IRATA Training Manual
TSOP 020

CONTENTS

Arco Professional Safety Services (previously Total Access) is established as the UK's leading training provider of Height Safety Support Services, with a reputation for delivering first class Operational and Technical services. Established over 20 years we remain at the forefront of our industry due to dedicated attention to providing safe, quality solutions to difficult access problems.

Our key specialist training services cover:

- Working at height
- Confined spaces
- General health and safety
- Construction and utilities
- Wind Energy

INTRODUCTION

This manual is to be used in conjunction with IRATA training conducted at Arco Training Centres or on behalf of Arco via a recognised trainer or training provider.

This document can be used as guidance for trainers, trainees and subcontractors involved with the delivery of IRATA training.

This manual is to be read in conjunction with the following documents:-

- IRATA Code of Practice for Industrial Rope Access
- IRATA Training and Certification Scheme
- BS ISO 22846-2:2012 – Personal equipment for the protection against falls – Rope Access Systems
- Health & Safety at Work Act 1974
- Work at Height Regulations 2005 (as amended 2007)
- The Control of Substances Hazardous to Health Regulations 2002 (COSHH)
- Personal Protective Equipment at work Regulations 1992
- The Workplace Health and Safety and Welfare Regulations 1992
- The Provision and Use of Work Equipment Regulations 1998 (PUWER)
- Management of Health & Safety at Work Regulations 1999
- Lifting Operations and Lifting Equipment Regulations (LOLER) 1998

TERMS AND DEFINITIONS

ANCHOR/ANCHORAGE POINT:

Place, fixing or fixture to which an anchor line is connected.

ANCHOR LINE/ANCHORAGE LINE:

Flexible line connected at least by one end to a unquestionably sound anchor to provide a means of support, restraint or other safeguard for a person wearing a body support. An anchor line may be a working line or a safety line.

ASCENDER:

A rope adjustment device which attaches to the working line and allows an operative to “climb” up or down a rope. The device will lock onto the rope when weight is applied in one direction, and will allow movement when the weight is removed.

BACK-UP DEVICE:

A rope adjustment device that is attached to the safety line. The device automatically locks on to the rope in the event of an uncontrolled descent, and or failure of the working line rope or equipment.

BELAY:

A place or places where either anchor lines or people may be anchored or secured.

BODY SUPPORT:

Belt or harness which conforms to a recognised European Standard.

COMPETENT PERSON:

Designated person suitably trained or qualified by knowledge and practical experience to enable the required task or tasks to be carried out properly.

CONNECTOR:

Device which enables a person to link himself or herself directly or indirectly to an anchor and able to open and lock closed.

COWSTAIL:

A connection to the main point on a harness (usually dynamic rope) which is used for a connection to an anchor point or backup device.

DESCENDER:

A manually operated friction device which under the correct working conditions will allow the operative to maintain a controlled descent. The device must also stop the descent should the operative let go of the device and or rope.

DYNAMIC ROPE:

Rope specifically designed to absorb energy in a fall by extending in length, thereby minimising the impact force.

ENERGY ABSORBER; SHOCK ABSORBER:

Component or components in a fall arrest system, designed to minimize the impact force generated in a fall.

FALL FACTOR:

Theoretical measurement of the severity of a fall. Calculated by the maximum height a person could fall divided by the length of lanyard from the person to the anchor point.

FALL ARREST:

A system or equipment which is designed to protect personnel from the risk of a fall when working at height.

WORK RESTRAINT:

A work restraint system comprises the equipment used to keep an employee from reaching a fall point, such as the edge of a roof or the edge of an elevated working surface.

KARABINER:

Type of connector, formed as a complete loop, with a spring loaded entry gate often safeguarded in the closed position by a screwed ring (‘screw gate karabiner’) or automatic locking device.

KERNMANTEL ROPE:

Textile rope consisting of a core enclosed by a sheath.(**NOTE:** the core is usually the main load bearing element and typically consists of parallel elements which have been drawn and turned together in single or several layers or of braided elements. The sheath is generally braided and protects the core, for example from external abrasion and ultra violet degradation.)

LIFTING EQUIPMENT:

Work equipment for lifting or lowering loads, including its attachment used for anchoring, fixing or supporting it e.g. chain or rope sling or similar, ring, link, hook, plate-clamp, shackle, swivel, eyebolt, webbing. Load also includes a person (LOLER).

LOW-STRETCH ROPE:

Textile rope with lower elongation properties and, therefore, less energy absorbing characteristics than dynamic rope.

OPERATIVE / TECHNICIAN

A person or persons undertaking IRATA training or work involving the use of recognised IRATA methods.

ROPE ACCESS:

Technique using ropes, normally incorporating two separately secured systems, one as a means of access and the other as a back-up security, used with a harness in combination with other devices, for getting to and from the place of work and for work positioning.

SAFE WORKING LOAD (SWL):

Designated maximum working load of an item of equipment under particular, specified conditions.

INSTRUCTOR:

A representative of the training provider, who delivers training in accordance with company policy and IRATA, recognised standards.

WORKING LINE; WORKING ROPE:

Anchor line used primarily for work positioning and restraint including descending and ascending.

WORK POSITIONING:

Technique that enables a person to work supported in tension or suspension by personal protective equipment in such a way that a fall is prevented.

WORK AT HEIGHT:

Work in any place, including a place at above or below ground level, and obtaining access to or egress from such a place while at work, except by means of a permanent staircase where if measures were not taken a person could fall a distance liable to cause personal injury.

Note; for further explanations of definitions refer to IRATA ICOP 2014

Health & Safety at Work Act 1974

The law governing all health and safety at work is the Health & Safety at Work Act 1974 (HSWA)etc. This relates to any person at work and is not restricted to a particular class of premises.

It is an “enabling” Act of a general nature. It places duties on both employer and employee and imposes a general statutory duty of care on all persons at work. It applies to all work activities and extends to include the protection of persons who are not employees (such as visitors and members of the public).

Employers have duties under the Health & Safety at Work Act 1974 (Section 2). The Employer has specific duties of care as laid out in the HSWA 1974 and these include the following;

Ensuring, so far as is reasonably practical, the health, safety and welfare at work through;

- Safe plant and systems of work (i.e. guards and lock-out procedures).
- Safe use, handling and transport of goods and materials.
- Provision of information, instruction, training and supervision.
- Safe place of work, including the means of access and egress.
- Welfare

The **self-employed** have duties under Section 3 of the HSWA 1974, which include;

- Not to expose themselves to Health & Safety risks (i.e. wearing PPE).
- Not to expose others to Health & Safety risks (i.e. keep shared work area tidy).

Section 7 of the HSWA 1974 places general obligations upon all **employees**. These include;

- Take reasonable care for themselves and others who may be affected by their acts or omissions (i.e. not to obstruct a fire exit).
- Co-operate with employers to allow them to carry out their duty or statutory requirements.

Non-compliance with the Act is a criminal offence, whether or not an accident occurs (Section 33 HSWA 1974). The enforcement of the Act is the responsibility of the Health & Safety Executive's inspectors who are agents for the Crown. Their field of responsibility is for the more technical workplaces (i.e. construction, manufacturing, power generation, railways and agriculture). The lower risk workplaces (offices, shops etc.) are "policed" by local authority environmental health officers (EHO's).

The sanctions that may be taken against those in breach of the law are enforcement notices (improvement or prohibition) or prosecution (Summary offences (minor) or indictable offences (serious). Which sanction used will depend on a range of circumstances, but mainly the level of risk for serious personal injury.

The Work at Height Regulations 2005 (as amended 2007)

The Work at Height Regulations came into force on 6th April 2005. The Regulation originates from a European Union Directive (The Temporary Working at Height Directive 2001). Under the Treaty of Rome, all EU member states are to incorporate Directives into their own legislation.

The objective is to reduce the number of industrial accidents caused by workers not working safely at height.
In 2013/14- **39** workers were killed in the work place by falling from height.

This section is designed to give a brief overview of the new Regulations and what they will require of you.

When am I at height?

"Work at height" means;

Work in any place (including a place at or below ground level) from which a person could fall.

Obtaining access to, or egress from any place of work, involving a risk of a person falling a distance liable to cause personal injury, but does not include obtaining access or egress by means of a permanent stairway.

What this will mean is that in general, it will be necessary to take preventative action whenever there is a potential risk of a fall, from any height, that is likely to cause personal injury.

The Hierarchy of Controls

For all working at height requirements, every employer shall follow the hierarchy to consider whether they can do more to prevent falls from height. Consideration should be given to the points below:

Avoid working at height:-

Can the work be done without being at height?

Prevent falls from height:-

Collective fall prevention – Handrails, Barricades
Personal fall prevention – Work Restraint, Work Positioning, Suspension

Minimise the consequences of a fall:-

Where a fall risk remains, steps should be taken to minimise the distance and consequences of any fall. (personal)

"Collective" measures should take precedence over "personal" protective measures. The protection should, wherever possible, protect a number of workers rather than relying on a system to protect an individual.

The Control of Substances Hazardous to Health Regulations 2002 (COSHH)

Duties of employees

- To co-operate with their employers enabling the company to adhere to the regulations. This can be done through established procedures.
- Use PPE and control measures and report defects.
- Ensure equipment is used and stored correctly and all defects are reported to a responsible person.
- Record where appropriate medical status.
- Report any accident or incident where applicable under the regulations.

The regulations cover a wide range of substances these include individual chemical substances or preparations such as paints, cleaning materials, metals, pesticides and insecticides. As well as manmade products and naturally occurring substances such as animal faeces and blood can all cause infection.

When considering a COSHH risk assessment you need to consider

- All work factors.
- Balance the known factors against the risk.
- Consider the best way to prevent exposure.
- Use agreed control measures to limit exposure if it can not be eliminated.
- Consider the need to monitor exposure at the work place.
- Review all measures.

When considering the welfare of the technician and the effect that any potential chemical may have on a person then the person responsible for the risk assessment should contact the supplier or manufacturer of the chemical for the most recent advice or guidance.

Personal Protective Equipment at work Regulations 1992

Regulation 4 – Provision of Personal Protective Equipment

Every employer shall ensure that suitable personal protective equipment is provided to his employees who may be exposed to a risk to their health or safety while at work except where and to the extent that such risk has been adequately controlled by other means which are equally or more effective.

Regulation 6 – Assessment of Personal Protective Equipment

Under section 6 the employer must select the correct PPE for the particular risks involved and for the circumstances of its use. Manufacturers and suppliers have duties under the PPE (Safety) Regulations 1992 and under section 6 of the HSWA 1974 to provide information of this type.

Regulation 7 – Maintenance and replacement of Personal Protective Equipment

Every employer shall ensure that any PPE provided to his employees is maintained (including replaced or cleaned as appropriate) in an efficient state, in efficient working order and in good repair.

Maintenance, required under the regulation, includes cleaning, disinfecting, **examination,** replacement, repair and testing. The responsibility for carrying out maintenance should be laid down, together with the details of the procedure to be followed and their frequency. Where appropriate, records of tests and examinations should also be kept. The maintenance programme will vary with the type of equipment and the use to which it is put.

PPE should be inspected before being issued to the wearer. It should also be examined before each use and should not be used if found to be defective. Properly trained staff should carry out examinations in accordance with the manufacturer's instructions. Manufacturers' maintenance schedules and instructions should normally be followed. Any significant departure from them should be discussed beforehand with the manufacturer or their authorised agent.

Regulation 11 – Reporting loss or defect

Every employee who has been provided with PPE by virtue of regulation 4(1) shall forthwith report to his employer any loss of, or obvious defect, in that protective equipment.

The Workplace Health and Safety and Welfare Regulations 1992

These regulations cover a wide range of basic health, safety and welfare issues and apply to most workplaces (with the exception of construction sites, those on ship or those below ground in a mine). They are amended by the Quarries Regulations 1999, the Health and Safety (Miscellaneous Amendments) Regulations 2002 and the Work at Height Regulations 2005, the Construction (Design and Management) Regulations 2007.

The Provision and Use of Work Equipment Regulations 1998 (PUWER)

These regulations cover the suitability of equipment used at work. Employers must ensure that equipment is capable of being used safely and that employees are competent to use the equipment

In addition to the requirements of PUWER, lifting equipment is also subject to the requirements of the Lifting Operations and Lifting Equipment Regulations 1998.

In general terms, The regulations ensure that equipment used or provided for use at work is:-

- Suitable and fit for purpose
- Safe for use
- Inspected and maintained
- Used by trained personnel
- Used in conjunction with any other PPE (if required)

Management of Health & Safety at Work Regulations 1999

The original “Management Regulations” came into force in 1993 as the principal method of implementing the EC Framework Directive 89/391/EEC. These Regulations set out wide-ranging general duties which apply to most areas of work. They are aimed at improving health and safety management. The Regulations set out an absolute duty on the employer to undertake an assessment of the risks to the health and safety of his employees to which they are exposed whilst they are at work (Reg. 3(1) (a)) and also to the risks of persons not in his employment but may be affected by his work activities (Reg. 3(1) (b)). The same duty is placed on the self-employed too (Reg. 3(2)).

Other requirements laid down within the Regulations include; health surveillance, health and safety assistance, employment of young persons, contacts with external (emergency) services, information for employees on any risks to their health and safety, capabilities and training etc.

Due to their general nature, these Regulations do overlap with other Regulations e.g. The Control of Substances Hazardous to Health (COSHH). An assessment of risk made for the purpose of COSHH will not need to be repeated for the purpose of the Management Regulations. However, where the requirements in one go beyond those in the other, additional measures will be needed to comply with the more stringent requirement.

Lifting Operations and Lifting Equipment Regulations (LOLER) 1998

What is lifting equipment in rope-based work?

LOLER applies to a wide range of lifting equipment and lifting operations and covers any equipment that lifts or lowers loads, including a person.

Examples are listed below.

- Ropes and equipment used for work positioning (personal suspension equipment) during rope access work.
- Rigging systems for lowering branches in arboriculture.

The regulations apply to any attachments used for anchoring, fixing or supporting this equipment.
Examples are listed below.

- Ropes
- Harnesses
- Connectors
- Anchor points
- Lanyards
- Equipment carrying bags.

The overriding principle of LOLER is to eliminate the risk of a person falling. If this is not possible then this risk should be reduced as low as reasonably practicable.

LOLER is aimed at ensuring that:

- All lifting operations are properly planned and managed.
- Lifting equipment is appropriate for the job and used in a safe manner.
- Lifting equipment is thoroughly examined at suitable intervals by a competent person.

Strength (regulation 4)

Under LOLER it is a requirement that the lifting equipment is adequate for its intended purpose. Equipment should be selected which meets standards relevant to the intended use.

Stability (regulation 4)

One requirement of LOLER is that all lifting equipment must have adequate stability and will not collapse or over turn when used. Also lifting equipment which is anchored to other work equipment or structures should be able to withstand the forces that will be imposed on it.

Lifting equipment used for lifting people (regulation 5)

Where rope access techniques are to be used LOLER requires the use of suitable devices to prevent the person from falling in the unlikely event of equipment failure.

This can be achieved by the following:-

- By the use of a safety (back-up) rope with a separate anchorage.
- By use of a rope which conforms to BS EN 1891 type A or where appropriate BS EN 892.
- By daily inspections by a competent person and adequate instruction and training for all persons involved.

Marking of lifting equipment (regulation 7)

All equipment which is to be used for rope-based access should have a declaration (or certificate) of conformity indicating the standard to which the equipment conforms. This information should be readily available to the end user.
The equipment to be used in a rope-based access system should be uniquely identifiable so that it can be easily associated with its respective documentation e.g. declarations of conformity, test certificates, examination and inspection records and instructions for use.
The regulations require lifting equipment to be marked with a safe working load (SWL). This is usually done by marking the equipment with a maximum breaking load which cannot be exceeded under any circumstances.
Rope-based access equipment is designed to support (under normal working conditions) the weight of 1 person. This can increase in a rescue to 2 persons, provided that the maximum breaking load is not exceeded and additional methods are used. This can be with an additional karabiner for friction in the case of a rescue.

Organisation of Lifting Operations regulation

Lifting operations should be properly planned by a competent person, be appropriately supervised and be carried out in a safe manner. A company or individual involved in lifting operations or supervision of rope-based access should have adequate practical and theoretical knowledge and experience to plan the work safely. Lifting should avoid where practical the movement of suspended loads over people and ensure an adequate exclusion zone at the anchorage point (if practical) and where possible an exclusion zone below any rope-based access workers.

Thorough examination of equipment (LOLER Regulation 9)

Regulation 9 concerns the thorough examination of lifting equipment: the detailed and specialised examination by a competent person.

Under regulation 12 of the Work at Height regulations (2005), every employer shall ensure that work equipment exposed to conditions causing deterioration which is liable to result in dangerous situations is inspected;

- At suitable intervals (In this case pre use checks by the user and also in line with company other P.P.E. inspection regimes and/or manufacturers recommendations).

- Each time that exceptional circumstances which are liable to jeopardise the safety of the work equipment have occurred.

The suitable intervals will be indicated by the manufacturer and stated in the instructions for use, care & maintenance for the individual item of equipment. The manufacturer will also supply a (maximum) life expectancy for the item.

The employer must ensure that the persons who determine the nature of the inspections and who carry out the inspections are competent to

do so. The competent person should have the necessary knowledge and experience to;

- Enable them to know what to look for (key components).
- Know what to look for (fault finding).
- Know what to do (reporting faults, making a record, who to report to).

The necessary level of competence will vary according to the type of equipment, where and how it is used i.e. may **not** be available in-house.

All PPE & lifting equipment must be given a visual and tactile inspection when:-

- Received as new
- Issued for use
- Before use by the user
- On return to stores

A formal inspection will be undertaken at 6 or 12 monthly intervals in accordance with LOLER or at intervals determined by an examination scheme drawn up by a competent person (dedicated inspection). When inspecting equipment, always read the manufacturer`s instructions prior to commencement.

Any item showing any defect should be withdrawn from service immediately.

Example of main attachment damage/wear on a rope access harness.

This item was withdrawn from service.

General care & maintenance of Equipment

The manufacturer of any lifting or Personal Protective Equipment should provide information on use, care and maintenance of the product. It is then the responsibility of the user to follow this information correctly.

N.B. The inspection of lifting equipment and PPE must be carried out by personnel who are trained and competent to do so. Familiarity with all equipment is essential if deviations from the norm are to be detected. In addition, the following general advice should be noted;

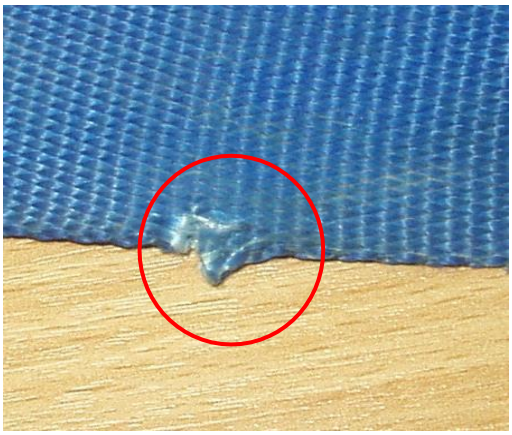
Textile Equipment (Harnesses, rope, slings etc.)

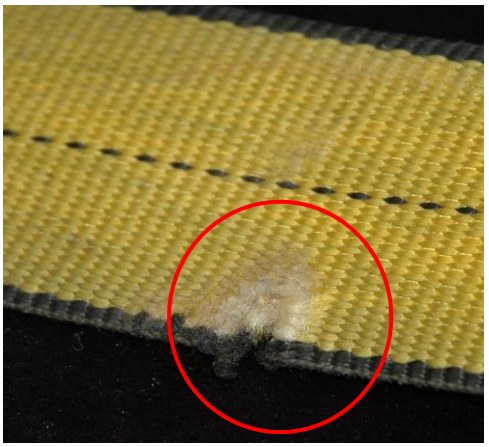
Rope and webbing should be given a visual and tactile inspection, both before being placed into storage and before being issued back into service. In the case of kernmantle rope a tactile inspection should be conducted, by physically running the rope through the hands and

feeling for any deformities to both the mantle (sheath) and the kern (core), whilst visually checking the sheath for signs of cuts, abrasions etc.

Webbing equipment should be inspected for cuts, nicks, tears, abrasions, broken stitches (Fig. 1), chemical contamination and distortion of the weave pattern (this indicates that the product has been subjected to significant or irregular loadings).

Examples of harness webbing damage/wear to stitching.
(These items were withdrawn from service.)





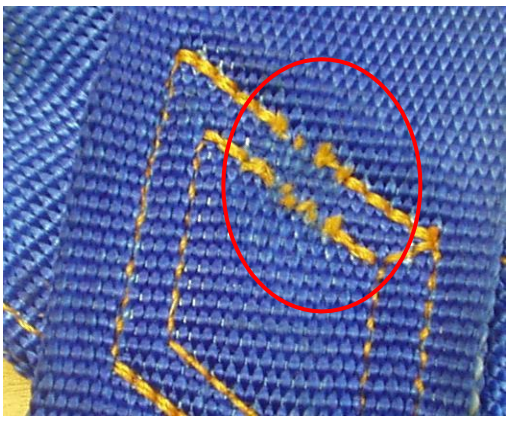


Fig1

Abrasion is the most common cause of strength loss in textile equipment (Fig 2 overleaf). This is usually caused by equipment rubbing against sharp or rough edges. Another significant cause of abrasion, which is often overlooked, is caused by the ingress of dirt and/or grit working its way into the weave or inner core of the product. Should this occur, abrasion of the internal fibres may result. This may lead to strength loss. It should be noted that dirt ingress may not be easily detectable in its early stages.

Example of abrasion damage.

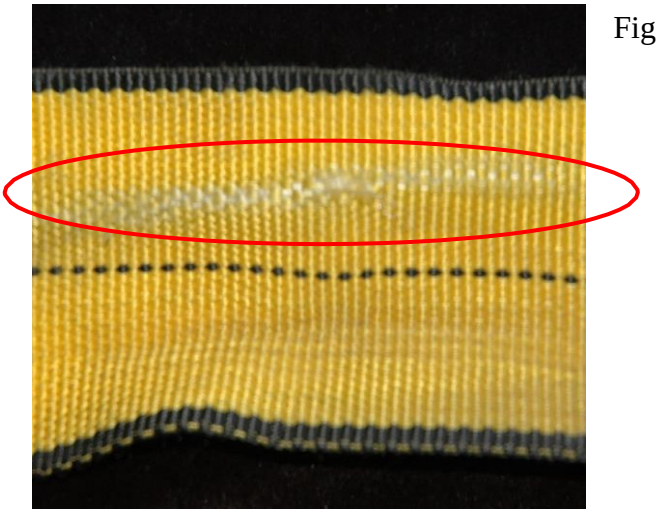


Fig 2

In order to control dirt ingress, textiles may be washed in clean water at a temperature of no greater than 40 degrees centigrade and in accordance with manufacturer`s instructions. If the textile is especially dirty, a suitable cleaning agent may be used. This should be carefully chosen and must be compatible with polyester and nylon products. Equipment should be rinsed thoroughly after washing. If a washing machine is used, it is advisable to place the equipment in a suitable bag to protect against mechanical damage. Dry any wet equipment naturally in a well-aired room away from heat or sunlight.

Mechanical damage will also have a detrimental effect on textile equipment, with the strength loss being directly proportional to the severity of the damage.

Overloading and/or shock loading will have a weakening effect on ropes and webbing, this being proportional to the amount of load that the textile is subjected to. Ropes and webbing that have been subjected to a high load should be scrapped immediately and in such a way that they cannot be returned into service.

Any textile that has been subjected to adverse chemical contamination must be withdrawn from service immediately. Information on the effect a particular chemical has on textiles can be gained from the equipment manufacturer and must be documented in the COSHH assessment.

N.B. Polyester has a better resistance than polyamides (nylon) to acids. Polyamides have a better resistance than polyester to alkalis.

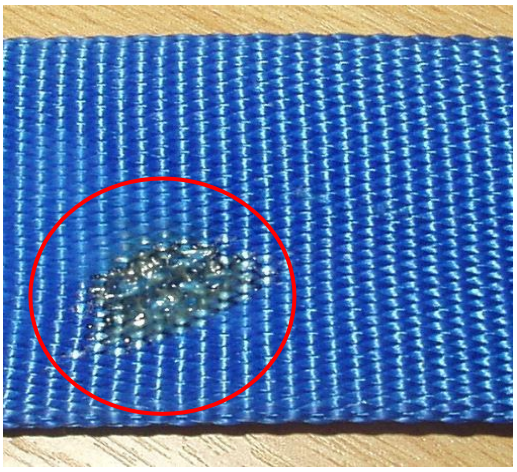
This is an important factor for consideration whilst carrying out a job specific risk assessment.

Chemical damage to textiles is often difficult to detect until the rope/webbing begins to deteriorate and can therefore be missed during an inspection. White powdery residues on the surface of the textiles or a notable change in texture may be an indication of this. If in doubt, destroy and dispose of the suspect item in such a way that it cannot be returned into service.

Textile equipment that has a burnt or glazed appearance may have been exposed to high temperatures (Figs. 3 & 4), either by coming into contact with hot surfaces, suffering the effects of heat caused by friction from the lowering device or the rubbing of textile against textile. All of these, depending upon severity, may have a detrimental effect on equipment strengths ranging from minor strength loss to rope/webbing failure.
Damaged examples of webbing exposed to hot materials.

Fig 3

Fig 4



Care should be taken to protect ropes and webbing from high temperatures. Most man made textiles will begin to change in character as temperature increase and therefore performance may be affected at temperatures in excess of 50 degrees Celsius. If there is any doubt always check with the manufacturer or supplier.

Metal Equipment

Metal items such as karabiners, maillon rapides, pulleys, etc. should be inspected to ensure that their mechanical function is not impaired in any way. Ensure that springs, hinges and threads work smoothly and that bolts and rivets are tight. Signs of deformation, wear, cracks, or other deviations from the norm should be sought.

Equipment should be kept clean and dry, with all moving parts (excluding those that may come into contact with textile equipment) lubricated. Any item proving to be defective should be taken out of service immediately.

Example of visible damage to karabiner nose.

Fig 5

Damage caused to textile equipment is usually visibly detectable before significant strength loss occurs. Metal equipment however can suffer internal damage, which may be extensive though not visibly detectable. This is often caused through the incorrect care or use of such equipment, e.g., dropping, overloading, etc. and can result in equipment failure without any prior warning. It is therefore vital that this equipment is afforded the correct care and maintenance (Fig. 5).

Metal equipment can be cleaned by submerging in clean hot water (max 100^{o} C) and using a suitable detergent or soap. An abrasive pad or scrubbing brush may assist; (these should NOT have metal bristles).

Equipment Storage

Equipment should be stored in a secure environment.
After equipment has been cleaned, dried, serviced (if necessary) and inspected, it should be stored unpacked in a dry, well-aired environment away from direct sunlight and other sources of excessive heat.

Care should be taken to ensure that there are no potential causes of damage to stored equipment in the locality, e.g., chemicals, sharp edges, etc.

Quarantine Procedures

A Quarantine Procedure is necessary to ensure that:

- New equipment does not enter service without being inspected, marked and the details of such being entered into the relevant logs.
- Defective or suspect equipment that has been withdrawn from service does not enter service again without the inspection or approval of a competent person.
- Equipment awaiting disposal cannot enter service again.
- Equipment returned from operations is not stored for future use without being inspected.

This may be achieved by simply having an individually secure area marked ‘Quarantine’, where equipment in the above categories can be kept separately from other equipment that is ready for issue/use.
When equipment enters quarantine a secure label should be attached to it stating the reason for such, e.g.

- Quarantine – New equipment, awaiting inspection. identification and issue
- Quarantine – Awaiting inspection returned from operations
- Quarantine – Suspect or defective – awaiting inspection
- Quarantine – Awaiting disposal

In all instances, other than the return from operations, a competent person should decide upon, and carry out, the correct course of action in dealing with equipment placed into quarantine.

Equipment Inspection list

This is a non exhaustive list of items of wear or damage that a trained and competent PPE Inspector should be looking for.

Visual and tactile inspection

Textile equipment

- Excessive wear to any part
- Abrasion
- Stitching cut, broken or abraded
- Cuts (load bearing parts)
- Damage by chemicals (powdery surface)
- Damage by heat
- Date of manufacture

Metal Items Adjustment buckles

- Assembly
- Correct functioning
- Cracks
- Corrosion
- Foreign matter dirt paint etc
- Date of manufacture

Ropes

- As for textile equipment
- Date of manufacture

Lanyards and energy absorbers

- Excessive wear to any part
- Energy absorber has not begun to deploy
- Tension on any return spring
- Knots or sewn terminations
- Date of manufacture

Helmets

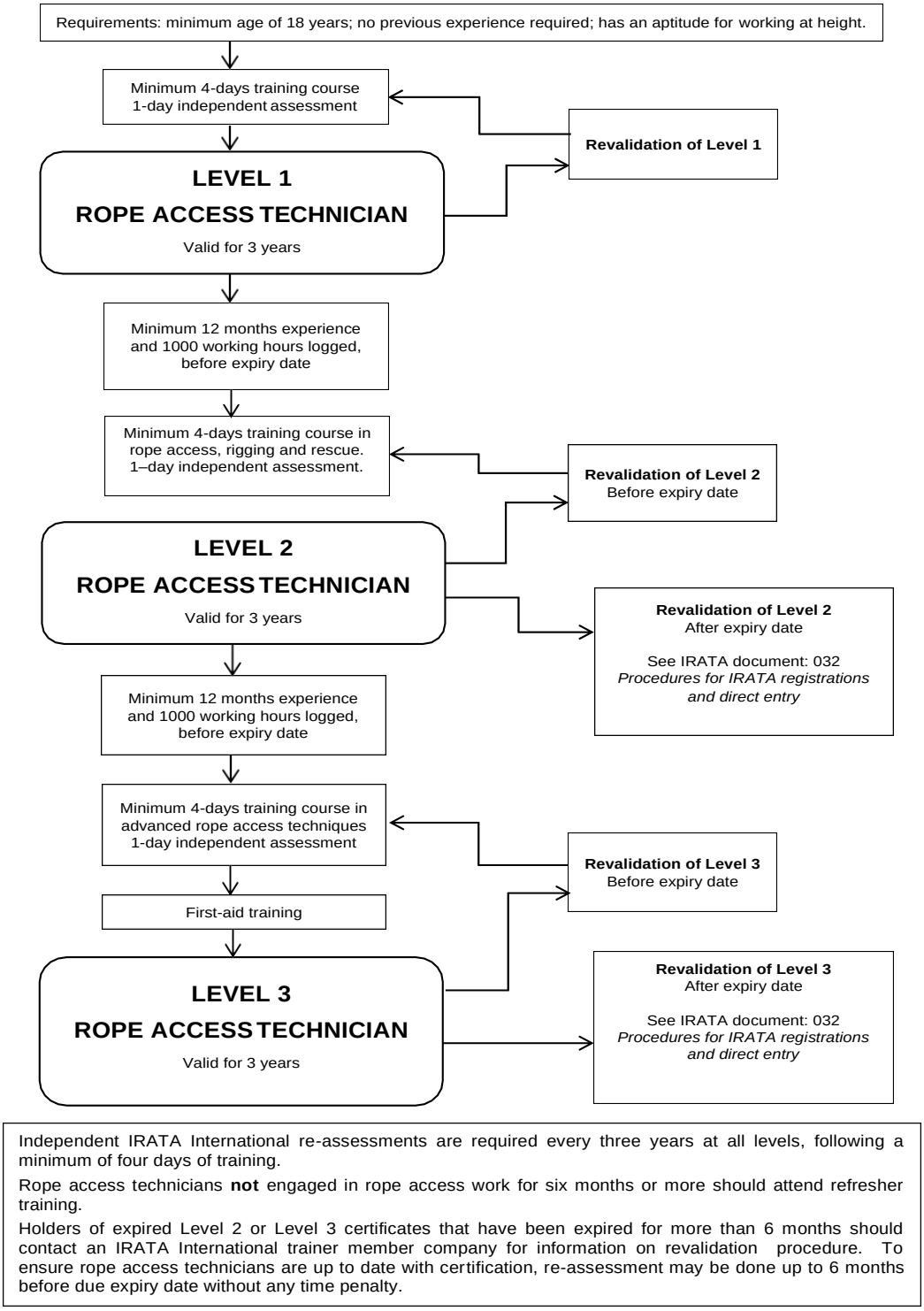
- Cracks
- Deformation to the shell
- Internal head cradle and straps are undamaged
- Date of manufacture
- Contamination (stickers , marker pen, etc)

Connectors

- Foreign matter dirt paint etc
- Corrosion
- Cracks
- Deformation
- Wear particularly where the rope or webbing lies
- Date of manufacture

Notes

IRATA Training, Assessment and Certification Scheme (TACS)



Independent IRATA International re-assessments are required every three years at all levels, following a minimum of four days of training.

Rope access technicians **not** engaged in rope access work for six months or more should attend refresher training.

Holders of expired Level 2 or Level 3 certificates that have been expired for more than 6 months should contact an IRATA International trainer member company for information on revalidation procedure. To ensure rope access technicians are up to date with certification, re-assessment may be done up to 6 months before due expiry date without any time penalty.

Detail courtesy of IRATA international (pages 34-39)

Training syllabus and assessment: requirements and guidance

6.1 General

6.1.1 To help ensure a safe system of work, rope access technicians need to be competent. To be considered competent, rope access technicians need to have sufficient professional or technical training, knowledge, actual experience and authority to enable them to carry out the required tasks properly. Competence is developed in training by addressing three elements:

a) **knowledge**, which is delivered by a range of methods, including classroom based lessons, lectures and presentations delivered by the trainer, and through self-directed learning using study materials supplied by the training company;

b) **skills**, which are taught through observation of practical demonstrations and subsequent practice of the syllabus elements by the candidate under the direction of the trainer;

c) **attitudes**, which are developed by explaining the importance of personal responsibility in creating and maintaining a safe system of work.

NOTE Training programmes and procedures can vary between training providers, while still meeting the requirements of this document.

6.1.2 The three elements of competence are continuously assessed both during training by the trainer and during an assessment by the assessor upon completion of the training:

a) knowledge is assessed by means of written and/or online examinations, by discussion during practical demonstrations, and observation of knowledge during practice;

b) skills are assessed by the demonstration of practical elements of this syllabus;

c) attitudes are assessed by observation of candidates' respect for safe practice.

6.1.3 A summary of the training syllabus is given in **Figure 3**. Syllabus elements covered at assessment are described in **6.1.3.1** to **6.1.3.14**. These syllabus elements vary, depending on the level being assessed.

6.1.3.1 At Level 1, candidates are assessed on all elements of the syllabus. At Level 2 and Level 3 it is not normally practicable to cover every element of the syllabus during assessment. Assessors shall select a representative number of elements meeting the criteria given in **6.1.3.2** to **6.1.3.11**.

6.1.3.2 Level 1 candidates shall complete 20 questions.

6.1.3.3 Level 1 candidates shall demonstrate all of the rope manoeuvres except passing wide re-anchors.

6.1.3.4 Level 1 candidates shall demonstrate all of the climbing techniques except vertical aid climbing.

6.1.3.5 Level 1 candidates shall demonstrate two rescues:

a) in descent from a separate set of ropes;

b) by lowering with a pre-rigged rig-for-rescue system.

6.1.3.6 Level 2 candidates shall complete 30 Level 2 questions.

6.1.3.7 Level 2 candidates shall demonstrate ascent, descent, changeovers, passing wide re-anchors plus at least four other rope manoeuvres.

6.1.3.8 Level 2 and Level 3 candidates shall demonstrate vertical aid climbing.

6.1.3.9 Level 2 and Level 3 candidates shall demonstrate at least one of each of the following rescue exercises at assessment:

a) rig-for-rescue;

b) hauling;

c) de-weighting on ropes, e.g. rescue from ascending devices;

d) de-weighting from structure, e.g. aid climb, fall arrest lanyards;

e) passing an obstruction, e.g. deviation, rope-to-rope, re-anchor

6.1.3.10 Level 3 candidates shall answer 10 Level 3 questions and 20 Level 2 questions.

6.1.3.11 Level 3 candidates shall complete one or more planning exercises covering:

a) anchor selection;

b) rigging and emergency planning;

c) hazard identification;

d) selection of equipment;

e) access method and personnel;

f) third-party protection and exclusion zones.

Completion of IRATA form 061, *Job planning,* satisfies this requirement. However, candidates or assessors may use their own format.

6.1.3.12 Level 3 candidates shall demonstrate a complex rig-for-rescue exercise involving a team of rope access technicians. This exercise should include making a written plan for the exercise.

6.1.3.13 Level 3 candidates shall demonstrate implementation of a method statement.

6.1.3.14 Level 3 candidates shall complete an equipment inspection report.

Syllabus item	Level 1	Level 2	Level 3	TACS Ref
Planning and management				6.2
IRATA International system				6.2.1
Legal framework				6.2.2
Hazard identification and risk assessment				6.2.3
Selection of access method				6.2.4
Selection of personnel and competence				6.2.5
Safety method statement				6.2.6
Exclusion zones, permits to work etc.				6.2.7
Planning for emergencies				6.2.8
First aid and suspension intolerance				6.2.9
Equipment				6.3
Selection of equipment				6.3.1
Care and maintenance of equipment				6.3.2
Pre-use checking of equipment				6.3.3
Detailed and interim inspections				6.3.4
Assembly of equipment and buddy check				6.3.5
Rigging				6.4
General				6.4.1
Anchor selection				6.4.2
Knots and rope handling				6.4.3
Basic anchor system				6.4.4
Y-hangs				6.4.5
Hazard avoidance and rope protection				6.4.6
Re-anchors				6.4.7
Deviations				6.4.8
Retrievable rigging				6.4.9
Work restraint lines				6.4.10
Vertical fall arrest systems				6.4.11
Tensioned lines				6.4.12
Rigging for rescue and hauling				6.5
General				6.5.1
Lowering systems				6.5.2
Hauling systems				6.5.3
Cross haul				6.5.4
Complex rescue systems (team exercise)				6.5.5

White boxes: demonstrate competence; understand and apply technique

Shaded boxes: show awareness of technique/use under direct supervision

Black boxes: awareness not required at this level

Figure 3 – Summary of the IRATA International training syllabus

Rope manoeuvres				6.6
General				6.6.1
Back-up devices				6.6.2
Descent				6.6.3
Ascent				6.6.4
Changeovers				6.6.5
Descent using ascending devices				6.6.6
Ascent using a descending device				6.6.7
Deviations				6.6.8
Rope-to-rope transfers				6.6.9
Re-anchors *				6.6.10
Passing mid-rope knots				6.6.11
Edge obstructions at the top				6.6.12
Use of work seats (comfort seats)				6.6.13
Passing mid-rope protection				6.6.14

** Level 1: small re-anchor (< 1.5 m); Level 2 and Level 3: wide re-anchor (> 1.5 m)*

Climbing techniques				6.7
General				6.7.1
Horizontal aid climbing				6.7.2
Vertical aid climbing				6.7.3
Climbing with fall arrest equipment				6.7.4

Rope rescues				6.8
General				6.8.1
Rescue from descent mode				6.8.2
Rescue from ascent mode				6.8.3
Passing a deviation with a casualty *				6.8.4
Rope-to-rope transfer with a casualty				6.8.5
Passing a small re-anchor with a casualty				6.8.6
Mid-transfer rescue				6.8.7
Passing mid-rope knots with a casualty				6.8.8
Use of tensioned ropes for rescue				6.8.9
Climbing rescues				6.9
Rescue from an aid climb				6.9.1
Rescue from fall arrest equipment				6.9.2
Rescue from an aid climb – short connection				6.9.3

* Level 2: single-anchor deviation; Level 3: double-anchor deviation

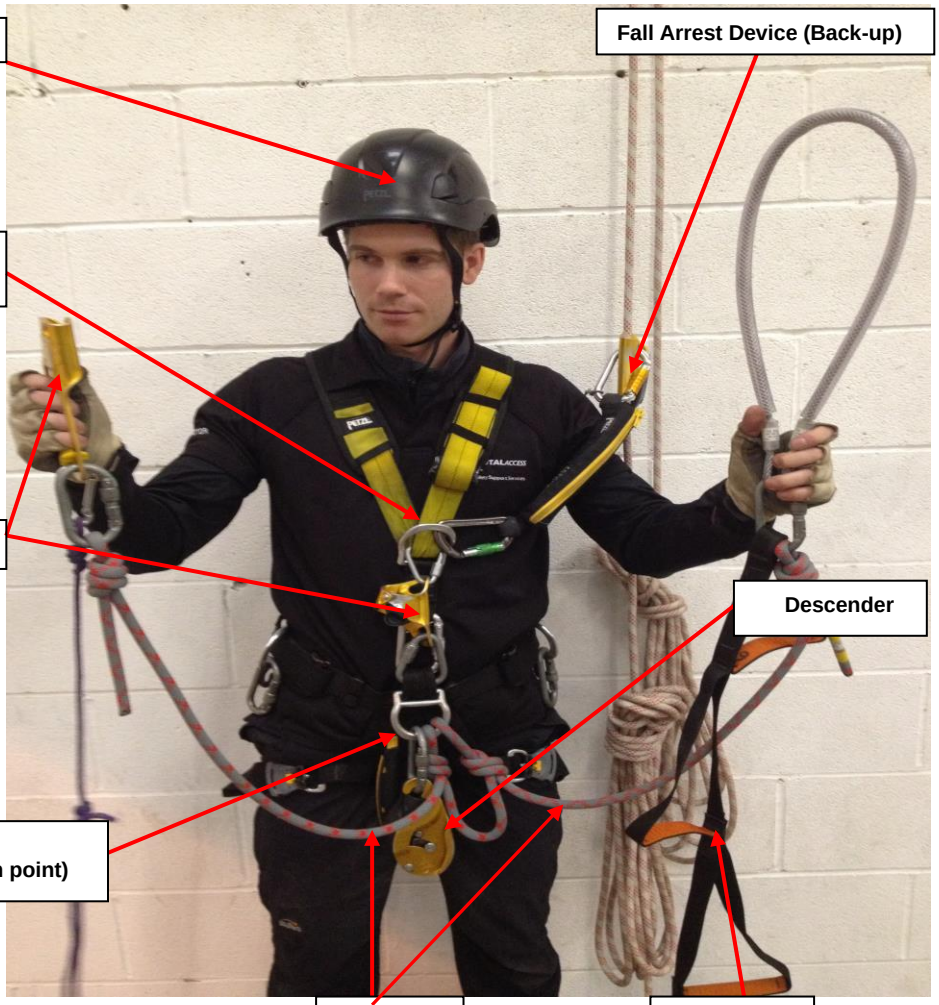
White boxes: demonstrate competence; understand and apply technique

Shaded boxes: show awareness of technique/use under direct supervision

Black boxes: awareness not required at this level

Notes

BASIC ROPE ACCESS HARNESS SET-UP



1.1 DESCENDING

- Ensure your working line (descender) and safety-line (back-up device) equipment is attached correctly and independently onto their respective ropes
- Always check the function of equipment before use
- Operate descending device, maintaining control of the ‘tail rope’ at all times if unlocked i.e. descending
- Try to ensure the safety line device maintains a high position when descending to minimise any potential fall distance or out of control descent

1.2 ASCENDING

- Ensure the ropes are twist and tangle free (as much as can be reasonably expected)
- Ensure your working line (chest ascender) and safety-line (back-up device) equipment is attached correctly and independently onto their respective ropes
- Always check the function of equipment before use
- Attach the hand ascender – with foot loop - to the working line above the chest ascender and check its operation by pulling down on the handle
- Place your foot in the foot loop and as you stand up, pull down on the handle of the hand ascender
- As you stand up in the foot loop the chest ascender should travel up the working line catching your progression when you stop

- Try to maintain a near vertical posture when ascending as this will make ascending the ropes considerably easier
- To move the hand ascender up the rope you must first take your weight off the foot loop, and then carefully slide the hand ascender up the rope. (Try to maintain a 90º angle with the leg). If the hand ascender is pushed up too high you may have problems pushing down on the foot loop
- When ascending do not forget to move the back-up device up the safety line as high as reasonably practical
- To move up the ropes repeat the process of alternating between your chest ascender and hand ascender/foot loop
- Do not forget to keep your back up device as high as possible as you climb

1.3 CHANGE OVERS

1.3.1 MOVING FROM DESCENT TO ASCENT

- Ensure your descender is locked
- Push your back-up device up the safety rope
- Place your hand ascender and foot loop on the working rope above your descender
- Open your chest ascender and stand up in the foot loop
- Place the working rope in your chest ascender above the descender. Close your chest ascender then lower your weight onto it
- Remove your descender from the working line as it is now redundant
- Continue up the ropes moving the back-up device as you climb

1.3.2 MOVING FROM ASCENT TO DESCENT

- Start by pushing your back-up device up the safety rope
- Attach your descender on the working rope (as close as possible to the chest ascender) and ensure your descender is locked
- Using your foot loop, de-weight your chest ascender and disconnect from the working line
- As your body weight is released from the chest ascender, slowly lower your weight onto the descender
- Remove your hand ascender and stow on the gear loop on the harness
- Ensure your back-up device is free to descend, unlock your descender and descend down the rope

1.4 DESCENT USING ASCENDERS

- Place your left hand on the hand ascender
- Place your right hand on the chest ascender with your index finger positioned to apply pressure to the top of the toothed cam of the chest ascender
- Stand in the foot loop to de-weight the chest ascender then apply downward pressure to the cam in order to partially open the device do not allow the rope to come out of the rope guide
- Whilst holding the ascender partially open, lower yourself down the working line approximately 30-40cm and release the pressure in order to engage the cam on the rope again
- Lower the hand ascender in much the same way by releasing any pressure i.e. foot loop, open the cam partially, and lower down the rope
- Lower the back-up device down the safety line ensuring that it is as high as possible at all times
- Repeat the steps above to descend down the ropes
- Body position should be kept close to vertical during this operation

1.5 ASCENT USING DESCENDERS

- Ensure the descender is correctly threaded and locked
- Attach your hand ascender to the working line above the descender and place your foot in the foot loop
- Unlock the descender and hold the ‘control rope’ in your right hand
- Place your left hand on the hand ascender and stand up with the assistance of the foot loop. At the same time pull any slack rope through the descender
- Should you need to move the back-up device higher you must first lock the descender
- Repeat the steps above to ascend up the ropes

2.0 PASSING KNOTS

2.1 ASCENT

WORKING LINE/SAFETY LINE

- On reaching a knot remove your handle ascender and reconnect to the working rope above the knot
- Position your chest ascender close to the knot by carefully ascending. Be careful to leave a **small gap approx. 5cm** between chest ascender and knot in order to enable its release
- Push your back-up device as high as possible on the safety line
- Attach your descender to the working rope just below your chest ascender and pull any slack through, lock off the descender
- Ensuring you have enough space for your chest ascender - between your hand ascender and knot - stand in the foot loop and remove your chest ascender, reattaching it to the working line above the knot. If needed, ascend up to the knot on your descender before attempting to reduce any potential fall distance.
- Remove the descender from the working line and continue to ascend
- Any obstruction (knot) in the safety line can be passed by tying a 'safe' knot to temporarily attach to - preferably with a short cowstail – in order to remove and reattach your safety device above the obstruction. Any knots in the safety line should be tied below your safety device, **never above**
- Once the safety device is reattached, remove the cowstail
- All temporary knots should be removed

Please note: Knots in the rope would only be a consequence of isolated damage or the joining of ropes together. Therefore you would only expect to encounter an obstruction like this in exceptional circumstances, as pre-use checks should be carried out and the correct length of rope selected before work begins. Damage in any rope would generally be isolated with an alpine butterfly knot and reported immediately.

PASSING KNOTS

2.2 DESCENT

WORKING LINE/SAFETY LINE

- Descend to the knot on the working line
- Ensure your back-up device is as high as practical on the safety line
- Perform a changeover from descent to ascent (1.3.1)
- Remove your descender and reattach it to the working rope below the knot
- Pull as much rope through your descender as possible so it is close to the knot and lock the descender
- Descend on your ascenders (1.4) until you are close to the knot and your descender
- Once you are close to your descender perform a changeover from ascent to descent (1.3.2)
- Ensure the back-up device is as high as practical at all times
- Any obstruction (knot) in the safety line can be passed by tying a 'safe' knot to temporarily attach to - preferably with a short cowstail – in order to remove and reattach your safety device below the obstruction.
- Any knots in the safety line should be tied below your safety device, **never above**
- All temporary knots should be removed

3.0 DEVIATIONS

3.1 ASCENT

The deviation should not exceed 20° from the vertical. This is because the deviation is not to be regarded as a point of attachment. If the deviation is to exceed 20° the rig should be changed using 2 points of attachment and 2 slings or strops.

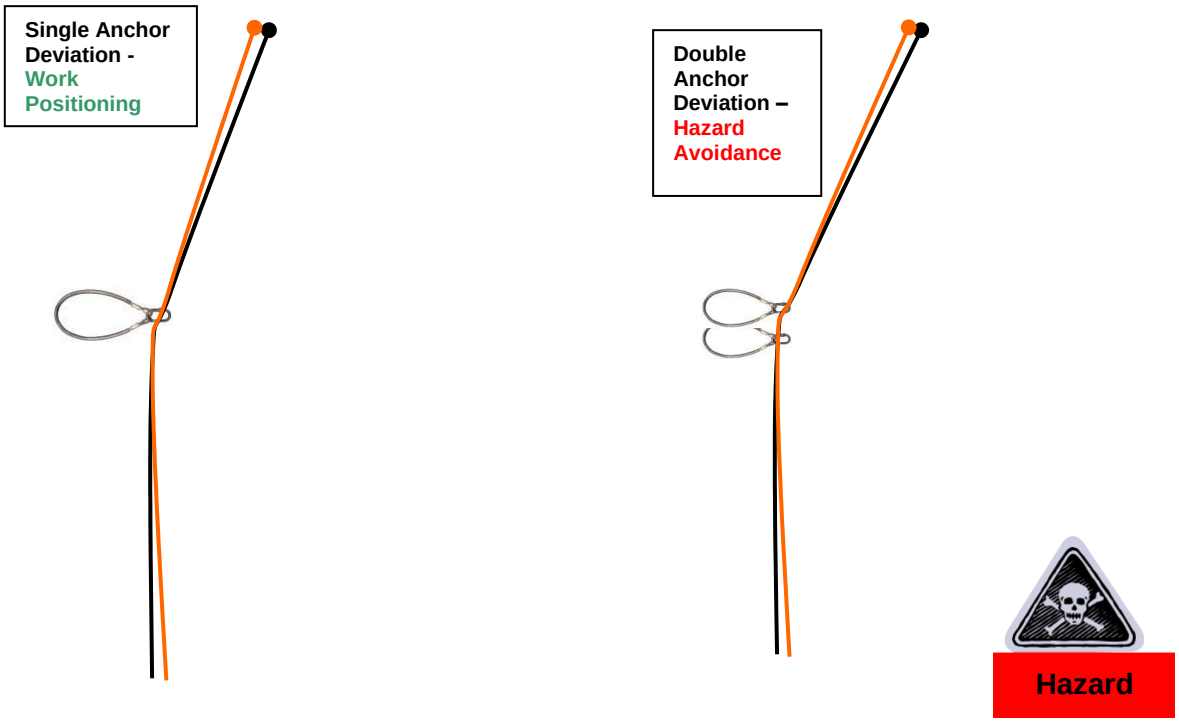
You should not need to remove any access equipment from the working or safety line when passing a deviation.

- Ascend the working line to just below the deviation
- Ensure the back-up device is as high as practical
- If not already there, place a second karabiner into the deviation sling and clip the ropes below all working and safety-line equipment into it
- De-weight the deviation karabiner that is above your equipment and under tension by pulling yourself towards the anchor
- Remove the karabiner that was under tension from around your ropes and control your swing away from the deviation
- The ropes below your equipment should remain in the deviation even though you are now underneath your main anchor points

DEVIATIONS

3.2 DESCENT

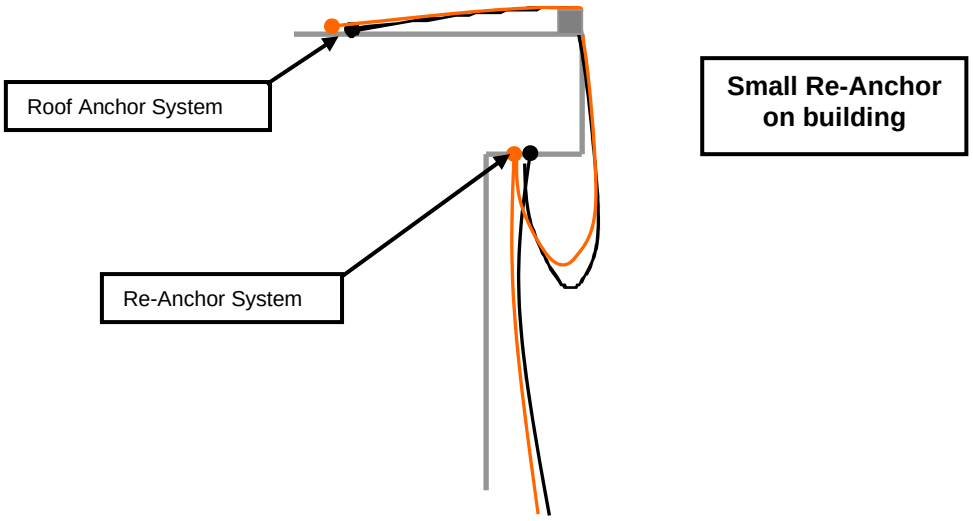
- Descend to just below the deviation anchor point
- Lock the descender and ensure the back-up device is as high as practical
- Pull yourself toward the deviation and connect the spare karabiner around the ropes above your equipment
- Remove the lower karabiner from the ropes below your equipment
- If this deviation is to be used again you can leave this karabiner in position for future use
- Unlock the descender, ensure the back-up device is free to travel and continue to descend
- You are now ‘in’ the deviation which is re-directing the ropes from their original vertical anchor position



4.0 RE-ANCHOR

4.1 ASCENT

- Ascend the working line ensuring your back-up device is as high as possible at all times. Stop just below the intermediate anchor point (re-anchor)
- Attach a long cowstail to the bolts/karabiner of the re-anchor or both loops of the knots
- Having created a temporary back-up system with your cowstail or equivalent, you are then able to move your safety line device across to your new anchor system safety line
- As you now have a cowstail and back-up device attached, you can stand in the foot loop to remove your chest ascender and transfer this to the new anchor system working line
- Remove your hand ascender and reconnect it to the new working line above the chest ascender
- Ascend the ropes until your cowstail can be safely removed from the re-anchor.
- Ensure you check the operation of the back-up device before removing the cowstail
- Continue to ascend the ropes



RE-ANCHOR

4.2 DESCENT

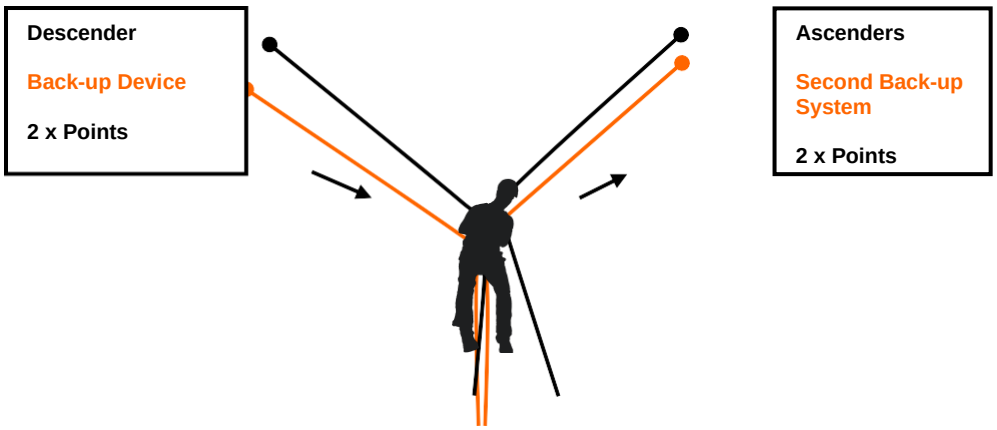
- Descend to the re-anchor and stop opposite the anchor points. **Do not descend to the bottom of the loop as this will be too low**
- Lock your descender and ensure that your back-up device is as high as practical
- Attach a short or long cowstail/connection to the bolts, karabiners or both loops of the knots of the re-anchor
- Unlock your descender and descend until your weight transfers onto the cowstail/connection
- When your descender is completely de-weighted, remove from the rope and reconnect to one of the ropes below the re-anchor, 'take-in' any slack, check operation and lock
- As you now have a cowtail/connection plus your descender connected, remove the back-up device from the safety line above you and reattach to the new safety line below the re-anchor
- Retrieve your cowstail/connection by using your hand ascender and foot loop or ascend slightly on your descender
- Unlock your descender, ensure the free movement of your back-up device and continue down the ropes.

*When faced with a long re-anchor care should be taken to ensure the operative is not subjected to an uncontrolled swing in the unlikely event of a rope or equipment failure. The operative may wish to undertake the large re-belay as if a wide rope-to-rope transfer. (see 5.0)

5.0 ROPE-TO-ROPE TRANSFER

- Ensure you are in your descending equipment on the working line of your existing anchor system/ropes
- Attach a second back-up device to the new safety line and check its operation
- Attach the ascending equipment to the new working line and check its operation
- You should now have **4 x points of attachment**, descender and back-up device on your existing ropes and ascenders and back-up device on your new ropes
- Unlock your descender and abseil, which will transfer your weight from your descender to the new set of working ropes (ascender). You can also ascend your new ropes if this aids work position
- Ensure you maintain 4 x points of attachment throughout the rope to rope transfer
- When your weight is fully transferred, remove your descender and back-up device from your old anchor system
- You can then either ascend or change over your equipment to descend.

You must maintain 4 points of attachment at all times while undertaking a rope-to-rope transfer due to the potential for an out of control swing should an item of equipment fail during the transfer



6.0 EDGE OBSTRUCTION AT THE TOP

6.1 Climbing over and down

- Ensure your back-up device is attached to the safety rope before you approach the edge and you have function tested your equipment
- Once at the edge and keeping a low centre of gravity, attach your descender to a point on the working rope that is just past/under the edge of the roof/parapet
- Move your back-up device to ensure it will hang directly over the edge with no slack
- Place your hand ascender on the working rope and place the foot loop over the edge
- From a sitting/kneeling position, place your foot in the loop, climb over the edge and lower your weight onto the working rope, while standing in the foot loop you are able to make any adjustments to ropes, rope protectors etc
- Finally move your back-up device over the edge, ensuring all rope protection measures are in place
- Check your equipment and continue to descend

6.2 Climbing over and up

- Ascend up to the edge of the obstruction and move your back-up device over the top
- Moving your hand ascender over the edge will allow you to get as close as you can to the edge with your chest ascender
- Place your foot loop as high as comfortably possible and stand up while pulling on both ropes to assist in climbing over the edge
- Once you have moved over the edge, remain attached to your back-up system as a minimum and move to a position of safety

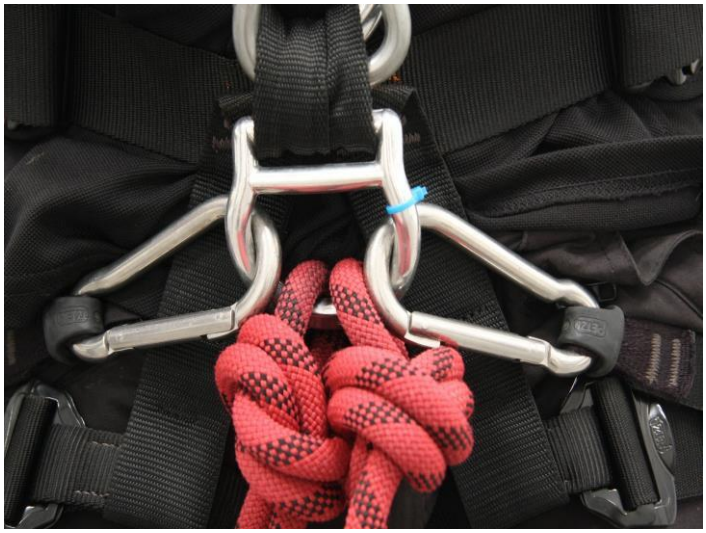
7.0 USE OF A WORK SEAT

The use of a work seat can be beneficial when working in one position for extended periods as it will help relieve a lot of discomfort caused by the harness constricting the waist and legs.

The work seat provides support and is not part of the suspension equipment.

Problems with using a work seat arise when the seat is used incorrectly; the seat should always be used according to the manufacturer's recommendations. Shown below is one correct method for attaching to the harness.

- (See Photo)



8.0 PASSING MID- ROPE PROTECTION

8.1 Ascent

- Ascend up to the mid rope protection
- Open the mid rope protection just enough to allow your hand ascender to move past the edge
- Move your back-up device up as high as possible
- Continue to open the mid rope protection while moving your hand ascender and chest ascender up the ropes
- Ensure the back-up device is as high as possible at all times
- When the obstruction has been passed, the mid rope protection can be replaced on the ropes for the protection of further operatives to ascend

PLACING MID- ROPE PROTECTION

8.2 Descent

- Descend down to the potential point of abrasion
- Tie the rope protectors to the working and safety lines above your equipment
- Descend down, bringing the rope protectors with you, ensuring the ropes run across the rope protector
- Close the rope protector as you descend. Ensure the Velcro strip is facing away from the hazard to prevent it parting under pressure from the edge
- Ensure the descender is locked when you close the rope protector (This may have to be done in 1 or 2 stages)

9.0 RIGGING

LEVEL 1/2/3

9.1 The Anchor System

The anchor system is of primary importance in the rope access safe system and anchors should be unquestionably reliable. The principle of double protection (see 13.2, 13.3) should be applied, therefore, at least two anchors i.e. at least one for the working line and at least one for the safety line, should always be used.

When the attachment is made to a structure and it is apparent that the structure has more than adequate strength, it is still advised to attach each anchor line to separate anchors, e.g. via two anchor slings (see 13.2).

9.2 IRATA Minimum Anchor Strength Requirement

Ultimate strength of anchors, except deviation anchors – at least 15kN

Deviation anchors and anchors placed simply to maintain the position of the anchor lines may have a lower strength than this, but should be sufficient for the load that could be applied.

9.3 Anchor Line Protection

All efforts must be made to ensure the anchor system does not fail as a result of rope damage e.g. sharp edges, heat, abrasion, contaminants etc. This can be achieved by following the hierarchy of rope protection below: -

1. **Remove the Hazard – Remove** source of heat, source of entanglement, unnecessary tool, detrimental edge
2. **Avoid the Hazard** – Ideally position the rigging or rig in such a way as to **avoid** rope contact with potentially detrimental surfaces, heat sources etc e.g. Re-Anchors, Deviations
3. **Rope Protection** – Where it is not possible to achieve the above, appropriate physical rope **p**rotection between the detrimental surface and anchor lines may be needed e.g. edge rollers, textile protectors

9.4 Anchor Systems

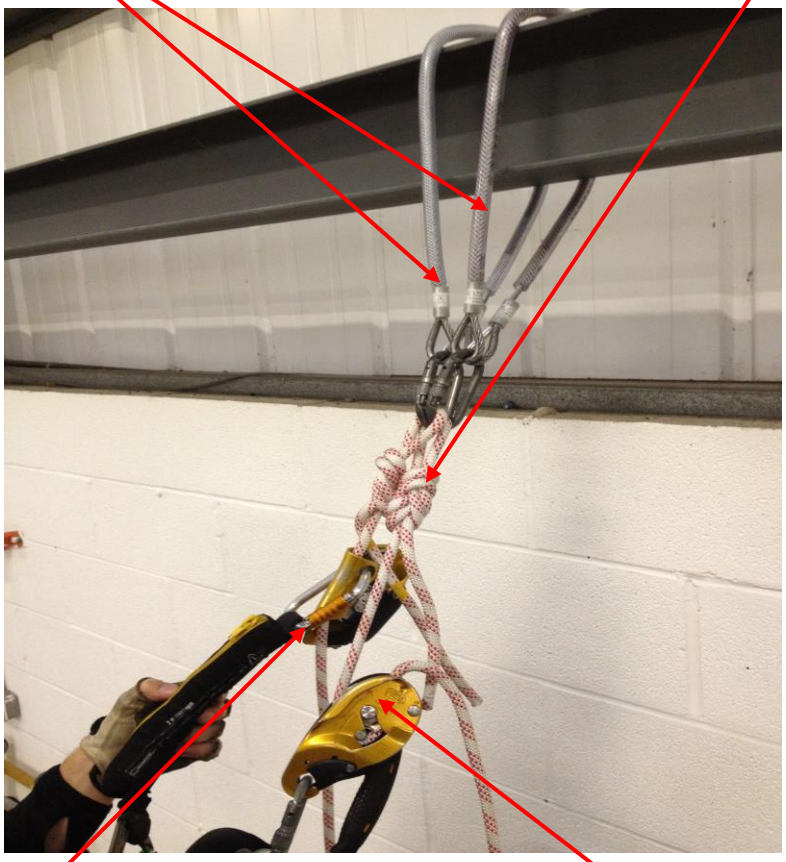
9.4.1 Basic anchor (Figure of 8/9 knots)

- The loops in the rope ends should be as short as practical
- The Figure of 8 knots should be dressed and tightened
- Ensure the karabiners are closed and screwed up
- By clipping both knots/ropes into both anchor points you share the load and gain extra redundancy in the system

Structural Beam (Unquestionably reliable)

2 x Independent Anchors (Slings/Strops & Karabiners)

2 x Figure of 8 Knots

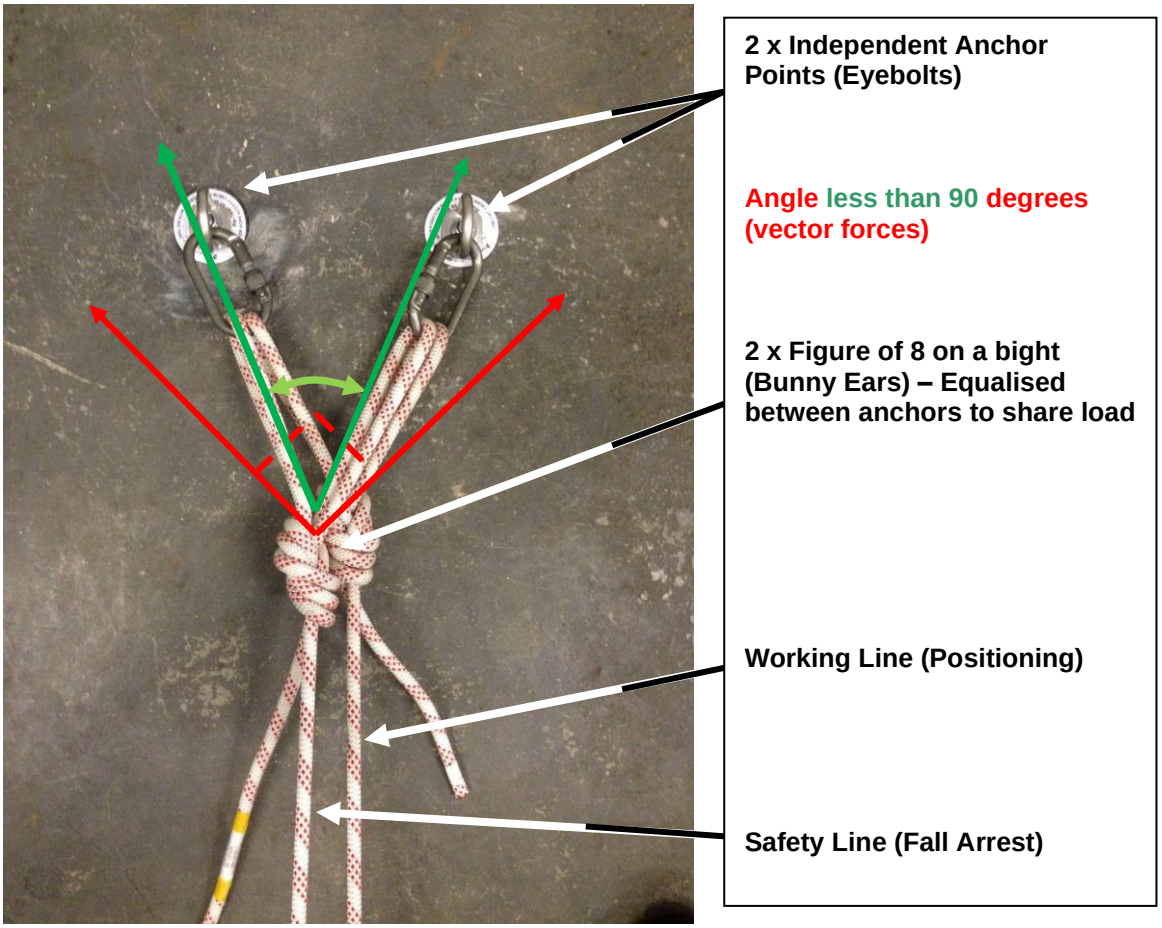


Safety Line (Fall Arrest Back-up)

Working Line (Work Positioning)

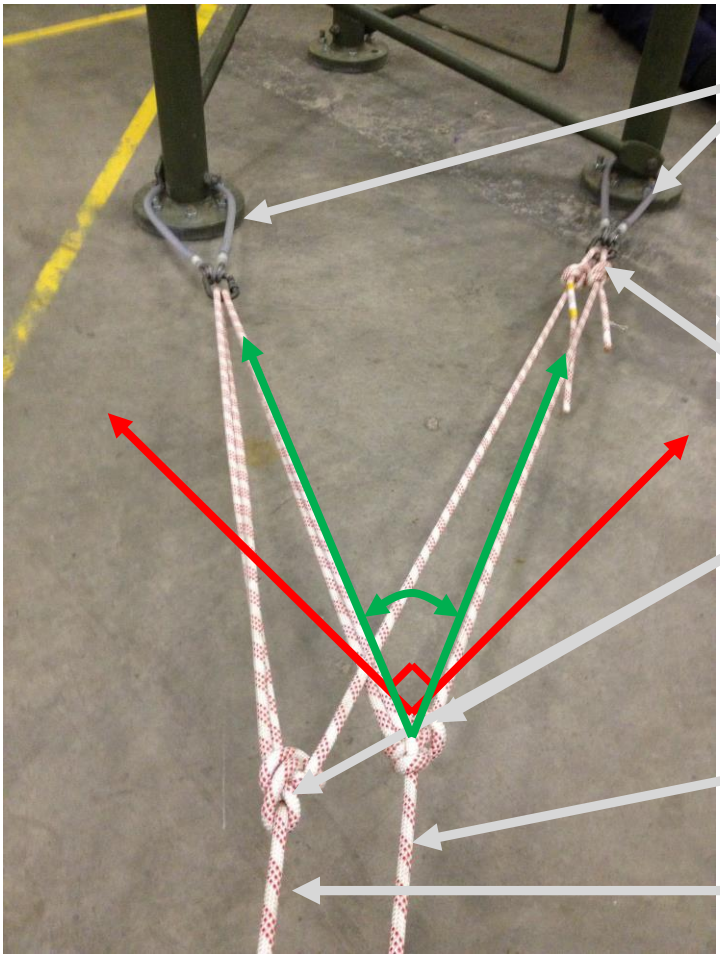
9.4.2 Y hang – Figure of 8 on a bight (Bunny Ears Knot)

- The loops should be as short as practical
- The knots should be dressed and tightened
- Ensure the karabiners are closed and screwed up
- The maximum recommended angle is 90° or less
- By clipping both knots/ropes into both anchor points you share the load and gain extra redundancy in the system



9.4.3 Y hang - Figure of 8 and Alpine butterfly

- The knots should be dressed and tightened
- Ensure the karabiners are closed and screwed up
- The maximum recommended angle is 90° or less
- By clipping both knots/ropes into both anchor points you share the load and gain extra redundancy in the system



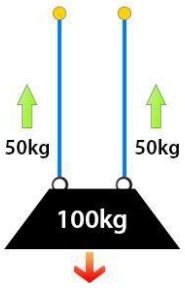
9.5 RIGGING ANGLES

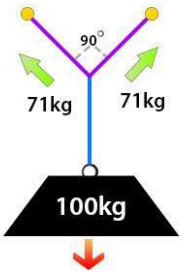
Load on anchor = L ÷ $\frac{\cos ½ \text{ angle}}{2}$

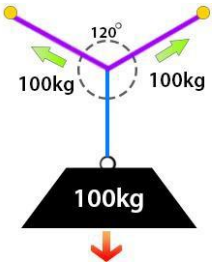
E.G. Load 100kg Rigging angle 90°

L ÷ $\frac{\cos ½ \text{ angle}}{2}$ = $\frac{100 \div \cos 45}{2}$ = $\frac{100 \div 0.707}{2}$ = $\frac{141}{2}$ = 70kg

Angle	Anchor point
0°	50 kg
60°	57 kg
90°	70 kg
120°	100 kg
140°	146 kg
150°	193 kg
160°	289 kg
v178°	2941 kg
179°	5747 kg







Note.

Results can vary depending whether you round up or down on the calculations

10.0 ADVANCED RIGGING Level 2/3

10.1 LARGE Y-HANG

Any Y-hang that with the failure of either anchor point would result in an uncontrolled swing that causes damage to the person, equipment, or property must be doubled up (2 slings/strops 2 karabiners etc).

A correctly tied Y-hang must have an equal load on all anchors used.

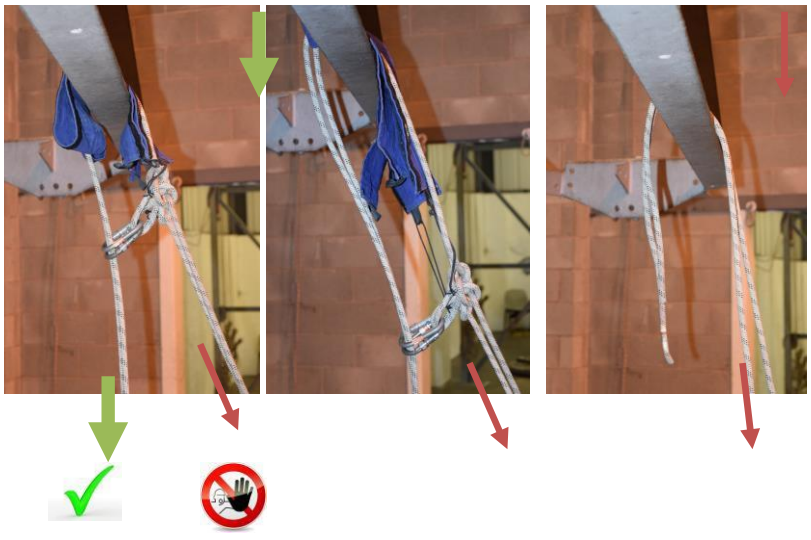
10.2 RE-ANCHOR (BELAY)

The same rules apply to rigging a re-belay as any normal anchor system. The loops may vary in size but consideration must be given to technicians who will be required to access it. This is especially important when considering a rescue. Ensure there is plenty of rope in the loop to aid descent rescues with casualties.

10.3 RETRIEVABLE RIGGING

A retrievable rigging system, commonly referred to as a 'pull-through', gives a technician further options when considering the access and/or egress of a job. It allows the anchor system and ropes to be set-up and de-rigged from a remote location should other access/egress methods be too difficult, inefficient or impractical. ****There are many systems that can be used to achieve this however, careful consideration must be paid to rope protection and the possibility of cross-loading connectors using certain methods.**

a) Working lines

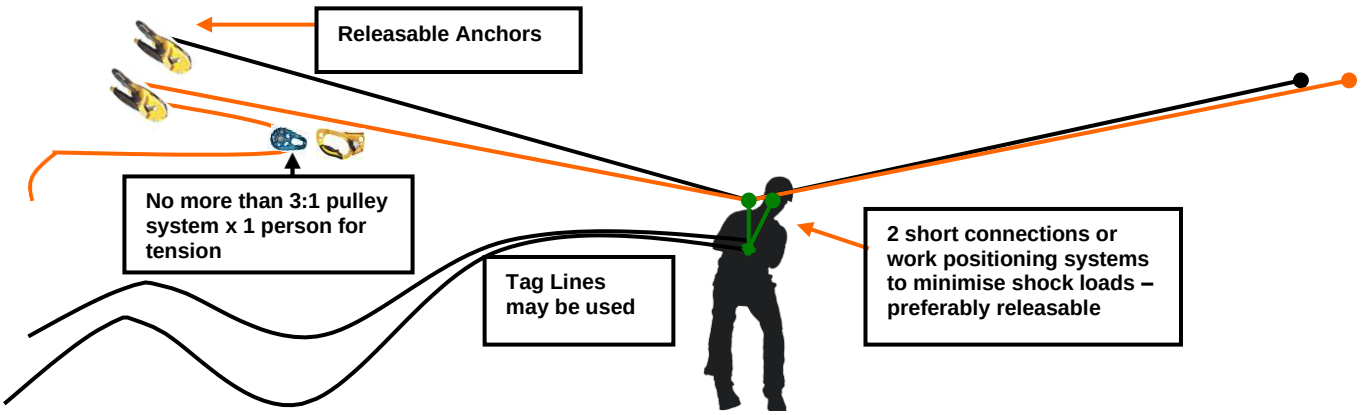


b) Pull to Retrieve

10.4 TENSIONED LINES

The rigging of tensioned lines is not as simple as people first think. Rigging angles, rescue and the job itself will all dictate your rigging system. The use of a 3rd or 4th rope system can help to share the loads to the anchor points. Tensioned lines may be used for Work Restraint, Work Positioning and/or Fall Arrest when rigged by a competent person.

When rigging a tensioned line it is very easy to exceed the SWL of your system when performing a rescue i.e. adding the extra weight of the rescuer to the tensioned line. One way to avoid this is to rig the system on releasable anchors such as descenders another way is to incorporate a tag line on the technician to pull them back along the system. Overloading of tensioned lines is a big concern. A basic 3-1 pulley system pulled by one person should be sufficient to gain the required tension. Avoid or minimise any shock loads being created when using tension lines.



See RIGGING ANGLES (Section 9.5 p60) for more information regarding anchor loading

11.0 AID CLIMBING Level 1/2/3

11.1 Mobile Anchors (Horizontal)

For this exercise you will need 3 x 1m wire strops (preferably plastic coated) and 2 etriers

There are a number of different ways to set up the equipment to undertake this exercise. One possible example is detailed below:

1) Ascend or descend to the point of transition
2) Attach a steel strop and cows-tail combination to the structure with an etrier attached
3) Attach the second steel strop, cows-tail and etrier to the structure
4) Attach the third steel strop and work positioning point (short connection) combination to the structure in-between the cows-tail strops. This can be achieved by standing in both etriers if needed
5) Remove all devices attached to the ropes
6) To move the outer attachments simply lift the weight off the legs and slide the strops along the structure
7) To move the centre strop the weight must be taken up on the etriers to allow the short link to be moved
8) If you encounter an obstruction detach each steel strop in sequence ensuring at all times that you maintain 2 points of attachment to the structure. When moving the centre steel strop you must first stand in the outer etriers to de-weight the strop to remove it from the structure
9) Upon completion of the task ensure 2 points of contact are reattached to the ropes before removing attachments from the aid route

11.2 Fixed Anchors (Horizontal)

For this exercise you will need 2 etriers and additional karabiners

1) Ascend or descend to the point of transition
2) Attach a cows-tail with etrier to the first anchor bolt
3) Attach a cows-tail with etrier tail to the second anchor bolt (this may be the cows-tail for the hand ascender)
4) Attach a third cows-tail/bull nose (short link)to the anchor bolt
5) Remove all devices attached to the ropes
6) To advance along the aid route you first remove the outer cows-tail and etrier combination (ensuring you already have 2 further attachments) and move it along to the next bolt in line
7) To move the centre attachment the weight must be taken up on the etriers to allow the short link to be removed
8) Alternate between the cows-tails to advance along the aid route
9) Upon completion of the task ensure that your ascenders / descenders / back-up equipment are reattached to the ropes before removing attachments from the aid route

Remember to check and count the number of attachments to the aid route before removal of any equipment. The most common cause of assessment failure on aid routes is where a candidate will count the number of attachments to a bolt, this is incorrect because if you have all 3 attachments to 1 bolt you are in fact attached by 1 point (to the aid route bolt) and this will result in a failure on the assessment.

11.3 Fixed Anchors (Vertical)

Level 2/3

Starting from ground level attach a cows-tail with etrier to the highest vertical bolt you can reach

1) Attach the second cowstail (short link) to the second vertical bolt
2) A suitable shock absorbing lanyard and etrier should be used for the third attachment. This can be attached to the lower vertical bolt
3) Stand in the etriers and move the short link to the top vertical bolt
4) Move the first cowstail and etrier higher up the vertical aid route
5) At this point you should have 3 connections to the vertical route
6) To advance up the vertical route you alternate the movement of the cowstails keeping your shock absorbing lanyard (cows-tail) as your lowest attachment

A shock absorbing lanyard must be used when cows-tail attachments exceed a fall factor 1. This is due to the limitations of dynamic rope in reducing the impact force on the user. In certain circumstances, a fall onto cows-tails greater than a FF1 can result in the user being subjected to forces greater than 6kN

Remember to check and count the number of attachments to the vertical aid route before removal of any equipment. The most common cause of failure is on aid route climbing where a candidate will count the number of attachments to a bolt, this is in correct, if you have 3 attachments to 1 bolt you are only attached by 1 point (to the vertical aid route) and this will result in a failure on the assessment.

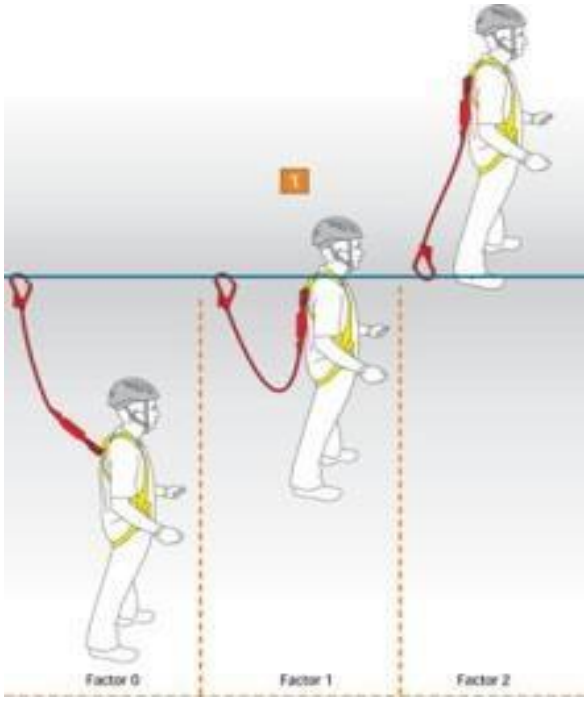
12.0 CLIMBING WITH FALL ARREST EQUIPMENT

Always follow the manufacturer information for calculating the ground clearance distance

The clearance distance is the total space between the anchor point and the nearest obstruction (or the ground). The clearance distance must include;

- 2 x lanyard length (to allow for low anchor points)
- Length of extended shock absorber or device slippage
- Distance between harness attachment point and the worker's feet
- Minimum stopping distance (normally quoted at 1m)

Shock absorbing lanyard example:



Fall Factors

Theoretical measurement of the severity of a fall

Length of Fall
Length of Lanyard = FF

The higher the number, the potentially more severe the fall

It all depends on what type of lanyard we are using however

e.g. a FF1 using a wire strop would result in much higher impact forces than a FF1 using shock absorbing lanyards

Diagram courtesy of Petzl

- Ensure the fall arrest lanyard is connected to a recognised fall arrest point on the harness. This will be either the sternal or dorsal points, (If in doubt consult the manufacturer's instructions)
- You must ensure that you always maintain the fall arrest connection in addition to yourself and/or a work positioning system
- When moving about the structure you must attach before detaching
- Attaching the spare or redundant lanyard to the solid point on a harness will prevent the full deployment of the shock absorber. This is dangerous and will potentially create greater stress loading on the harness and the operative. Such action will result in failure at assessment

Incorrect parking

of spare lanyard

- Ensure that when using the lanyards you **do not "choke"** the lanyard back on itself around the structure. This will result in the connector cross loading and could impose a force in excess of its minimum breaking load. This action will result in a failure at assessment

Incorrect

Attachment

Method

13.0 DESCENT RESCUE

13.1 Separate ropes

Level 1/2/3

1. Descend down to the casualty, lock your descender and position your back-up device as high as practical
2. Clear the ropes out of the way to avoid tangles which will complicate the rescue
3. Connect to the casualties harness`s sternal fall arrest point using your short cowstail
4. Connect a second point of attachment to the casualty
5. Unlock the casualty's descender and gently transfer the casualty's weight to you (via the short link) by operating their descender
6. When all the weight has been transferred, remove the casualty's descender and stow on their harness
7. Remove the casualty's back-up device and stow on their harness
8. Position the casualty so that you can protect them during descent/landing
9. Ensure you have placed the working rope through an additional friction karabiner connected to a structural part of your harness
10. Unlock your descender and continue down to the ground
    - **ENSURE THE BACK-UP DEVICE DOES NOT BECOME TIGHT AS IT WILL BEAR THE WEIGHT OF 2 PERSONS AND FREEING IT WILL BECOME EXTREMELY DIFFICULT**
11. When at ground level detach any connections from the casualty, conduct a first aid assessment and treat in accordance with current HSE recommendations

13.2 Casualty's ropes

Level 2/3

STARTING FROM GROUND LEVEL

1. Ascend up the casualty's back-up line using the casualty's working line as your back-up line, to a point where you are waist level with the casualty
2. The rescuer will then attach 2 points of attachment to the casualty. One can be the bull nose (short link) and a karabiner from the rescuers descender
3. Down climb using your ascenders to transfer your weight to the casualty via the attachments
4. The casualty may need to be brought to an up right position before you remove your ascenders. This can be achieved by placing a karabiner on the casualty's sternal fall arrest point and clipping to the rope above the casualty's descender (this may require 2 karabiners)
5. Ensure you have placed the working rope through an additional friction karabiner connected to a structural part of your harness
6. Unlock the casualty's descender and continue down to the ground
    - **ENSURE THE BACK-UP DEVICE IS FREE TO TRAVEL. FAILURE TO DO SO CAN RESULT IN THE BACK-UP DEVICE LOCKING ON TO THE SAFETY LINE. THIS WILL THEN BEAR THE WEIGHT OF 2 PERSONS AND FREEING IT WILL BECOME EXTREMELY DIFFICULT**
7. When at ground level detach any connections from the casualty, conduct a first aid assessment and treat in accordance with current HSE recommendations

14.0 ADVANCED RESCUES

14.1 Casualty on Ascenders (One method)

LEVEL2/3

1. If starting from ground level you will ascend the safety line of the casualty using the casualty's working line as your safety back-up line
2. When level with the casualty thread the casualty's descender onto their working line and attach it to their chest fall arrest point and lock
3. Run your foot loop through the casualty's foot loop karabiner and connect back to the casualty's sternal point on the harness thus creating a 1:1 advantage(a pulley will assist the advantage)
4. Stand in the foot loop while pulling up on the casualty. This will remove the casualty's weight from the chest ascender. Remove the chest ascender (if necessary take up any slack through the descender) lock it off and then lower the casualty on to their descender
5. Remove their hand ascender and stow
6. Connect yourself to the casualties' harness with 2 points then remove your ascenders and back-up device
7. Ensure the casualty is in an upright position, unlock the descender and using an additional friction karabiner, descend with the casualty to ground level
8. When at ground level detach any connections from the casualty, conduct a first aid assessment and treat in accordance with current HSE recommendations

14.2 Deviation Rescue (One method)

LEVEL 2/3

For the purpose of this rescue we will assume that the casualty is suspended from the rescuer.

1. Descend down until the deviation point is about level with your shoulders

2. If the deviation can be taken out because it is only keeping you near the place of work remove it and descend to ground level

3. If the deviation can not be removed consider re-rigging the deviation or follow with the procedure below;

4. Attach a second descender ,(taken from the casualty) ,to the back-up rope below the deviation

5. Use the casualty's back-up device to connect to the working line below the deviation

6. Continue to descend down until all the weight is transferred to the second descender below the deviation point

7. Remove the first descender and quickly remove any slack in the system

8. Remove the back-up device from above the deviation and continue to descend

14.3 Re-Anchor Rescue

(DESCENT)

14.3.1 SMALL FOR LEVEL 2

This can be done with either the casualty suspended from the rescuer or the rescuer suspended from the casualty. For the purpose of this rescue we will assume that the casualty is suspended from the rescuer. Ensure all connections to casualty are as short as possible.

1. Descend to the re-anchor
2. Ensure the ropes are placed to one side of the rescuer to prevent tangles
3. Attach a second descender (taken from the casualty) to the suspension point on the harness and attach to the new working line below the re-belay, remove as much slack as possible then lock
4. Unlock the your descender and continue down until the weight has transferred to the second descender below the re-belay and lock
5. Transfer the back-up device over to the new safety line and check it`s operation
6. Remove the first descender from above the re-belay and stow on your harness
    - Before transferring the weight to below the re-belay ensure the casualty is not tangled in the ropes. This is a common problem in a re-belay rescue
7. Unlock the descender and continue to ground level
8. Do not forget the use of an additional friction karabiner

14.3.2 LARGE FOR LEVEL 3

- The same method as 14.3.1 can apply for level 3. If the distance involved is particularly large you may want to consider passing the re-belay using the rope-to-rope method

14.4 RESCUE PAST KNOTS

LEVEL 3

The decision of how to suspend the casualty is down to the rescuer. There are several methods for passing knots, below is one possible method.

1. Descend to the knot on the working line ensure you stop about 1 metre above the knots

2. If the safety line has no knots in it you could attach a second descender (taken from the casualty) to the safety line and carry out a standard transfer of weight from one side to the other ensuring you maintain 2 points of contact at all times

3. Another possible solution is to tie a termination loop knot below the knot wishing to be passed. This can then be attached to a rope grab above your equipment creating a re-anchor with no obstruction below the temporary anchor point

4. Weight can then be transferred to a second descender placed underneath the re-anchor as per passing a re-anchor

5. Remove the first descender and continue down to the ground

6. A second back-up device or temporary back-up system can be used to pass any knot in the safety line

14.5 AID CLIMB RESCUE

LEVEL 2/3

There are many different ways to rescue from an aid climb situation this is just one example:

1. Aid climb to the casualty and rig two sets of ropes, (2 independent points are sufficient you do not need a Y-hang)

2. Attach their descender to the sternal fall arrest point on their harness, then thread the descender onto the working line, and take up any slack then lock

3. Attach a back-up device to the safety line and check the operation

4. Disconnect the casualties slack cows-tails

5. Use your foot loop through a karabiner to create a 1:1 counterbalance to de-weight the casualty from their connection to the aid route. Then lower them onto the descender

6. Connect to the casualty with 2 points remove yourself from the aid route and transfer onto the casualty

7. Ensure you have placed the working rope through an additional friction karabiner connected to a structural part of the rescuers harness

14.6HAULING & LOWERING RESCUES/SYSTEMS (Level 1/2/3)

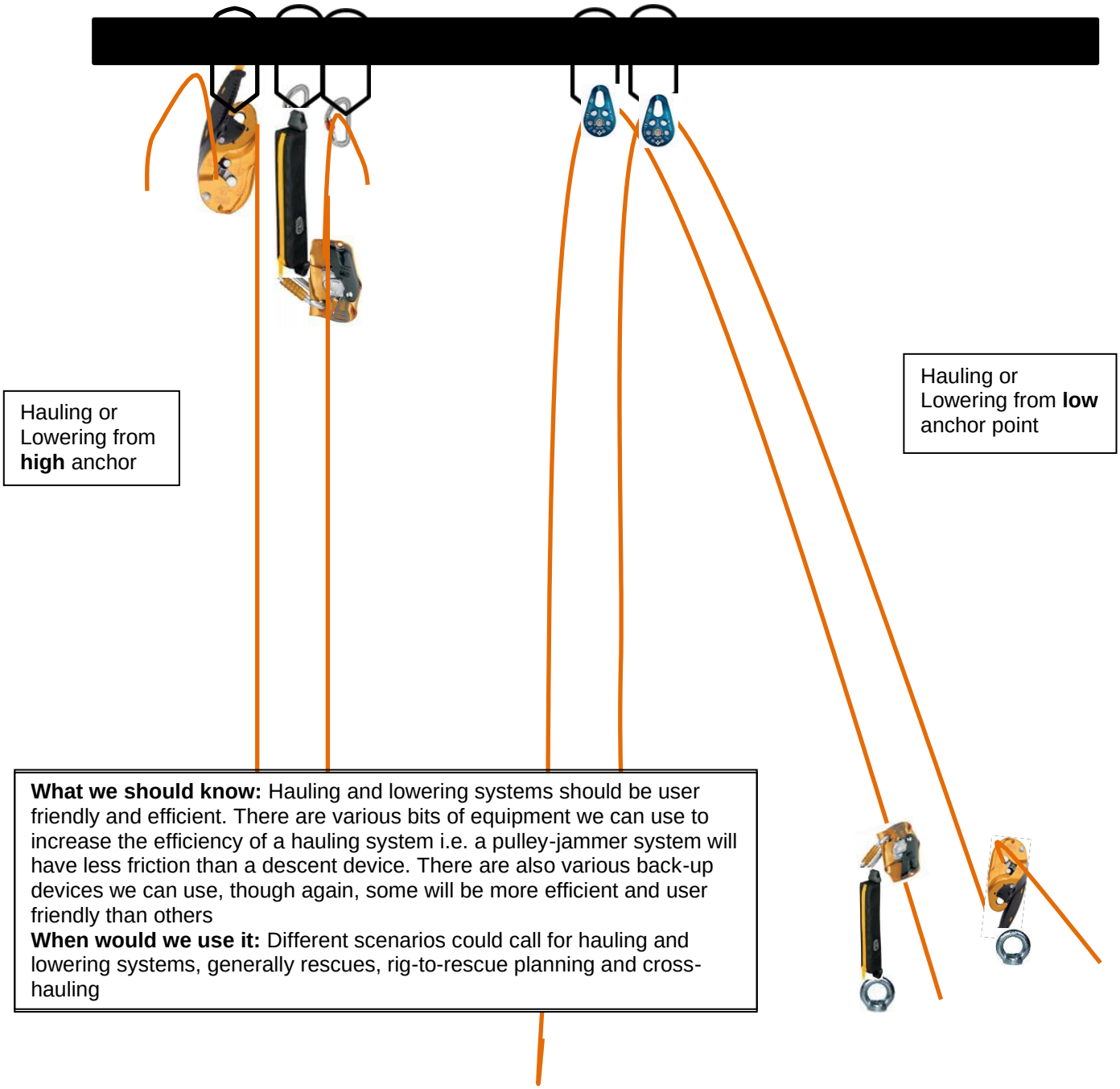
The rule of thumb when considering a rescue is to work with gravity not against it , unfortunately this is not always possible. All Level 3 technicians should consider how they will perform a rescue, what equipment they will need, the availability of manpower and the time the rescue may take. These items should be provided as part of the rescue brief. When considering the use of pulleys and a mechanical advantage in a hauling system, care should be taken to fully understand the amount of advantage that you employ. Typically 2:1, 3:1, 4:1, 5:1, 6:1 and 9:1 pulley system will, if used properly, assist in lifting a casualty, it must be noted that using mechanical advantage uses more rope and increasingly complicates the system.

When rigging the ropes at the start of the job, considerable time can be saved by incorporating suitable self locking descenders in the rigging. Typically these would be threaded to the working rope and safety back-up rope, providing an immediate method of lowering or retrieving, should a problem occur. (Rig to Rescue)

The use of a separate set of ropes which have been pre-rigged can form the basis of a rescue pack. This pack should also contain additional pulleys and ascent/descent equipment which you can employ to assist in a rescue.

The rescue route must be carefully considered; straight down to the ground may not be the best. The landing area must be free (as much as possible) from obstructions or protrusions and must offer the best possible access for the emergency services.
The rescuers involvement will not stop until the casualty has been handed over to the relevant emergency services.

4.6.1 Basic Hauling & Lowering Systems

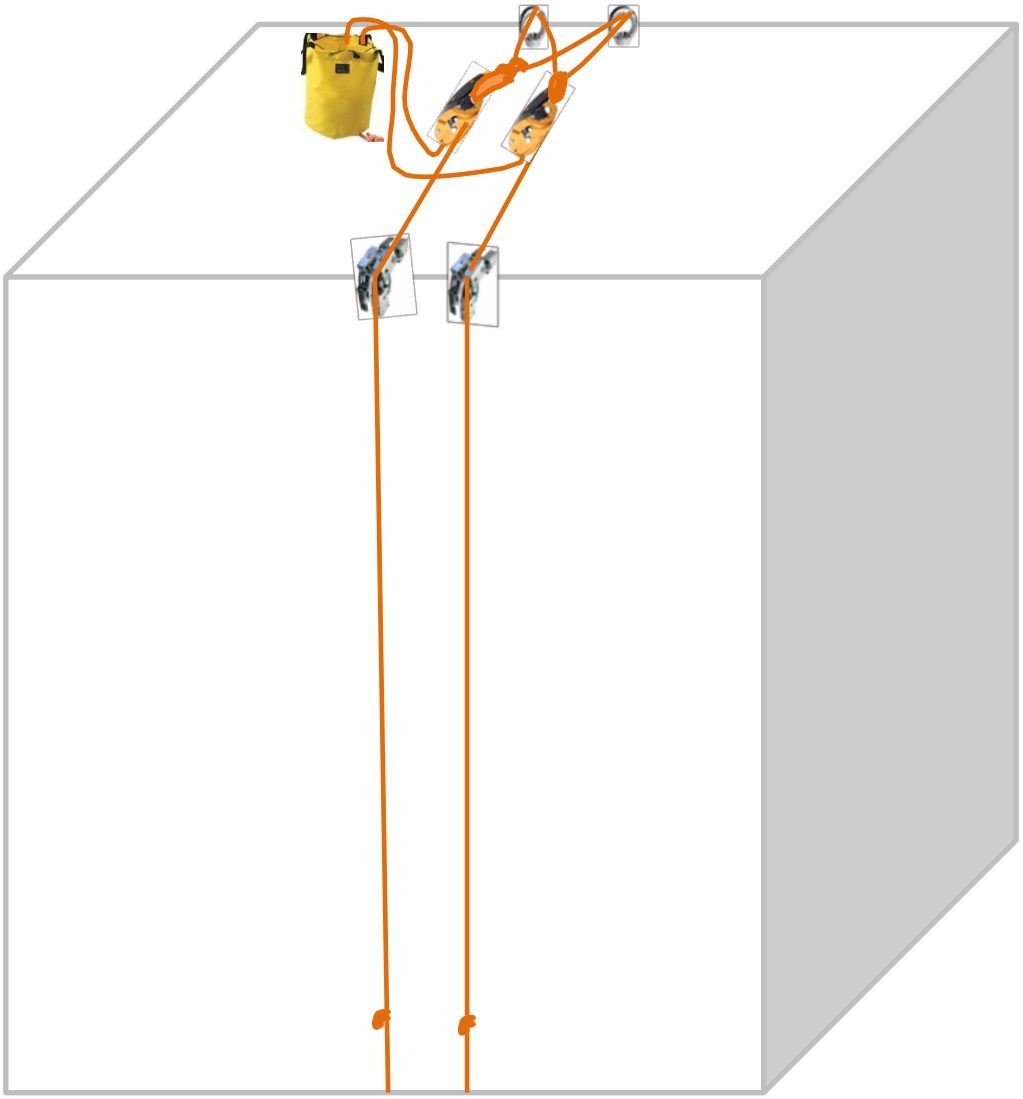


What we should know: Hauling and lowering systems should be user friendly and efficient. There are various bits of equipment we can use to increase the efficiency of a hauling system i.e. a pulley-jammer system will have less friction than a descent device. There are also various back-up devices we can use, though again, some will be more efficient and user friendly than others
When would we use it: Different scenarios could call for hauling and lowering systems, generally rescues, rig-to-rescue planning and cross-hauling

14.6.2 Rig-to-Rescue System

What we should know: Typical Rig-to-Rescue systems can eliminate the need for a rescuer to put his/her self at risk. It is not always possible and various factors need consideration, particularly the selection of equipment, amount of rope needed, type of work being carried out and obstructions to descent

One method:



When would we use it: Ideally, whenever possible as it reduces risk and time should a worker become incapacitated on the ropes.
Think: Consider what equipment to use as the releasable anchor point for both working and back-up systems. They must withstand shock loads and both must easily release.

15.0 KNOTS

The use of knots is a fundamental part of rope access. They constantly used to link the rope access technician to their anchors in one form or another. It is therefore important to understand the differences between various knots used in rope access. Here are some examples of acceptable knots for rope access.

Scaffold / Barrel Knot

Applications

- Mainly used to create a termination loop for cowstail connectors

Advantages

- When tightened it grips the connector preventing cross-loading
- Testing has shown the barrel knot to provide good shock absorption compared with other knots
- Very compact knot so can be useful when rigging space is limited

Disadvantages

- Can be tied incorrectly but look correct!!
- Can be difficult to untie when heavily loaded
- One way loading

Typical Strength Loss

- **23% - 33%**

Figure-of-Eight on the bight

Applications

- Can be used for attaching cowstails to the harness
- Termination loop for cowstail connectors
- Anchor system termination loop for connectors

Advantages

- Easily identifiable
- Relatively easy to release after being loaded
- Variations can be used for tying ropes together or re-threading around an attachment point

Disadvantages

- Not as compact as some knots

Typical Strength Loss

- **23% - 34%**

Figure-of-Nine on the bight

Applications

- Mainly used to create a anchor termination loop in rigging system

Advantages

- Easily releasable after being under load
- Very little strength loss in rope when tied correctly
- Good shock absorbing characteristics

Disadvantages

- Could release when not under load
- Bulky

Typical Strength Loss

- **16% - 32%**

Alpine Butterfly

Applications

- Mainly used in conjunction with a figure-of-8/9 on the bight to form a Y-Hang in rigging systems
- Can be used to isolate damage in the rope
- Can be used as a temporary mid-rope connection point between technician and anchors

Advantages

- A 3-way loading knot
- Easily adjustable to lengthen or shorten the loop

Disadvantages

- Can be tied incorrectly but look correct!!!
- If not tightened the loops of the knot can cause confusion

Typical Strength Loss

- **28% - 39%**

Double figure-of-eight on the bight (bunny-ears knot)

Applications

- Mainly used to create a Y-Hang as part of the rigging system

Advantages

- Can connect a rope to two anchor points by tying one knot
- Loop sizes are easily adjustable for anchor load equalisation
- Easy to release after being under load

Disadvantages

- Dressing the knot can be difficult
- Can cause confusion
- Each loop from the knot should have a separate anchor point
- One bunny ears knot needs to be tied for the working line and one needs to be tied for the safety line

Typical Strength Loss

- **23%-39%**

Overhand Knot

Applications

- Mainly used to tie cowstails to the harness

Advantages

- Easy to tie
- Small and compact
- Easy to identify

Disadvantages

- Not as strong as some Knots
- Can be difficult to untie after being heavily loaded

Typical Strength Loss

- **32%-42%**

Stopper Knot

Applications

- Stopper knots are placed in the end of every rope that is rigged to stop technicians abseiling off the rope accidentally

Advantages

- Easy to tie
- Small and compact
- Limited chance of coming undone (30cm from end)
- Unlikely to damage equipment

Disadvantages

- Can get caught in different structures when de-rigging as with any knot

Typical Strength Loss

- **N/A**

European & British Standards

BS7883 – Code of practice for the design, selection, installation, use and maintenance of anchor devices conforming to BS EN 795. 2005.
BS8405 - Personal protective equipment against falls from a height. Descender devices. Single-hand operated descender devices for self or assisted rescue. 2003+A1:2009.
BS8437 – Code of practice for selection, use and maintenance of personal fall protection systems and equipment for use in the workplace. 2002
BS8454 – Code of practice for the delivery of training and education for work at height and rescue 2006

BS8513 – Personal fall protection equipment. Twin-legged energy-absorbing lanyards. Specification 2009

EN ISO 9001 – Quality management systems. Requirements. 1994, later superseded in 2000 & 2008.
EN ISO 20345 – Personal protective equipment. Safety footwear, 2004.

EN166 – Personal eye protection. Specifications, 1995 later superseded in 2002.
EN341 – Personal protective equipment against falls from a height. Descender devices. 1992.
EN353-1 – Personal protective equipment against falls from a height. Guided type fall arresters including a rigid anchor line, 1992, later superseded in 2002.
EN353-2 – Personal protective equipment against fall from a height. Guided type fall arresters including a flexible anchor line. 1992, later superseded in 2002.
EN354 – Personal protective equipment against falls from a height – Lanyards. 1993, later superseded in 2002.
EN355 – Personal protective equipment against falls from a height – Energy absorbers. 1993, later superseded in 2002.
EN358 – Personal equipment for work positioning and prevention of falls from a height. Work positioning systems, 1992, later superseded in 1999.
EN360 – Personal protective equipment against falls from a height. Retractable type fall arresters, 1992 later superseded in 2002.

EN361 – Personal protective equipment against falls from a height – Full body harnesses. 1992, later superseded in 2002.
EN362 – Personal protective equipment against falls from a height – Connectors. 1992, later superseded in 2004.
EN363 – Personal fall protection equipment. Personal fall protection systems. 1992 later superseded in 2002 & 2008.
EN364 – Personal protective equipment against falls from a height. Test methods, 1992.
EN365 – Personal protective equipment against falls from a height – General Requirements for instructions for use and for marking. 1992, later superseded in 2004.
EN397 – Specification for industrial safety helmets, 1995.
EN564 – Mountaineering equipment. Accessory cord. Safety requirements and test method. 1992, later superseded in 1997 & 2006.
EN566 – Mountaineering equipment –Slings –Safety requirements and test methods. 1997, later superseded in 2006.
EN567 – Mountaineering equipment. Rope clamp. Safety requirements and test method. 1992, later superseded in 1997.
EN795 – Protection against falls from a height – Anchor Devices – Requirements and Testing. 1996.
EN813 – Personal fall protection equipment. Sit harnesses, 1997, later superseded in 2008.

EN892 – Mountaineering equipment. Dynamic mountaineering ropes. Safety requirements and test methods. 1992, later superseded in 2004.
EN1263-1 – Safety nets. Safety requirements, test methods, 1997, later superseded in 2002.
EN1263 -2 – Safety nets. Safety requirements for the positioning limits, 1998 later superseded in 2002.
EN12841 – Personal fall protection equipment. Rope access systems. Rope adjustment devices. 2006.
EN1492-1 – Textile slings. Safety. Flat woven webbing slings made of man-made fibres for general purpose use, 2000+A1:2008.
EN1492-2 – Textile slings. Safety. Roundslings, made of man-made fibres, for general purpose use, 2000+A1:2008.
EN1492-4 – Textile slings. Safety. Lifting slings for general service made from natural and man-made fibre ropes, 2004+A1:2008.
EN1496 – Personal fall protection equipment. Rescue lifting devices, 1996 later superseded in 2006.
EN1497 – Personal fall protection equipment. Rescue harnesses, 1996 later superseded in 2007.

EN1498 - Personal fall protection equipment. Rescue loops, 1996 later superseded in 2006.
EN1808 – Safety requirements on suspended access equipment. Design calculations, stability criteria, construction. Tests, 1999+A1:2010.
EN1868 - Personal protective equipment against falls from a height. List of equivalent terms. 1997.
EN1891 – Personal protective equipment for the prevention of falls from a height. Low stretch kernmantle ropes. 1998.
EN7985 – Code of practice for the use of rope access methods for industrial purposes. 2002 later superseded in 2009.
EN12275 – Mountaineering equipment. Connectors. Safety requirements and test methods. 1998.
EN12277 – Mountaineering equipment. Harnesses. Safety requirements and test methods, 1998, later superseded in 2007.
EN12278 – Mountaineering equipment. Pulleys. Safety requirements and test methods, 1998, later superseded in 2007.
EN12492 – Mountaineering equipment. Helmets for mountaineers. Safety requirements and test methods, 2000.
EN12841 – Personal fall protection equipment. Rope access systems. Rope adjustment devices. 1996

EN13374 - Temporary edge protection systems. Product specification, test methods. 2004.
EN14052 – High performance industrial helmets, 2005.

Please note that the current revised version of any of the detailed standards, as well as other current standards are detailed at ***www.bsigroup.co.uk*** together with any subsequent amendments.

Notes

Notes