting Out the Site

All setting out must be in line with the lift plan.

The Competent Person in charge of the site (the Appointed Person or the Crane Supervisor) must 'second check' the planning points as set out in the lift plan.

Once the plant and equipment are on site, the hazards and risks can be seen in context and so planned positioning may need to be re-considered.

3.2 Placement of Plant and Vehicles

3.2.1 Placement and Rigging of the Crane

The position(s) of the crane on the arboricultural worksite must be planned by the appointed person and recorded on the lift plan (see section 2.2.4). The lift plan should be used by the appointed person, or in their absence, the crane supervisor, to ensure the correct placement of the crane on the site. The appointed person responsible for planning the operation must be informed if, for example, the hire company supplies a different make and model of crane to that specified in the lift plan or if a change needs to be made to the position of the crane.

Prior to arrival and final positioning of the crane on site, the appointed person or crane supervisor should check:

- that access roads are available and soundly constructed with suitable entry points to site.
- that the work site is adequately prepared for the mobile crane
- that the setup area is level
- the location of trees to be lifted and scope of lift
- the location of overhead obstructions
- the location of any underground services and/or trenches, including utilities and drainage that may affect the integrity of the ground
- that there is adequate room for rigging of the mobile crane including any support vehicles and other plant and equipment
- that non-site personnel can be adequately protected from operations

Once the crane is in its final position and has been correctly rigged, a trial operation should be completed by the crane operator. This will ensure that:

- there is adequate counterweight swing clearance
- outrigger packing is adequate
- the crane is capable of the task

During the lifting operation the lifting team should periodically inspect:

- outrigger jacks for leaking oil or any retraction of the rod
- outrigger mats for excessive settlement and/or sinking into the ground

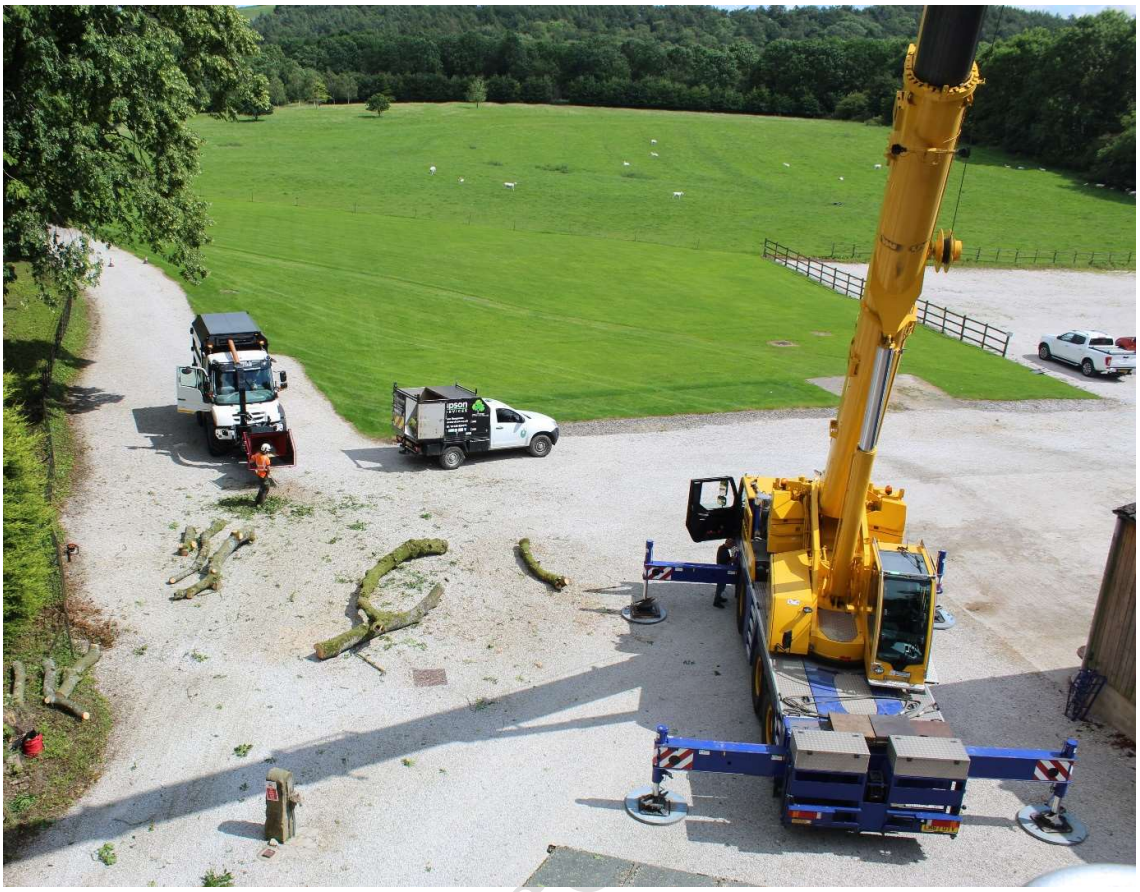
- outrigger floats for cracking or critical damage.

Example of a fully rigged crane

3.2.2 Placement of the Trucks, Wood Chippers, Plant and Timber Hauliers

The trucks, wood chippers and other plant must be placed as shown in the method statement and under the direction of the crane supervisor.

The crane supervisor must co-ordinate activity to ensure adequate separation between people, plant and operations.



3.3 Communication Systems

The risk assessment should identify the most appropriate communication system to be used.

All site personnel involved in the lift should be conversant with the chosen signalling method.

Whatever type of signalling method is used, commands to the crane operator must only be given by one person at any one time. The responsibility for commands must be 'handed over' and the crane operator must be clear that a change of signaller has taken place.

Hand Signals

When using hand signals, the signaller should stand in a safe position where they can see the tree section being lifted and can be clearly seen by the crane operator, facing the operator if possible. Each signal should be distinct and clear.

	
Operations Start Follow my Instructions	**Stop**

Emergency Stop	Hoist Pointing up while circling the hand
 	
Inch the Load The hand is clenched and unclenched until the load reaches the required position	**Lower** Pointing down while circling the hand

	 
Lower Slowly Pointing downwards with both hands and circling each hand	**Slew** In the indicated direction

Jib Up Lifting and lowering the fist until the jib reaches the required position The other hand is placed on the head	**Jib Down** Lifting and lowering the fist until the jib reaches the required position The other hand is placed on the head

End of the Operation
I am no longer acting as your Banksman

Radio Communication

Situations often occur in arboricultural lifting operations using a crane where the slinger signaller is out of sight of the crane operator and standard hand signals cannot be used. For example, when the climbing arborist is within the tree canopy and cannot see the crane operator.

In situations where hand signals alone are inadequate, radio communication should be used, to supplement the hand signal code. Due to the likelihood of visual contact being lost, it is strongly recommended that radio communication should be used in all tree work operations involving the use of cranes.

To avoid problems with the use of radios such as:

- loss of signal leading to loss of control of the lift
- interference from other radios in the vicinity
- misunderstanding between the crane operator and the slinger signaller

you should:

- use good quality, durable VHF/UHF radios. (If you use a two-way radio system that does not operate on one of the pre-programmed, licence-free frequencies (within the band 446.0 - 446.1 MHz) approved by Ofcom, you will need a licence. The benefits of a licensed frequency are generally greater range, less interference from other users

and more features available on the hand sets.). An alternative to radio handsets is the use of communication headsets. These are built into the helmet earmuffs and operate via Bluetooth or wireless two-way radio, operating in the PMR 446 MHz band. The advantages of communication headsets are:

  - a reduction of surrounding noise when talking, allowing for clear communication
  - handsfree communication allowing the climbing arborist to communicate whilst performing tasks requiring the use of both hands.

- ensure that all radio users are familiar with the controls and operation of the model of radio that they are required to use.
- keep the selected channel clear of all other communications.
- ensure that crane operator and slinger signaller have a sufficient command of a common language so that clear, unambiguous communication can take place.
- assign all personnel involved in the signalling a clear and unique call sign. This call sign should precede all communications. The crane operator should not respond to any command that is not preceded by the given call sign.
- ensure that voice commands are only given by one person at any one time and the command is acknowledged and repeated by the operator to demonstrate that the message has been received and understood.
- ensure adequate charging arrangements are made so that the radio battery has sufficient capacity to last for the duration of the lifting operation, batteries are charged at the end of a shift and that spare charged batteries, are available at all times.

The use of a carry harness for members of the arboricultural team using radio handsets, is strongly recommended to protect the handset and facilitate safer, easier use of the radio whilst working.

Radio integrated into the helmet

Hand held radio in a chest harness

Voice commands for lifting operations

Voice Command	Notes
Start operations	
Stop now (Emergency stop)	
Take the weight	
Raise	When fine positioning control is required, the signaller should repeat the command continuously for as long as motion is required. As long as the crane operator can hear the command, it is clear that the radio is working. If the commands cease before the final "Stop", the operator knows that communication has broken down and stops the operation. Example - "Lower slowly, Lower, Lower, Lower, Lower, Lower, Lower, Stop".
Lower	
Lower slowly	
Slew left	"Left" and "Right" refers to the viewpoint of the crane operator. This also applies when a crane is being operated using remote controls.
Slew right	
Jib up	
Jib down	
Extend jib	
Retract jib	
Travel to me	
Travel from me	

Site Check List

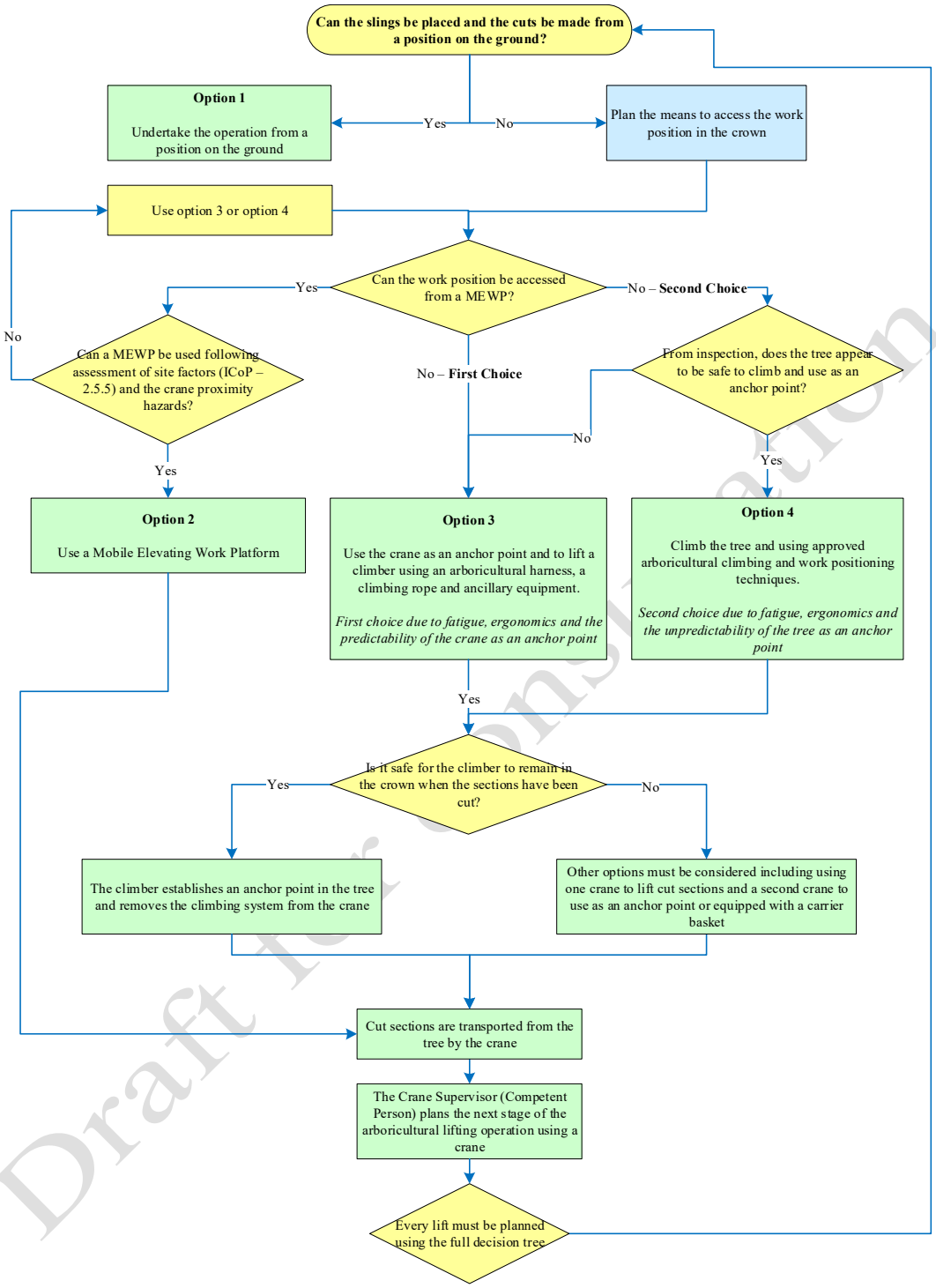
- Has the Crane Supervisor ensured that the site has been set out in accordance with the lift plan?
- Has the crane been placed and rigged as set out in the lift plan?
- Have communication systems been planned, tested and agreed?

3.4 Accessing the Crown of the Tree

Reference must be made to:

- ICoP for Tree Work at Height
- The Guide on Tree Climbing and Aerial Rescue
- The Guide to MEWPS in Arboriculture

The owner/director/manager of the arboricultural contracting company (responsible person), the appointed person and the crane supervisor must ensure that all work at height involving arboricultural lifting operations using a crane is planned with reference to the following decision tree.



Flowchart 3

3.4.1 Use of a Mobile Elevating Work Platform (MEWP)

Use of a MEWP to access the cutting position during arboricultural operations using a crane can be useful especially on a very large tree where storm damage or decay may have compromised the structural integrity of the branches.

MEWPs are particularly useful when dismantling the stem following branch removal.

A MEWP would be less useful for working in dense crowns or areas of close branch structure due to the inability to achieve the desired cutting position. There may also be issues arising from the proximity of the crane and the MEWP or from a limited ability to achieve an escape route. Tree sections suspended from the crane must not be allowed to strike the basket.

Reference must be made to the technical guide for the use of MEWPs when planning operations using a MEWP.

Dropped material must not be allowed to hit the MEWP basket or base.

3.4.2 Use of a Personnel Carrier

A personnel carrier suspended from a crane.

In a situation where a tree is in an unstable condition, where it would not be safe to climb or for the climber to remain in the crown, the branches to be removed are overhanging important features and there is no access for a MEWP, a personnel carrier is an option as a working platform. This would require the co-ordination of two cranes, one to suspend the carrier and the other to support and transport the branch and stem material.

The carrier selected should be suitable for arboricultural work activities and comply with BSEN14502-1-2010.

The carrier should be marked with the maximum number of persons that can use the carrier, the maximum weight of any tools or equipment to be lifted on the carrier, and the gross weight of the carrier (weight of carrier + weight of maximum number of person + weight of tools)

The carrier should be fitted with lifting slings or chains that are permanently fixed to the carrier by way of connectors that require a tool to undo or disconnect.

When a crane is used to lift or support people the SWL for the crane and accessories should be reduced (de-rated) by 50% to provide an appropriate factor of safety.

When a carrier is used on a crane for lifting persons, the crane becomes dedicated personnel lifting equipment. This necessitates the need for a second crane to lift the tree sections.

Operators must secure themselves to an anchor point within the carrier using a harness and an adjustable lanyard in the same was as when working from a MEWP.

The use of a carrier can create additional hazards such as becoming fouled by branches causing it to tip and fall when lowered into or close to a tree canopy. A suspended carrier will rotate with the pull and push of the chainsaw.

In all but exceptional circumstances and following a careful risk assessment process, a carrier should not be used as a substitute for a MEWP.

3.4.3 Use of a Climbing Harness

NOTE – we are awaiting an updated photograph which shows a second point of attachment over the master link. This is likely to be a flip line or positioning lanyard attached to the bridge of the harness. It would also be useful to show the chain slings also on the hook. The order onto the hook will be – master link followed by the chain sling so that the master link is furthest from the opening of the hook.

Cranes are not specifically designed for the raising and lowering of people in a tree climbing harness. The raising and lowering of an arborist by the crane to access the tree during tree work operations should only be carried out where it is not practicable to access the crown of the tree using a MEWP and following the completion of a risk assessment which fully justifies the plan.

When a crane is used to lift or support people the SWL for the crane and accessories should be reduced (de-rated) by 50% to provide an appropriate factor of safety.

The work at height decision tree (flowchart 3) sets out a hierarchy as follows:

Option 1 – Undertake the operation from a position on the ground
Option 2 – Achieve access to the crown using a MEWP
Option 3 – The crane is used as an anchor point by the climber
Option 4 – The tree is used as an anchor point by the climber

The hierarchy applies to sites where a crane is to be employed in the transport of branch and stem material and does not replace the hierarchy set out in the ICoP under normal circumstances.

The hazards arising from transporting a climber using a well-planned crane lift are less than those arising from fatigue, ergonomic stresses, and the unpredictability of the tree.

The crane is an inspected and predictable engineering solution whereas the tree, even with a high level of assessment, is an unpredictable structure.

The crane is a very safe and predictable anchor point so the risk in working at height in this way mainly arises from the climber incorrectly assembling the work positioning system.

The sequence of manoeuvres when the climber intends to use the crane to access the crown are as follows:

1. The climber attaches the work positioning system to the master link on the hook and also puts their positioning lanyard or flip line through the master link for added security during the ascent. The flip line or positioning lanyard must be connected to the bridge of the harness rather than the side D rings.
2. A second arborist must check the work positioning system and the positioning lanyard / flip line position before the climber is elevated by the crane.
3. The climber places the chain slings onto the hook or decides whether to place the textile slings onto the hook or onto their harness.
4. The climber communicates that they are ready to the Crane Supervisor.
5. The crane operator is signalled to lift the climber to a height greater than the crown of the tree.
6. Once suspended at an appropriate height, the crane operator is signalled to position the climber over the crown of the tree. The Crane Supervisor must ensure that the journey to this point is through clear space and well away from proximity hazards.
7. The climber takes the positioning lanyard / flip line from the safety hook and descends to the work position using the work positioning system that is attached to the master link over the safety hook. Care must be taken in situations where the hook block is lowered into the canopy of the tree. This can create additional hazards to the climber e.g. the hook block getting caught on branches, the hook block breaking branches that could fall on to the climber, loss of visual contact between the crane operator and the hook block. If the hook block is lowered into the crown, it must be ensured that its direction of travel, is free from obstacles and constant communications are maintained between the crane operator and slinger/signaller directing the crane movements.
8. Once descended into a convenient position in the crown, the climber attaches the lifting sling(s) to the section to be removed. This enables them to assess the suitability and integrity of the attachment point before lowering themselves further and into the cutting position.

9. The climber installs a second work positioning system in the crown before retrieving the first system from the master link on the safety hook.
10. Before using any cutting tools, the climber must ensure that they are attached to the tree using two load bearing support / positioning systems.

Once anchored into the crown, the climber must adopt the techniques described in the Tree Climbing Guide.

Each raising and lowering operation must be carefully planned and must address the following:

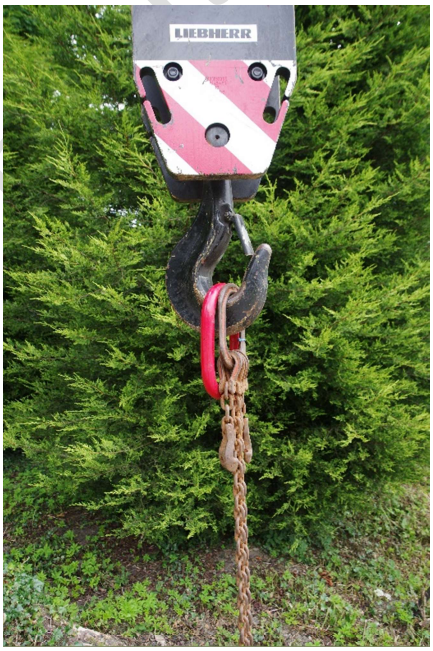
- The weight of any climbing equipment and attachments should be included as part of the load.
- The crane should have a rated capacity for the crane configuration to be used which is at least twice the weight of the climber, climbing equipment and its lifting accessories.
- The crane should be equipped with a motion control system that automatically stops the movement of the crane when the controls are released.
- The crane should have power lowering. Cranes with a free-fall facility should not be used to lower and raise persons unless the free-fall facility is locked out.
- Load-bearing hydraulic cylinders on the crane, should be fitted with a device to stop movement in case of hose failure.
- Crane movements should be gentle, and the working speed of the crane for all movements, should be limited to a maximum of 0.5 m/s.
- Wire ropes used for raising and lowering persons should have a minimum diameter of 8 mm.
- The crane safety hook must have a latch.
- The crane should be fitted with an anemometer or other device to monitor wind speeds during lifting operations.
- The rated capacity limiter/rated capacity indicator on the crane should be maintained in good working order.
- When lowering below the crane base level, a fail-safe procedure should be provided to ensure that sufficient hoist rope remains on the drum at all times to prevent the end of the rope running off the drum while lowering.
- The crane operator should be present at the normal crane control station when lifting persons.
- Proximity hazards during the lift
- Constant communication should be maintained between the arborist being lifted, the Crane Supervisor and the crane operator at all times during the lifting operation, preferably by the use of two-way radios. (See section 3.3)
- The raising and lowering of persons should not be carried out in the following conditions:

    - winds exceeding 7 m/s (25 km/h)
    - thunderstorms
    - snow, sleet, or ice
    - fog
    - any other weather conditions that could affect the safety of personnel.

- The crane, lifting attachments and climbing equipment should be subject to regular pre-use inspections and thorough examination where appropriate at specified intervals.

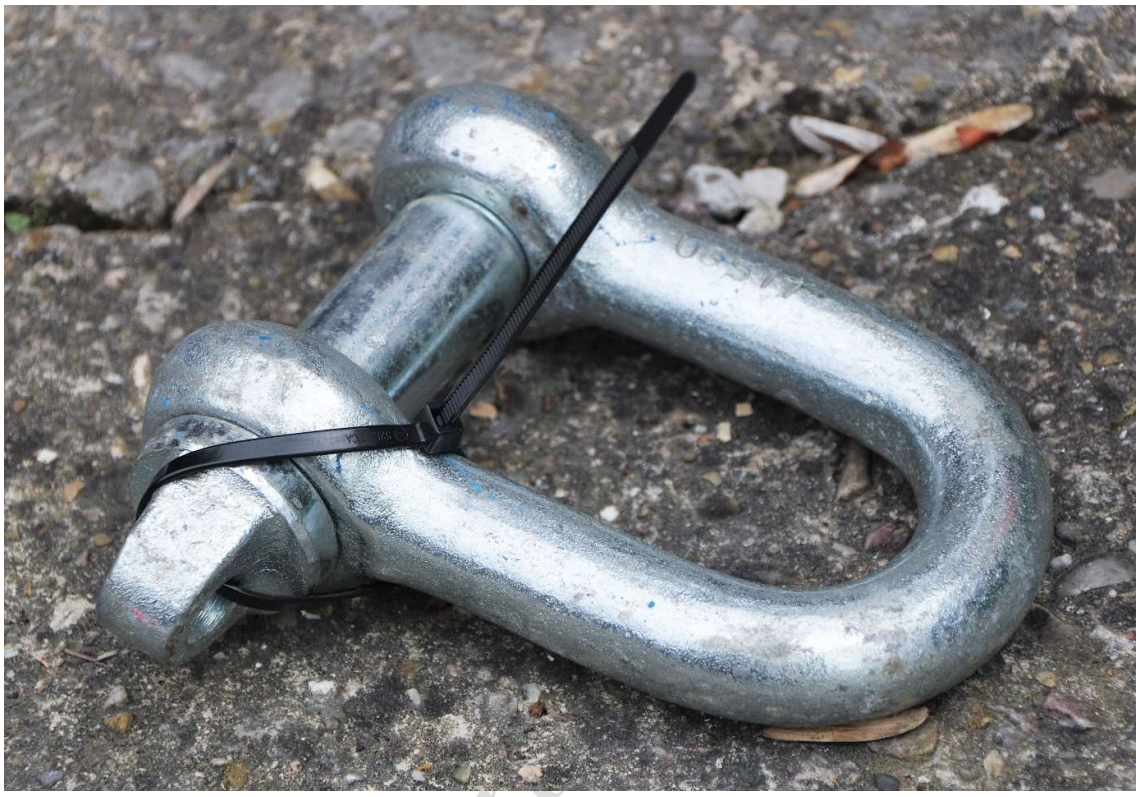
When a risk assessment has determined that the safest method of accessing the tree is by attachment of the work positioning system to the crane hook, the following controls must be in place:

- The crane hook may have sharp metal burs, it may be contaminated with oil or grease and will have lifting accessories attached. These conditions can lead to the climbing rope being damaged or becoming entangled. The climber's rope or cambium savers must not be attached directly to the hook under any circumstances.
- An oval master link should be placed on the hook before any lifting accessories and the hook should have a functioning safety catch (keeper). The climbing rope or cambium saver can then be passed through the master link. Hooks vary in size and the master link used must be large enough to fit over and move freely on the hook.

A master link on a safety hook with a latch.

Shackles, if used, must be secured to prevent accidental opening.



- The climbing rope must be bagged, and the rope bag clipped to the climber's harness to prevent trailing and possible entanglement with lifting accessories, the tree or other obstacles.

NOTE – we are awaiting an updated photograph which shows a second point of attachment over the master link. This is likely to be a flip line or positioning lanyard attached to the bridge of the harness. It would also be useful to show the chain slings also on the hook. The order onto the hook will be – master link followed by the chain sling so that the master link is furthest from the opening of the hook.

- The climbing rope and components of the climbing system must not interfere with the function of any of the crane's components or be compromised by any part of the crane.
- The climbing rope must be long enough to descend from the maximum height that the climber will be lifted on the crane during the lifting operation.
- Communication must be maintained between the climber, the Crane Supervisor and crane operator at all times (see section 2.4.2).

- Equipment used to attach the climbing system to the crane hook must be subject to regular pre-use inspections and thorough examination where appropriate at specified intervals and must not be used for any other purpose.
- The climbing system must be detached from the crane and attached to the tree when the crane is lifting tree sections.

The arborist must never be connected to the hook at the same time as a load and must never be transported to the ground with the cut section.

Site Check List

- Crown access methods have been agreed and can be justified in line with the hierarchy for work at height?
- If a MEWP is to be used, its position has been planned in relation to the proximity of the crane, drop zones and landing areas?
- If the crane is to be used to lift personnel, has the SWL been derated by 50%?

Emergency Planning Check List

- Have you planned for aerial rescue?
- Do you have everything you need, and "to hand"?
- Has the nominated rescuer(s) received training in rescue techniques and the equipment to be used?
- Does everyone understand their role and responsibility in the event of an aerial rescue?
- Can the casualty be removed from the tree safely without risk of injury to the rescuer?
- Are the tree, and the anchors available, still safe to climb?
- Have the nominated rescuer and the operatives involved practised rescue techniques at regular intervals to maintain skills?

3.5 Branch Removal

3.5.1 Estimating the Mass of Loads

When undertaking arboricultural lifting operations using a crane, the crane supervisor must ensure an adequate safety margin between the capacity of the crane and slings and the branch or stem section to be removed.

This will involve estimating the mass of the section to be cut and communicating this estimate to the crane driver.

Table 6.1 Reference log mass chart (green Oak logs, SG 1.0) in kg units

	diameter of section in cm																	
length in cm	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
20	3,5	6	10	14	19	25	30	40	50	55	65	75	90	100	115	125	140	155
30	5	9	15	20	30	40	50	60	70	85	100	115	135	150	170	190	215	235
40	7	13	20	30	40	50	65	80	95	115	135	155	175	200	225	255	285	315
50	8,8	16	25	35	50	65	80	100	120	140	165	190	220	250	285	320	355	395
60	11	19	30	40	60	75	95	120	145	170	200	230	265	300	340	380	425	470
70	12	22	35	50	65	90	110	135	165	200	230	270	310	350	395	445	495	550
80	14	25	40	55	75	100	125	155	190	225	265	310	355	400	455	510	565	630
90	16	30	45	65	85	115	145	175	215	255	300	345	400	450	510	575	640	705
100	18	30	50	70	95	125	160	195	240	285	330	385	440	505	565	635	710	785
125	22	40	60	90	120	155	200	245	295	355	415	480	550	630	710	795	885	980
150	25	45	75	105	145	190	240	295	355	425	500	575	665	755	850	955	1065	1180
175	30	55	85	125	170	220	280	345	415	495	580	675	775	880	995	1115	1240	1375
200	35	65	100	140	190	250	320	395	475	565	665	770	885	1005	1135	1270	1420	1570
225	40	70	110	160	215	285	360	440	535	635	745	865	995	1130	1275	1430	1595	1765
250	45	80	125	175	240	315	400	490	595	705	830	960	1105	1255	1420	1590	1770	1965
275	50	85	135	195	265	345	435	540	655	780	915	1060	1215	1380	1560	1750	1950	2160
300	55	95	145	210	290	375	475	590	715	850	995	1155	1325	1510	1700	1910	2125	2355
350	60	110	170	245	335	440	555	685	830	990	1160	1345	1545	1760	1985	2225	2480	2750
400	70	125	195	285	385	505	635	785	950	1130	1325	1540	1765	2010	2270	2545	2835	3140
450	80	140	220	320	435	565	715	885	1070	1270	1495	1730	1990	2260	2555	2865	3190	3535
500	90	155	245	355	480	630	795	980	1190	1415	1660	1925	2210	2515	2835	3180	3545	3925

The Appointed Person would decide upon an appropriate safety factor and unless risk assessment justifies otherwise, a safety factor of 2:1 should be considered as a standard.

For example, if the weight of the desired section is estimated to be 1 tonne, the crane must be able to lift at least 2 tonnes at the radius the crane is operating.

The maximum weight to be lifted must be specified in the lift plan by the Appointed Person and the arborist must not exceed this limit.

When dealing with branch sections, it may be more efficient to take smaller sections rather than larger sections because it is easier to process a smaller section on the ground and space might be limited. It is more difficult to estimate the weight of a branch section than a stem section due to the combined weight of the branch framework and leaves

A safe procedure for the crane supervisor to use when estimating the weight of the section to be removed and to ensure that the maximum weight specified by the Appointed Person in the lift plan is not exceeded is:

1. Refer to the log weight tables to familiarise yourself with the likely weight of the timber
2. Ask the crane operator what is the maximum weight that they can lift at the current jib length and load radius and at the designated landing point
3. Apply the 2:1 safety factor
4. Start by taking deliberately small sections as test lifts and ask the crane operator how much each of the test lift sections weighed
5. Record each lift in a log along with its weight
6. Maintain constant communication with the climbing arborist and the crane operator
7. Take progressively larger sections but do not exceed the maximum weight in relation to the safety factor

If any of the lifts exceed the estimated weight, the crane supervisor must restart the procedure to recalibrate the estimating process.

Example lift weight record:

Crane Supervisor			
Site			
Date			
	Species	**Estimated Weight**	**Actual Weight**
Lift 1			
Lift 2			
Lift 3			
Lift 4			
Lift 5			
Lift 6			
Lift 7			
Lift 8			
Lift 9			
Lift 10			

The benefits of recording the estimated and actual weights are:

- The crane supervisor and the climbing arborist will continually refine their estimate of weight as the work progresses
- The crane supervisor and the climbing arborist will be less likely to exceed the maximum weight specified in the lift plan by the Appointed Person

3.6 Connecting the Crane to the Branch and Stem Sections

Whether using chains slings or textile slings, the arborist must aim to achieve a balanced lift.

When cut, branches may move unexpectedly due to the distribution of weight and the chosen points of attachment of the slings. Assessment of sling positions should be a team effort as the ground-based arborist may have a better view of a timber section and therefore a better judgement of weight distribution, than the climbing arborist.

The arborist must accurately predict the centre of gravity of the load at ensure that it is directly below the crane hook.

There are many factors to consider such as:

- The minimum breaking strength (MBS), the manufacturers working load limit (WLL) and the safe working load (SWL) of the slings.
- The reduction in the SWL due to the configuration of the slings.
- The load line must be above the centre of gravity of the section to be removed so as to avoid pendulum swings.
- The load must not be allowed to drop when the section is cut from the tree.

Slings come in a variety of types and as discussed in section 2.4.3 – Selection of Equipment – textile items are easily damaged during arboricultural operations.

Chain slings are less prone to damage during arboricultural operations but if they are supplied by the crane company it is very likely that they will have been used to lift building materials and steel girders.

Previous lifts in the construction industry may have created sharp burs on the chain links. In addition, the chains will probably be oily and coated in abrasive stone dust from the construction site.

Slings must:

- Come with a current record of thorough examination by a competent person.
- Have manufacturers information on a permanently secured label. This information must include the name of the manufacturer, the serial number of the sling and details of the load limits.
- Be selected carefully to make sure that the safe working load (SWL) in the chosen configuration is appropriate to the estimated weight of the branch or stem section (including a factor of safety).
- Be inspected before each lift to make sure that they have not been damaged during the previous lift.

The arborist must understand that the manufacturers load limit information only applies to a new chain or sling. Any wear or damage will reduce the stated load limits.

The crane supervisor must be vigilant for the crane operator applying too much tension to the branch or stem section prior to cutting. Too much tension may compromise the SWL of the chains or slings and result in the cut section moving in an unpredictable manner.

Suitable gloves should be worn by operators handling chains and cables.

3.6.1 Connecting chain slings to the hook

The hook must be a safety hook with a latch.

The correct function of the latch must be checked after each connection.

3.6.2 Connecting textile slings to the hook

The safety hook must be inspected for sharp edges and burs prior to use with textile slings as these will damage the sling.

The hook must be a safety hook with a latch.

The correct function of the latch must be checked after each connection.

When using a single sling, it can be simply placed onto the hook

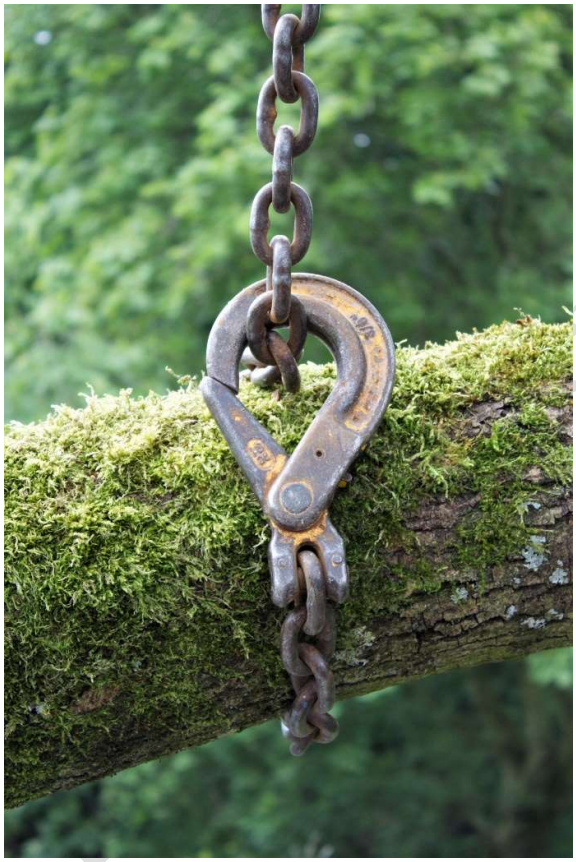
Care must be taken when using two slings because the angle between the slings has a significant effect upon the load on each sling. The angle between the slings must be kept to a minimum.

	✗ When lifting a load of 1000kg, an angle of 120º between the slings results in each sling carrying a load of 1000kg.
	✓ ✗ When lifting a load of 1000kg, an angle of 90º between the slings results in each sling carrying a load of 700kg.
	✓ When lifting a load of 1000kg, an angle of 30º between the slings results in each sling carrying a load of 530kg.

3.6.3 Connecting chain slings to the tree

A single leg chain sling can simply be choked around the branch. As the chain sling is tensioned during the lift, the links of the chain will bite into the timber and grip the branch.

Hooks must always face outwards from the crane hook.



When using a multi leg chain sling, each leg is choked around the branch.

The arborist must factor the reduction in the safe working load resulting from the use of the choker configuration because the manufacturers stated SWL is likely to be when the sling is used in the vertical configuration.

If the chain slings are used in the choker configuration, the capacities must be reduced by

20%

It is also very important to note that the legs of the chain sling may not share the load equally.

Never

- Exceed the manufacturers Exceed the manufacturers stated SWL for the configuration in use
- Shorten the chain sling by knotting the chain.
- Join the chain using a bolt.
- Hammer a chain to straighten a link.

Example Safe Working Loads of Alloy Grade 80 Chain Slings

These safe working loads were taken from the chart for **alloy grade 80 chain slings** in the North Sea Lifting Ltd, 'International Rigging and Lifting Handbook' and are included in this guide as an example.The arborist must check the safe working loads for the specific slings that are selected for use.

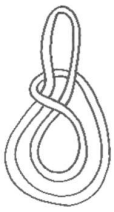
Diameter (mm)	1 leg chain sling examples	2 leg chain sling examples	3 and 4 leg chain sling examples
7	1.5t	2.12t	3.15t
8	2.0t	2.8t	4.25t
10	3.1t	4.25t	6.7t
13	5.3t	7.5t	11.2t
16	8.0t	11.2t	17.0t
18	10.0t	14.0t	21.2t
19	11.2t	16.0t	23.6t
20	12.5t	17.0t	26.5t
	Rated at 0°	Rated at 0° to 90° between the legs	

3.6.4 Connecting textile slings to the tree

A single textile sling is secured to the branch in a ‘choker’ or as known in the arboricultural industry, a ‘lark’s foot’ (choke hitch) configuration.

The lark’s foot (choke hitch) must be made on the body of a sling and never on a splice.

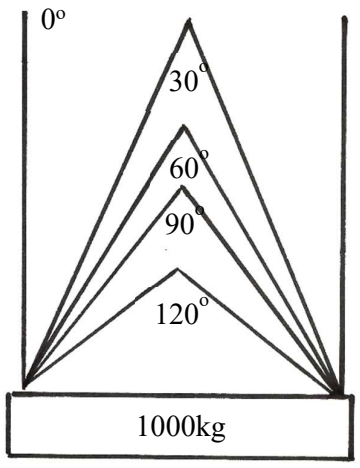
The arborist must factor the reduction in the safe working load resulting from the use of the lark’s foot (choke hitch) configuration because the manufacturers stated SWL is probably when the sling is used in the vertical configuration.

Vertical Configuration	Choker or Lark's Foot Configuration
	
1.0t 1.5t 2.0t 3.0t 4.0t 6.0t 8.0t 12.0t	800kg 1.2t 1.6t 2.4t 3.2t 4.8t 6.4t 9.6t
These safe working loads were taken from the chart in the North Sea Lifting Ltd, 'International Rigging and Lifting Handbook' and are included in this guide as an indication of the reduction in strength, the arborist must check the safe working loads for the specific slings that are selected for use.	

Never exceed the manufacturers stated load limits.

Two round slings can be used to create a 'basket' configuration, again using a lark's foot (choke hitch) to connect each sling to the branch.

The arborist must understand that the angle between the slings has a significant effect upon the safe working load of the configuration.



The following table shows the effect of the sling angle on the load applied to each sling.

Sling Angle	Load Applied to Each Sling
0°	500kg
30°	530kg
60°	580kg
90°	700kg
120°	1000kg

The arborist must ensure that the angle between the slings is kept as low as possible and as a rule of thumb, the angle must never exceed 90°. See 3.6.2

Slinging Crown Tops

The suspended crane hook should be directly over the balance point (centre of gravity) of the load or slightly opposite and away from the position of the arborist so that the load does not swing towards the arborist once it has been severed. The arborist must plan their safe position in relation to the anticipated movement of the cut section.

When removing a crown top, there are broadly two options for sling positions:

- Attaching the sling(s) to the stem
- Attaching the slings to the side branches

The arborist must carefully consider these two options in relation to balancing the lift and any decay or other structural defects in the stem or lateral branches.

The centre of gravity must be below the slings to prevent the cut section from inverting.

Slinging Lateral Sections

The suspended crane hook should be directly over the balance point (centre of gravity) of the load or slightly opposite and away from the position of the arborist so that the load does not swing towards the arborist once it has been severed. The arborist must plan their safe position in relation to the anticipated movement of the cut section.

When using one sling, the centre of gravity must be below the sling to prevent the cut section from inverting.

	✗ Slinging the section at the tip. When cut the butt will fall and the top will swing towards and may strike the arborist. Slinging at the tip may also put a falling/swinging load on the crane and this must be avoided.
	✓ ✗ A balanced lift using one sling at the mid-point of a branch. It is difficult for the arborist to estimate the centre of gravity. When cut, the butt may fall and the top will swing and may strike the arborist, or the section may invert, and the butt may strike the arborist. Movement of an unbalanced section may put a falling/swinging load on the crane, and this must be avoided.
	✗ Slinging the section at the butt. When cut the section will invert and the butt may strike the arborist. Slinging at the butt may also put a falling/swinging load on the crane and this must be avoided.

	✓ A balanced lift using two legs of a chain sling. When using multiple slings to achieve a balanced lift, the centre of gravity must be below and between the slings to prevent the cut section from inverting.

Slinging Stem Sections

The suspended crane hook should be directly over the balance point (centre of gravity) of the load or slightly opposite and away from the position of the arborist so that the load does not swing towards the arborist once it has been severed. The arborist must plan their safe position in relation to the anticipated movement of the cut section.

When using single or multiple slings, the centre of gravity must be below the sling(s) to prevent the cut section from inverting.

	Single sling on the right, the butt will swing to the right when the section is cut.
	Single sling on the left, the butt will swing to the left when the section is cut.
	Using two slings will achieve a balanced lift.

Site Check List

- A system is in place to estimate the mass of the load to be lifted which will ensure that the load never exceeds the maximum as specified by the Appointed Person in the lift plan?
- Has the lifting team agreed the system for connecting the crane to the tree sections to be removed using the chosen slings?
- The lifting team understand the effect on the SWL as a result of the angle between multiple slings and the type of attachment to the branch (choker, lark's foot, timber hitch etc)?
- The sequence of branch removal has been agreed?

3.7 Cutting Techniques

Whether the section to be removed is a branch or a length of upright stem, the arborist must aim for cuts which will enable the piece to be taken up and away from the arborist by the crane.

The suspended crane hook should be directly over the balance point (centre of gravity) of the load or slightly opposite and away from the position of the arborist so that the load does not swing towards the arborist once it has been severed. The arborist must plan their safe position in relation to the anticipated movement of the cut section.

When dealing with stem sections the arborist is very likely to be using climbing spurs and a flip line and so will not be able to significantly change their position. The position chosen by the arborist must allow the cut section to be lifted away in the opposite direction and never over the arborist's head.

Cut selection must take account of the characteristics and condition of the tree. Ash for example is prone to snapping whereas Oak hinges well. A tree which is diseased is very likely to behave differently to a healthy tree.

The arborist must also account for any decay or suspected decay in the timber when selecting the cutting technique.

3.7.1 Step Cuts

Step cuts can be used on both vertical sections and lateral sections.

The arborist must decide, based upon the weighting and position of the section and the position of the slings whether the step cut should be inboard, outboard, top and bottom or side to side.

The chainsaw must have a guidebar which is longer than the full diameter of the branch so that the cuts can be made in one operation.

The position of the overlap on upright sections should correspond with the intended direction of movement of the section once severed. The overlap should not be so big as to require excessive force to remove the section by the crane. This can result in sudden an unpredictable movement of the section and shock loading of the crane and lifting accessories.

Tension and compression can be difficult to read when dealing with complicated sections. Cuts may need to be part completed and the tension and compression tested using slight raising, lowering or sideways movement of the crane.

Once the cuts are made, the arborist must move away from the section so that the crane can snap the section free.

Plastic wedges can be useful in preventing the cut from trapping the saw when working on upright sections. Several wedges which have been drilled and fitted with lengths of cord can be suspended from the harness so that when the section is lifted away the wedges simply fall back into their place on the harness.

3.7.2 Sink Cut and Back Cut

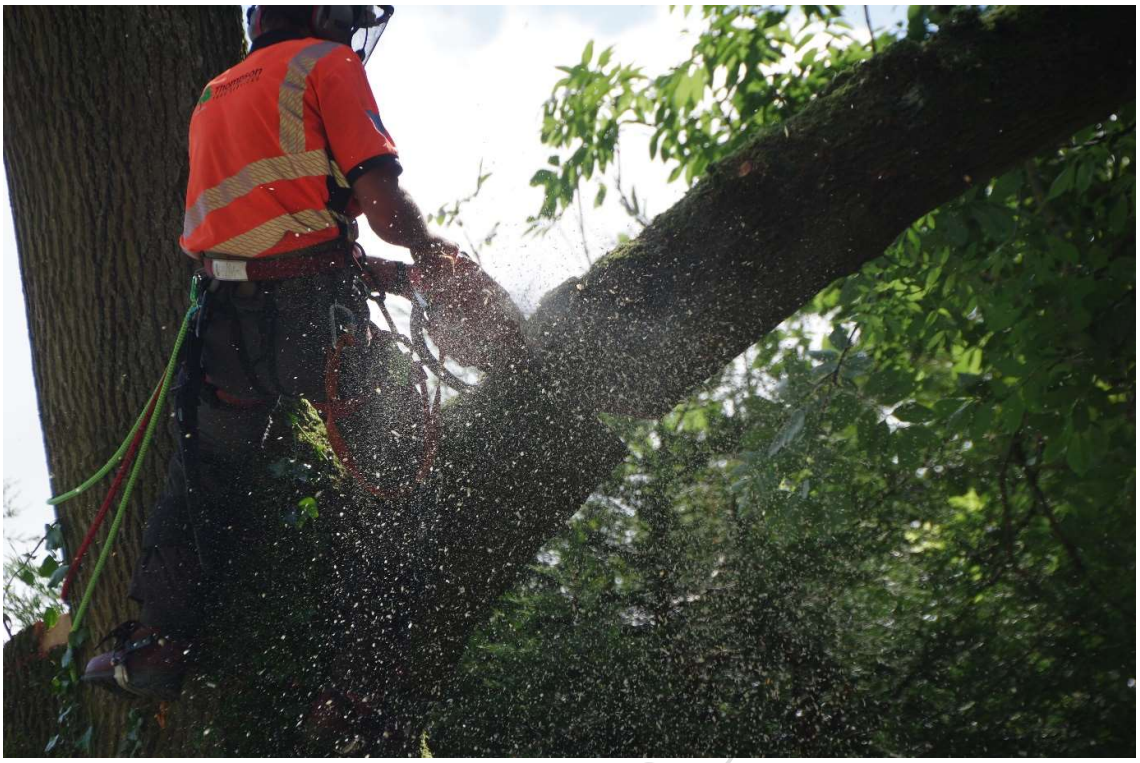
In a similar way to felling a tree, the arborist would place a sink cut on the underside of the section in the direction assessed to be where the section would naturally fall. A back cut is then made slowly so that the section 'relaxes' onto the slings so that once severed it can be taken up and away by the crane.

A sink cut can be placed on the top of the section so that when the back cut is made on the underside, the crane can lift the section into a vertical position before it is severed and taken up and away.

Care must be taken to ensure that the section does not drop once severed resulting in a dynamic load on the crane.

The chainsaw must have a guidebar which is longer than the full diameter of the branch so that the cuts can be made in one operation.

Placing the sink cut.



Placing the ‘felling cut’.

The completed cuts

The section ‘relaxes’ slowly onto the slings, the hinge breaks and the section is taken up and away by the crane.

3.7.3 Straight Through Cuts

Straight through cuts, as the name suggests, are cuts that are made straight through the branch or stem section.

The chainsaw must have a guidebar which is longer than the full diameter of the branch so that the cuts can be made in one operation.

Compared to step cutting or using a sink cut, straight through cutting results in less control of the section at the point where the weight is transferred to the crane. The section may tear off creating side loading or a swinging load both of which must be avoided.

On lateral sections, if the slings are loaded, the tension and compression in the branch can be opposite to what the arborist would normally expect during rigging operations i.e. the top of the branch may be under compression and the underside, tension.

The arborist also has less opportunity to move away from the severed section before it is lifted up and away.

Plastic wedges can be useful in preventing the cut from trapping the saw when working on upright sections. Several wedges which have been drilled and fitted with lengths of cord can be suspended from the harness so that when the section is lifted away the wedges simply fall back into their place on the harness.

Once the section is severed from the tree the arborist must communicate with the Crane Supervisor and crane operator to start lifting.

The crane must not be used to tear the remaining fibres following cutting. If a clean cut has not been achieved, the arborist must return to the section to complete the cut.

The arborist must retreat into a safe area away from the section being lifted.

Site Check List

- The arborist working from the MEWP, the personnel carrier or using arboricultural climbing and work positioning equipment understands the cutting techniques to be used?

3.8 Moving Cut Sections to the Landing Area and Disconnecting

Once the arborist has cut the section from the tree it should not swing significantly, drop or spring upwards. These movements are an indication of incorrect placement or tension in the sling(s). Ideally the section should move slightly away from the arborist.

The crane operator should not raise the cut section unnecessarily or allow it to remain suspended. The section must be taken away from the arborist as soon as possible.

When a load must be handled near personnel, extreme care should be exercised, and adequate clearances allowed. The route of the load should be planned to avoid lifting over persons.

All personnel must be instructed to stand clear of the load being lifted and to remain clear until the load comes completely to rest in the landing area.

When lifting a load from a stack, all personnel should be instructed to stand away from the stack in case adjacent materials or objects are displaced.

Where possible, lifting of loads over highways, railways, rivers or other places to which the public have access should be avoided. If this is not possible, permission should be obtained from the appropriate authority and the area kept clear of traffic and persons.

The hoist rope and hook block must be vertical at the start of and throughout the lifting operation.

Care should be exercised by the crane operator to avoid shock loading or side loading on the jib of the crane. Jibs are not designed to arrest a falling load or for side loading.

Loads should always be lifted gently, and crane motions should be operated smoothly to avoid loads swinging (a swinging load increases the overturning moment of the crane).

The crane must not be used to drag any load along the ground with the hoist rope or hook out of the vertical position.

3.8.1 Tag Lines

Tag line(s) should be used where necessary:

- To enable operators to maintain a safe distance from the load
- To direct the load into the landing area
- When the load presents a wind-catching area
- If there is a possibility that the load could come into contact with any other object during the lifting operation
- To stabilise the load and prevent it from spinning
- To orientate or align the load for landing

Persons holding tag lines must not wrap a line around any part of their body or attach a tag line to any structure. The tag lines should not be knotted or looped.

Tag lines should NOT be used if they create a safety hazard. This might include:

- Insufficient clearance for operator controlling the tag line to keep out of the drop zone or a slew area with restricted clearance
- Areas where there is not a clear walking route for the operator

If positioning and load control is required but the use of a tag line would present a hazard, then consideration should be given to alternatives such as push/pull poles.

If using a tag line, the Crane Supervisor must specify how many lines are to be used and how they are to be attached to the timber section.

Tag lines are most effective when they are horizontal. The higher the load and more vertical the tag line, the less effective it will be. Small branches and deadwood invariably fall from a cut branch while it is being transported. Long tag lines allow for a nearer to horizontal pull and allow the operator to stay clear of the fall area below the load.

Care should be taken that tag lines cannot become fouled during use.

3.8.2 Placing the cut section on the ground

When a cut section comes to rest in a position on the ground, the slings may be trapped beneath the load making it very difficult for the ground worker to release them ready for the next lift.

Slings may be damaged by crushing and abrasion.

Bearers should be used in the landing area to make it easier to remove the slings and to prevent damage. Lengths of branch sections may be used as bearers.

3.8.3 Placing the cut section directly onto the timber transport vehicle

Timber transport vehicles would include:

- Roll on / roll off skip
- Pin sided trailer
- Tipper truck
- Agricultural trailer

If the crane is used to load a section directly onto the timber truck, the crane supervisor must ensure that the section has completely come to rest on the vehicle and is stable before the slinger approaches the section.

It would not be acceptable for the slinger to await the load from a position on the load area of the truck due to not being able to achieve a safe distance from the load being lowered. The slinger might find themselves in a position beneath the load or they might step backwards and fall from the bed of the vehicle. Tag lines could be used to direct the load.

The slinger must be clear of the timber transport vehicle before the crane operator lifts the slings or chains away from the load because the movement might dislodge the timber stack.

Sections must not be landed directly into the wood chipper.

3.8.4 Disconnecting the cut section from the crane

Operators working on the ground must always maintain awareness of the situation on site.

From the point that the section is cut from the tree the ground workers must visually follow the section on its journey to the landing area and ensure that they and all others stay well outside the drop area beneath the moving suspended load.

As the section is placed on the ground, the bearers or onto the timber transport vehicle, the ground workers must aware of the potential for the section to roll and for branches to break under tension.

Operators must not approach the cut section until it has come completely to rest on the ground and the slings are obviously slack. Where possible, slings should be disconnected before groundworkers begin to process the tree section.

Branches and other snags on the cut section may be preventing the sling and crane hook from hanging centrally and this might result in the hook swinging once the sling is disconnected. Operators disconnecting slings must ensure that they walk the hook to its neutral hanging position rather than letting it swing because it might strike another worker or come back to hit them.

Suitable gloves should be worn when handling chain slings or the load line. There could be sharp burs on the chain slings and broken strands of wire on the load line.

Site Check List

A landing area has been agreed and prepared with bearers if necessary?
The use of tag lines has been discussed and a plan agreed?

Glossary

Appointed Person

The person appointed by the employing organisation to plan and have overall control of the lifting operation.

- Responsible for planning the safe system of work
- Responsible for the selection of an appropriate crane
- Produces the Lift Plan

An appointed person must be qualified and competent in the type of lift to be undertaken.

Arborist Ground worker

- Directing the crane operator to ensure safe movement of the crane and tree section.
- Controlling the movements of the tree section if required using a tag line.
- Attaching a tree section to the crane.
- Detaching the tree section from the crane.

Centre of Gravity

The point where the mass of the section is concentrated. This point will always attempt to move into the lowest position.

If supported at the centre of gravity, the branch will remain in a balanced position.

Climbing Arborist

- Directing the crane operator to ensure safe movement of the crane and tree section.
- Attaching and detaching the load to and from the crane.
- Cutting the tree section using appropriate techniques to avoid shock loading and side loading the crane jib

Construction Plant Hire-Association (CPA)

A trade association representing the UK plant industry.

The crane company may use the **CPA Model Conditions for the Hiring of Plant** to define the agreement between the arboricultural contractor and the crane company for crane hire events.

The crane company may use the **CPA Contract Lifting Services Conditions** to define the agreement between the arboricultural contractor and the crane company for contract lift events.

Crane Operator

The operator of the crane.

- Operating the crane in accordance with the manufacturer's instructions and within the safe system of work, as defined in the Lift Plan.

Crane Supervisor

The person who controls the lifting operation on site if the Appointed Person is not on site.

- Responsible for ensuring that the operation is undertaken in accordance with the safe system of work as defined in the method statement.
- Authority to stop the work if there any safety concerns.

Crane Coordinator

The person responsible for planning the sequence of operations on a site where more than one crane is being used.

Complex Lift

A category of lift.

The complexity of a lifting operation depends on the hazards associated with the load, the path that the load is lifted along, the lifting equipment, and the environment in which the lift is being carried out.

In accordance with BS7121-1, to enable lifting operations to be planned, supervised and carried out effectively, lifts should be categorized into basic, intermediate or complex lifts

Therefore, in accordance with BS7121-1, all lifts in tree work operations using a crane should be categorized as complex lifts.

Complex Load

A complex load has the following characteristics:

- Unknown weight
- Unknown centre of gravity
- No specifically engineered lifting points such as eye bolts
- Unknown structural integrity of the piece to be lifted

Hoist

A device used for lifting or lowering a load by means of a drum around which rope or cable wraps.

A hoist is designed to lift a load vertically or up a steep incline.

A winch is designed to pull a load horizontally over a slightly inclined or level surface. A mechanical device that is used to pull in or let out the tension of a rope or cable.

Hook Block

The assembly to which the hook of the crane is attached. It typically consists of a steel enclosure housing a number of pulleys.

Larks Foot

A knot used to attach a sling to a branch. Also known as a choke hitch.

Latch

The latch is the sprung gate on the safety hook. It might sometimes be referred to as the ‘keeper’.

Lay Down Area

The area designated for landing and processing tree sections.

Lifting Capacity

The crane selected should have a rated capacity for the crane configuration to be used which is at least twice the weight of the load and lifting accessories);

Lift Radius

The horizontal distance between centre of the slew ring of the crane and the vertical centreline passing through the centre of gravity of the load.

Lift Height

The maximum height to which the crane must lift the cut section.

Lift Plan

This normally consists of at least the risk assessment, method statement and any relevant drawings.

LOLER

The Lifting Operations and Lifting Equipment Regulations place duties on people and companies who own, operate or have control over lifting equipment.

All lifting operations involving lifting equipment must be properly planned by a competent person, appropriately supervised and carried out in a safe manner.

All equipment used for lifting should be fit for purpose, appropriate for the task, suitably marked and, in many cases, subject to statutory periodic 'thorough examination'.

Unless there is an 'examination scheme' specifying other intervals, thorough examinations should be conducted every:

- 6 months, for lifting equipment and any associated accessories used to lift people
- 6 months, for all lifting accessories
- 12 months, for all other lifting equipment

Minimum Breaking Strength (MBS)

The load above which an item of lifting equipment might fail (could also be called Minimum Breaking Load).

This value is established by the manufacturer using sample testing.

Method Statement

Part of the lift plan detailing the safe system of work.

MEWP

Mobile elevating work platform.

Risk Assessment

Part of the lift plan detailing the hazards, evaluating the risk and specifying controls.

Safety Hook

The hook with a safety latch on chain slings.

Shock Loading

A sudden and drastic increase in load in a system.

Side Loading

Occurs if the load is to either side of the boom tip.

Side loading affects the cranes capacity.

Slinger Signaller

A person directing crane movements.

The role of the slinger signaller is to connect lifting accessories to the hook and to provide instruction in the form of signals or verbal communication to the crane operator.

Safe Working Load (SWL)

The maximum load which any item of lifting equipment should be subjected to under particular service conditions as specified by a competent person.

The SWL therefore may be lower than the WLL.

All equipment falling within the LOLER criteria must be given a SWL. Only the manufacturer or a competent person can apply this to an item.

Why do we need SWL? Lifting equipment should not be loaded in excess of its SWL in order to guarantee its MBS for the duration of its determined service life. Rope is given a higher factor of safety than metal items due to deterioration and wear over time. For example; minor cuts, abrasions, glazing, dirt and age.

Tag Line

A tag line is a rope attached to a lifted load for purposes of controlling load spinning and pendulum movements.

Tensile Strength

As for MBS

Thoroughly Examined

See 7121 re crane examinations

The pre-use checks and thorough examination of cranes used for lifting persons should be carried out in accordance with BS 7121-2-1:2012, Clause 12.

Working load limit (WLL)

The maximum load an item of lifting equipment is designed to raise, lower or suspend, not accounting for particular service conditions that may affect the final rating of the equipment as specified by the manufacturer.