# National Unit specification

## General information

## Unit title: Cable Crane Systems (SCQF level 5)

## Unit code: H69V 45

**Superclass:** SK

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**Version:** 01

## Unit purpose

This Unit will provide the learner with the knowledge and understanding of cable crane systems and their role in the harvesting of timber from mountain and other steep ground areas. It will also establish the associated practical skills which will empower the learner to maintain and operate cable crane systems as part of a timber harvesting operation.

## Outcomes

On successful completion of the Unit the learner will be able to:

1 Maintain the tools, equipment and machinery associated with cable crane systems.
2 Participate in the setting up of a cable crane system.
3 Operate a cable crane to extract timber as part of a harvesting operation.

## Credit points and level

1 National Unit credit at SCQF level 5: (6 SCQF credit points at SCQF level 5)

## Recommended entry to the Unit

While entry is at the discretion of the centre, learners would normally be expected to have attained one of the following, or equivalent: Practical Skills at SCQF level 5 in Forestry or other land use areas (eg D900 10 *Tractor Operation 1* or equivalent).

## National Unit specification: General information (cont)

**Unit title:** Cable Crane Systems (SCQF level 5)

## Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes for this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

## Context for delivery

If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

## Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**.

## National Unit specification: Statement of standards

## Unit title: Cable Crane Systems (SCQF level 5)

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

## Outcome 1

Maintain the tools, equipment and machinery associated with cable crane systems.

### Performance Criteria

(a) Carry out maintenance, checks and repairs on wire ropes engaged in timber extraction by cable.
(b) Carry out routine maintenance of winches.
(c) Carry out routine maintenance of power base machinery used in cable crane system.
(d) Work safely within industry best practice guidelines.

## Outcome 2

Participate in the setting up of a cable crane system.

### Performance Criteria

(a) Set up the power base Unit for extraction of timber by a cable crane.
(b) Secure the power base Unit and wire rope support infrastructure.
(c) Set up cable crane wire rope system for timber extraction.
(d) Work safely within industry best practice guidelines.

## Outcome 3

Operate a cable crane to extract timber as part of a harvesting operation.

### Performance Criteria

(a) Attach chokers in the correct sequence for efficient extraction.
(b) Use correct signalling protocol for safe extraction of timber.
(c) Operate base Unit to extract timber safely to roadside or for secondary extraction.
(d) Work safely within industry best practice guidelines.

## National Unit specification: Statement of standards (cont)

## Unit title: Cable Crane Systems (SCQF level 5)

### Evidence Requirements for this Unit

Evidence is required to demonstrate that learners have achieved all Outcomes and Performance Criteria.

**Outcome 1 — The demonstration of the maintenance of tools, equipment and machinery used in the operation of a cable crane system**

Evidence should consist of:

- Routine maintenance of power unit according to manufacturer's specification and records kept of each occurrence through observation and log keeping. Each learner should keep a log of their activities and the maintenance schedules.
- Inspection, maintenance and repair of wire ropes including wire rope splicing appropriate to the size of rope and its function in the system and performance recorded through observation checklist and examples of maintained ropework. Each learner should provide evidence of correctly maintained wire ropes.
- Maintenance of pulleys, tower, winch drums and retention and anchor devices and each learners performance recorded through check lists and observed machine testing.

**Outcome 2 — The demonstration of the practical skills required in setting up a cable crane system within an appropriately risk-assessed working environment**

Evidence should consist of:

- Setting out an accurate extraction line to fit the terrain; to maximise production and to minimise set up times. Learner performance should be recorded through observational checks and practice runs.
- Setting up and aligning power base to extraction line and spar and anchor trees both head and tail. Learner performance should be recorded through best practice checklists and measurement of straight extraction line and angles of anchor ropes.
- Rigging winch tower, anchor, spar and support trees identifying ropes and suitable anchor points Learner performance should be recorded through observational checklists and test runs of cableway system.
- Assembling and installing carriage in the cable way system. Learner performance is recorded through observational checklists and running of carriage in system demonstrating correct practice.
- Running out all ropes in the correct order to set out the system. Learner performance is assessed through best practice observational checklist and correct set up of system.

## National Unit specification: Statement of standards (cont)

## Unit title: Cable Crane Systems (SCQF level 5)

**Outcome 3 — The demonstration of the operation of a cable crane to extract timber products**

Evidence should consist of:

I Controlling the power unit and winch operating speed in the haul back and haul in phases of the operation. Learner performance should be assessed by observed practical exercise and recorded by observational checklist.

II The 'breaking out' of timber loads from the site and that each tree is chokered in the correct sequence. Learner performance is recorded through observation checklist.

III Extracting timber loads whilst minimising stress loading of machine, wire ropes and winch components. Learner performance should be assessed by observed practical work and recorded on industry best practice checklists.

IV Adjusting the extraction of timber in relation to site and crop conditions and circumstances. Learner performance should be assessed through observed adjustments to extraction methods depending on site and crop conditions and recorded by best practice checklist.

V Communicating as part of a winch team as per industry best practice and following agreed communication systems in both audio and visual signalling. Learner performance should be assessed by tutor observation of inter team communication and recorded by use of a best practice checklist.

## National Unit Support Notes

## Unit title: Cable Crane Systems (SCQF level 5)

Unit Support Notes are offered as guidance and are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

## Guidance on the content and context for this Unit

This Unit is aligned to National Occupational Standards:

LANTw 44 Choker Timber in Wire Rope Work
LANTw 45 Extract Wood Products by Cable Crane

This Unit is designed to help in re-establishing technical knowledge of the practical operation of cable crane systems.

The use of cable crane systems in Great Britain has been in decline since the 1970s because of the relatively high cost and low productivity of the systems when compared with wheeled skidders and forwarders. In mountain or other steep ground areas this has led to the decline in thinning operations and a loss of productivity in higher value timber because of this lack of selection.

With a change in forestry policy and a developing shortage of resource for established markets and developing markets, particularly for renewable energy there is a requirement to utilise more fully the growing timber resource of the steeper areas of forests. In addition the increased price in timber makes such operations potentially more economic. As a consequence of the decline in the use of cable crane systems and the reliance on forwarding as the main method of extracting timber there has been a loss of technical development and skilled personnel in Great Britain.

The history of cable crane systems development and use within Great Britain should be explored, from the basic Isachsen system of the 1960's to the introduction of the larger more technically advanced European cableway systems being adapted for us in the forest conditions of Great Britain.

The terminology exclusive to cable crane systems should be known and the component relationships clearly understood. Essential terms to be understood include: Spar and anchor trees, skyline, choker, haul-in rope, haul back rope, locking and non-locking carriages, straw line, tower, set-up, landing area, primary and secondary extraction, off-set extraction, fanning of racks

## National Unit Support Notes (cont)

## Unit title: Cable Crane Systems (SCQF level 5)

The terrain features that determine a cable system as the preferred choice of extraction method should be understood with the application on steep ground which excludes any wheeled or tracked vehicle use supplemented with the understanding that cable based systems are much more environmentally sensitive than wheeled or tracked machines and where ground damage is a significant issue cable based systems are preferable even on reasonably flat sites.

The crop characteristics required for efficient and cost effective extraction by cable crane systems should be analysed and understood by the learner. This should include:

- individual tree size related to efficiency and safe working load for the system being used.
- the critical relationship between the volume to be extracted and the set-up time for the system in each movement of the machine.
- the overall volume to be extracted.

Site characteristics that place limits on the efficiency of the system should be identified and evaluated with potential solutions understood, eg storage space at roadside maybe severely restricted because of the steep terrain and narrow landing strip provided by the forest road. Solutions to such a restriction might be the deployment of an excavator based machine off road with secondary extraction. With some tractor based machines it might be possible to utilise off-set extraction, eg Chapelhall. In other cases it might require a system of hot logging which will involve a coordinated removal of extracted material to continuously provide free space for subsequent extraction.

The use of a site layout that minimises the number of set-ups, eg fanning can lead to cost savings despite the increase in dead ground because of repeated travels over the same previously cleared area.

The steepness of the terrain will generally involve whole tree extraction whereby motor manual felling is used to provide whole trees for extraction to roadside or a suitable location for processing to specification.

Whole tree processing at roadside leads to a concentration of residues which may require further processing or dispersal. The risks of environmental pollution from such residues should be understood and the precautionary measures identified.

Health and safety restrictions and limits on sites must take account of the area at risk from 100–400 metres of active wire rope. This is particularly true when related to live electricity wires. The location of much of mountain forestry means that electricity supply lines frequently conflict with extraction areas and routes. The strictest adherence to buffer zones and the industry best practice are essential to ensure safe working. Extra care should be taken in wet weather because of the danger of arcing.

The presence of electricity power lines could determine the direction of extraction; the type of machinery to be used in order to reduce operating risks. Adherence to industry guidelines and regulations with regard to working in proximity to electricity lines is of prime importance.

## National Unit Support Notes (cont)

## Unit title: Cable Crane Systems (SCQF level 5)

Radio reception can be a limiting site factor in that mountain logging areas have patchy radio reception and in areas of poor reception this can lead to a slowing of the communication process as the chokerman and winch operator make sure there commands are accurate. This may involve a return to hand signals rather than radio or mobile phone contact.
Only trained personnel should operate cable crane machinery

**Outcome 1**

Wire ropes must be the correct specification for the purpose they serve and this will vary depending on which system is being operated. The factors to be considered are:

- Length which will be dependent on the drum size of winch and diameter of the rope Haul back ropes will be of smaller diameter than haul in ropes because the haul in rope has to reach the extent of the extraction rack and return to the drum on the machine. It also takes less strain than the haul in rope and therefore a lighter more flexible rope may be used without compromising the safety of the operation.
- Diameter which will vary on function with tensioned skylines having a greater diameter than winch drum room.
- Tensile strength should be in the range of 180–200 kgf/mm$^2$

In order to ensure correct maintenance of the wire ropes used in cable systems it is essential that the construction of wire ropes is understood. With the continuous friction generated in the system because of the type and nature of the other components and the terrain features, wear and abrasion are constant factors to be monitored in the checks and maintenance of wire ropes. In order to have a rope resistant to abrasion but still flexible to spool properly on the drums and be worked relatively easily 6 strand ropes with each individual strand made up of 19 smaller strands is commonly used in Great Britain.

The core of the rope can be made of fibre wire or wire rope Fibre core gives flexibility as well as providing a reservoir for maintaining the oil for protection against rust and loss of flexibility in the rope. Wire core and wire rope core provide greater resistance to crushing and pressure damage from poor quality tensioning of the rope. Loose rope coils on the drum is a major cause of crushing and distortion of the wire ropes and must be prevented wherever possible.

The lay of the rope is another important feature in ensuring the ropes remain consistent in shape and performance. This refers to the way in which the individual wires run in relation to the individual strands of the rope. For cable systems the best combination is for individual wires to run opposite to the direction of wind of the strand ie the individual wires are twisted together clockwise and the strands anti-clockwise. This allows for greater resistance to untwisting or kinking.

The opposite lay is known as Lang's lay wherein the individual wires and strands are laid in the same direction. This type of rope allows for easy working and greater flexibility but is more prone to kinking and untwisting. The rope commonly used in cable systems in forestry is known as right hand ordinary lay.

## National Unit Support Notes (cont)

## Unit title: Cable Crane Systems (SCQF level 5)

### Routine care and maintenance

It is essential that continuous monitoring of the condition of the ropes is carried out in order that preventative maintenance can be carried out without risk of system failure which could result in injury and certainly to loss of productivity.

Rope damage can be caused by poor set up so it is essential that ropes, pulleys and winch drums are properly aligned to ensure no excessive friction is caused by sharp angled running of the rope. Abrasion damage can be caused by the haul back rope running along the ground and contacting sand or rock. Care must be taken to provide 'runners' for the haul back rope to ensure abrasive wear is kept to a minimum.

Over time through normal operations there will be wear in the wire ropes. The reduction of the diameter of the outer individual wires by a third will result in that rope having to be replaced.

- Ensuring that correctly tensioned ropes are feeding onto and off the drums is an essential skill to prevent spooling and loose coiling which is then subjected to pressure as tensioned rope is wound onto loose coils. The winch operator must continuously check the ropes for loss of tension and crushing damage. Regular re-winding of the whole length of rope is an essential maintenance task for the winch operator to prevent crush damage from loose spooling.

Regular oiling of the running ropes is an essential maintenance action which ensures that the rope does not dry out and lose flexibility and that the oil acts to resist water entry into the core and thus prevents rusting starting from the centre of the rope. Rusting because of water entry is a major cause of rope failure.

### Safety Checks

- Ensure that a Test Certificate has been provided on purchase of the winch ropes and that this is retained.
- Rope diameter and lay being used comply with the winch manufacturers specifications
- Check that only ropes of the same size and construction are joined together.
- Pulley sheaves, rollers and other equipment for guiding ropes should be compatible with the dimension of the rope and they should be kept in a serviceable condition to avoid damaging wire ropes.
- Hauling ropes must be securely fastened to winding drums. At least three full turns should remain on the drums at all times. Length indicators maybe used to signal proximity to the end of the rope.
- Splicing, soft eye loops or swaging should be used to terminate ropes. Knots should not be used even for a temporary repair.
- Check daily for visual signs of rope deterioration such as excessive wear, broken wires or strands, distortions and corrosion. Monitoring of rope condition is an ongoing process in order to ensure early intervention in rope maintenance. Repair or replace broken or damaged ropes without delay.
- Replace all ropes when their nominal diameter falls below 90% of the original.
- Broken or badly frayed ropes must be joined by adequate splicing or be replaced. Knots greatly reduce the strength of the ropes and must not be used.

- Broken or damaged skyline ropes must be repaired at once. The splice must be as long in metres as the actual diameter in millimetres (eg with 13 mm skylines the splice must be 13 m long). In hauling ropes, a 3 m splice is adequate.
- Damaged or broken anchor ropes must be replaced.
- Repairs to the middle of a rope require a long splice which is approximately 1 m long for every millimetre of rope diameter. Operators have to be trained repair ropes with a long splice and it can take two men up to 4 hours to carry out this task. Various publications on rope splicing are available from rope manufacturers. A long splice reduces the strength of a rope by approximately 10%. Skyline cables can be spliced safely with a long splice, but it should be inspected weekly.

It is important that operators continually update their knowledge of ropes and rope repairs to ensure both safety and cost efficiency are maximised.

Wherever possible rope repairs are carried out under workshop conditions but the nature of the operations and the machinery involved will mean that most rope maintenance and repairs will take place on the working site. It is essential therefore that accompanying each machine there is a tools and equipment box that can meet the general needs for repair and maintenance.

In addition to wire rope repair and maintenance the operators of the winch should be able to carry out routine maintenance and minor repairs to the winch and the power unit.

It is essential that the maintenance schedules set out in the manufacturer's handbook or training manual are adhered to and all adjustments to both winch and power unit are as specified. The correct adjustments are made to the winch brakes and any element exposed to wear replaced when required or recommended.

The power unit should meet the requirements of current legislation, eg PUWR regulations

Essential to learning is the practical maintenance and repair of all the components of the cable system and this should be done not only in the controlled environment of classroom and workshop but also in the field.

**Outcome 2**

**Planning, Preparation and Layout of racks**

Cable crane systems are some of the most difficult systems to work cost effectively because of the complexities of the systems, the severity of the terrain, the amount of unproductive time and the difficulties in handling high volume concentrations of timber. It is essential therefore that the operation and site layout are planned to ensure maximum efficiency.

Well sited and laid out racks are essential for safe and efficient cableway working. Rack layout requires good operational knowledge particularly about the limitations of the machine and the system. Poor rack layout will significantly increase unproductive time, reduce the productive capacity of the system and can lead to increased damage to ropes and machine components.

## National Unit Support Notes (cont)

## Unit title: Cable Crane Systems (SCQF level 5)

Poor racking in first thinning's will have a negative impact upon every subsequent operation.

**Preparatory survey**

With the development of more sophisticated IT based mapping and information systems preliminary desk based planning can be used to establish a framework for the laying out of the site. Factors to be considered and identified in this phase are the first stage is a physical survey of the area which should always be carried out prior to the felling operation in thinning and clearfell operations. It should be carried out by a supervisor with sound knowledge of the equipment and working methods. Factors to be considered are:

- Environmental restrictions within the wider landscape and within the site, eg conservation constraints, water courses.
- Presence of live electricity supply lines. These will place a significant restriction on operations of cable systems and may determine no-go areas, direction of extraction and increased risk assessment and safety measures.
- Natural features or barriers that will determine boundaries of racks and their associated extraction catchment areas.
- Location of obstacles such as cliff faces within rack lines that will prevent extraction.
- Water course that will require buffer zones to reduce the risk of pollution.
- Stacking space both at roadside and off road shortage of which is a major limiting factor for efficient extraction and removal.
- Identify areas that could be most suitably converted into stacking space, road bends as exits that would allow greater roadside space.
- The minimum volume required to justify set-up costs over the distances to be extracted can be calculated from stand data. This influences decisions on the thinning interval and possibly rotational age for clearfell.
- Areas where racks may converge or where dead ground is such that volumes to be extracted are uneconomic.
- Conditions within the stand will determine the methods to be used to make the operation as cost effective as possible, eg delayed thinnings may be so difficult to take down that thinning type may have to be altered from selective to mechanical or a combination of both.
- Availability of spar, anchor and support trees.

**Rack Layout**

Any IT based preliminary planning for site layout must be followed up by on site survey which checks the draft plan against site conditions and characteristics. With the more reliable availability of GPS receivers that work more effectively under canopy this information can be recorded and can be both downloaded and uploaded to update the site and operational plan. Rack layout should be done before the first thinning and it is essential to plan the rack layout to enable the cableway to operate at maximum efficiency.

## National Unit Support Notes (cont)

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Rack layout should follow this sequence:

- Select the direction and density of the rack system dependent on the properties of the site and the considerations noted above. For greater efficiency a rectangular layout of parallel racks close to the capacity of the winch is most desirable. Where ground is particularly problematic set out your framework of major extraction racks on your concave slopes — the most efficient and easiest for cable systems — and then cover the remaining ground with as effective a length of rack as the site will dictate. Remember that short racks with small volumes will have the same set up time as major racks with high volumes.
- Fanning of racks is used when roadside space is at a premium and where a number of racks fan out from the same landing area. This is an inefficient system with considerable areas of dead ground at the short and most efficient extraction distance closes to the winch.
- Set out the racks, after their position had been confirmed by IT mapping and on the ground survey marking roadside or the start of rack trees. Fluorescent plastic tape is best for this, as corrections are easier and with less risk of confusion through multiple paint marks or axe blazes. Racks must be straight and in order to ensure this they must be set out accurately with no deviations. This can be done in a number of ways:
  - By the use of ranging rods aligned by eye which are then stepped up the hill until the extent of the rack is reached. Trees directly on the line make off-setting from the centre necessary which can result in deviations from the straight line. This can have a serious impact on the straightness of the racks over long distances with as a consequent inefficient extraction, increased standing crop damage, increased risk of accidents and increased wear and tear on the system.
  - Using a compass. The same difficulties with trees in line of vision occur with compass alignment as with ranging rods.
  - Coloured racking lights were developed as a system of laying out racks particularly for dense Sitka Spruce harvesting sites on steep ground. With three lights it is possible to align at least one of the lights when the central light is obscured. This is still a very accurate way of setting out racks.
  - GPS direction pointers can be used in the best of conditions but the level of accuracy is still not sufficient to ensure straight racks.
  - By felling the rack. The feller is given the start point and the correct direction initially and can keep the rack straight in line with ranging rods, set up at roadside to start with. This does not allow for the need to modify the original direction because of unforeseen obstacles or obstruction to extraction.
- Select spar, anchor and any necessary support trees for this and future operations. Ideally this should be done before the first thinning is marked and with the IT based plan in mind. All support trees should be selected for their wind firmness and ability to stand the strains of side hauling. They should all be marked clearly to ensure that they are retained during further operations. Spar tree should be at least 20m in from the outside edge of the stand to afford it some protection from wind.
- Wind blow or damage of support trees in cable systems is a risk and wherever possible alternative trees are identified which would ensure the least modification to the existing rack for future operations.

- Support points on the rack can be selected by an experienced crew if they have been briefed on the size of spar, support and anchor trees required. When partially or fully-locking carriages are used, the load will be fully suspended on concave profiles, and the system must be designed to cope with greater loads.
- Mark the centre line of the rack on both sides of the road or set-up area at the rack entry. This helps in the alignment of the tractor to ensure that the wire ropes will run centrally and free from obstruction.

**Rack Specifications**

| | |
|---|---|
| Rack width in thinnings | 3.0–3.5 metres |
| Profile | Highlead: concave to regular, but not convex unless supported. Skyline: will require support at convex points. |
| Alignment | Must be straight. |
| Rack spacing | Selective thinning and Pattern thinning/shortwood 20–25 metres. Pattern thinning (chevron or herring-bone with pole length extraction 35–40 metres. |
| Final fellings | Minimum rack width 20 m, preferably wier up to the limit of trouble-free side hauling. |
| Side slope | Avoid if possible, can cause damage to trees on the lower side of the rack. |
| Relative direction | Keep parallel if possible, no criss-crossing. |
| Stacking space | Must be adequate. |

(Forestry Commision guidance)

**Setting the machine up**

The winch should be set up according to the manufacturer's handbook and all Health and Safety measures taken to ensure the safety of workers and members of the public. Correct procedures should be used in the positioning of the tractor and the rigging of tower, spar, anchor and support trees and ropes.

**Winch Units**

There are a range of power bases for cableways in Britain including tracked excavators, forwarders, lorries and agricultural tractors with winches and tower either mounted directly on the prime mover or on trailers. There have been consistent developments of cable based extraction systems in Europe and Northern America and these machines are being trialled for work in British mountain logging conditions. The choice of machine and system will depend on a number of factors such as, access, size of crop, terrain, volume to be extracted and availability within reasonable travelling distance.

## National Unit Support Notes (cont)

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Within Britain the most versatile and offering the greatest opportunities over a range of crops and woodlands are the tractor-based Units using 45–65 bhp models. Lighter tractors are adequate for cableways used on short ranges and load sizes up to a tonne. Larger engine size gives the power necessary for heavier loads and long range work. Highlead working with a small tractor can be an attractive option for sensitive working in smaller woodlands.

Tracked excavator units (usually 20 tonnes plus) have become more widespread in use. These machines because of their weight can reduce set up time and are more flexible in the location of their set up, ie they are not restricted to forest roads. They can dig access tracks for themselves and usually have a tower fixed to the boom which can be supported by using the bucket as a ground anchor in an excavated pit. Forwarder based Units generally have improved traction and ground clearance compared to tractor based Units. Secondary extraction may be required for off road set ups.

All these units have a different set up and close attention must be paid to the manufacturers' handbook when preparing the system for work.

**Cable System**

The rigging and running out of the cables for use in the system will again be carried out in accordance with the details in the manufacturers' handbook. The correct procedures will be used at all times and required PPE worn.

**Outcome 3**

The well organised and prepared presentation of produce for extraction is a fundamental requirement for efficient extraction of materials by cable systems. It is essential that the motor manual felling has been carried out with extraction in mind and that the timber to be pulled out has been felled to permit easy and smooth movement. Where it is possible domino effect extraction is carried out, ie the poles or trees are arranged in suitable parcels that will allow easy break out and the successive picking up of other trees as the winch side hauls to the main rack. The chokerman must avoid heavy break out of timber which puts excessive side pressure on all elements of the system.

With small to medium sized trees the chokers will be polypropolene or similar light but strong material and multiple chokers may be used. With larger trees wire or chain chokers may be substituted. The chokerman will operate two sets of chokers and will be attaching the second set as the machine operator processes the first set. As the carriage returns for the second load it takes back the first set of chokers and so on.

The chokerman must ensure that all poles or trees are chokered in such a way that they are secure, will reach the landing area safely and can easily be released by the winch operator.

In some of the larger machines self-releasing chokers are used or self-releasing carriages which speed up the process of unloading.

## National Unit Support Notes (cont)

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### Signalling

Because of the distances involved and the difficult terrain it is essential that a clearly understood signalling system is used by the winch operator and the chokerman in two man teams. Wherever possible that is a radio based system with a unique call prefix which identifies the machine. That is followed by an instruction and each instruction is acknowledged before any action is taken. Radio protocol must be established and followed to avoid confusion and increased risk of accident. The 'stop' command is not preceded by a prefix and all winch operators in the area should obey that command until such times as they are given the all clear.

Should radio reception be unsatisfactory then hand signals should be used by the chokerman. These are specific signals which refer to particular actions to be undertaken by the winch operator, eg 'haul in no brakes' to move the carriage towards the winch to a new position for side hauling. All signals must be clearly given and received.

### Operating winch

Unless under instruction only fully trained personnel should be operating cable crane machines and winches. Each system will have its own techniques and safety features and measures. Prior to any operation the operator should ensure the safety of the machine in particular any guarding, eg operator caging or PTO shaft guard on tractor powered winch.

Emergency drills should be established fully so that the correct repose and action is taken by the operator if there is a serious failure in the system. Correct working of the winch will include clean and smooth breakout and side haul to rack, controlled haul in of material, eg using the correct tension and brake pressure on the haul in and haul back lines to maintain even controlled progress, correct safe procedure to land materials for release at roadside and safe efficiency stacking of load for processing or secondary extraction. Continuity is important therefore good organisational skills are required to ensure a smooth un-chokering and the efficient use of two sets of chokers.

Continuous monitoring of the condition of the wire ropes and the machine are essential elements of the work. Loose spooling, dry ropes, signs of abrasion are all indicators that require a maintenance response from the operator. The stability and safety of the machine are also closely monitored and any problems with anchor features, pulleys or tower should be addressed immediately. Site safety is a critical factor and access should be restricted to approved personnel only.

Materials extracted should be positioned in such a way that secondary extraction or processing can be carried out smoothly and with the minimum of lost time for the winch.

## National Unit Support Notes (cont)

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## Guidance on approaches to delivery of this Unit

This Unit is suited to being delivered using a range of teaching and learning methods with a significant emphasis on practical skills learning through instruction and experiential learning. Introductory learning can be facilitated with the use of video clips of a range of cable crane systems working on steep ground. With the use of Smart technology these clips can be used in the establishing of component parts and their relationships within the system and to bring about familiarity of methods of work. This should be supplemented by a visit to a live site to give an initial experience of the working system and the real working environment.

Work shop sessions of demonstration and practice should be used in the identification, maintenance and repair of wire ropes. The use of demonstration clips placed on a VLE system can be used as a teaching tool and also as a learning tool being a point of reference in consolidating correct procedures and practice.

Site organisation, system set-up and system operation should be primarily practical demonstration with associated practice. These sessions can be supplemented with the use of video clips and Smart materials as indicated above.

## Guidance on approaches to assessment of this Unit

Assessment for this Unit will be integrated into the learning with a continuous process of practical skills assessment until a satisfactory level of performance is achieved. The assessments will be recorded using as their base criteria the best practice guidelines from the industry and take the form of performance checklists. The practical skills will be:

- identification, care and maintenance of wire ropes
- set up of cable crane system
- extraction site assessment
- chokering of timber
- control of forest end extraction
- cable crane operation

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

## National Unit Support Notes (cont)

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## Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**.

Given the practical nature of this Unit is does not easily lend itself to e-assessment.

## Opportunities for developing Core and other essential skills

This Unit will offer opportunities in developing skills in *Working with Others* with the close and responsible team work being essential for the safe and efficient use of cable crane systems. *Problem Solving* can also be developed with decision making skills required in the selection of support trees, the siting of racks and the trouble free operation of the system.

*Information and Communication Technology (ICT)* skills can be developed in the use of Smart technology to explore site characteristics and layout.

## History of changes to Unit

| Version | Description of change | Date |
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## General information for learners

## Unit title: Cable Crane Systems (SCQF level 5)

This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

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On completion of this Unit you will have developed understanding of how cable crane systems can be used in the harvesting of timber in areas where other systems may not be practical. You will develop practical skills in using and maintaining the tools, equipment and machinery associated with cable crane systems, how to set up cable crane systems and how to operate them to extract timber. The ability to set up and operate the systems safely and efficiently will be a key focus of the Unit.

The assessment of this Unit is likely to be largely practical in nature, requiring you to demonstrate that you can safely carry out the various processes required to set up and operate a cable crane system.

In addition to the knowledge and skills detailed above you may also have the opportunity to develop the Core Skills of *Information and Communication Technology (ICT*), *Working with Others* and *Problem Solving*.