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IRATA INTERNATIONAL GUIDELINES

(Insert frontispiece letter drafted by David Thomas, HSE)

FOREWORD

IRATA, the Industrial Rope Access Trade Association, was formed as a result of an initiative by a number of leading British companies involved in industrial rope access techniques. The association's main aim is to promote the development of rope access techniques and to ensure that its members work in a safe and effective manner. It has become clear that the systems of access and training developed by IRATA have international relevance. This is reflected in the fact that the Association has (year 2000) members based in Australia, Netherlands, Canada, Malaysia and Norway as well as the UK., with contacts spanning far more countries around the globe.

Full members of the association are subject to stringent entrance qualifications and audit to ensure that they meet IRATA's requirements for quality assurance, safety, training and working practices. The benefits of these procedures and requirements are reflected in the very low level of accidents reported by IRATA members. By the end of 1998, members had recorded nearly four million man-hours of work on ropes with an incident rate of less than three per 100,000 hours. Virtually all these accidents or incidents were so minor that they were not reportable under the requirements of UK regulations.

This document is a distillation of the full UK IRATA guidelines, with references to UK laws and regulations removed. In this form it is hoped that it will provide an operational basis for IRATA members worldwide. The guidelines have been compiled using the experience of established rope access contractors and recommend known good working practices. It should be noted that these international guidelines cannot interpret the law in any country, and do not relieve employers of their duties under the various legal requirements that may relate to their specific situation and applications. It should also be noted that the guidelines apply to industrial rope access work only, where the prime activity is the work itself: they are not intended to cover, for example, leisure activities or emergency evacuation systems and their procedures, although trainees in such other activities would probably benefit from a level of protection similar to that advised within these pages.

Although care has been taken to ensure, to the best of IRATA's knowledge, that the contents of these guidelines are accurate to the extent that they relate to either matters of fact or accepted practice or matters of opinion at the time of publication, IRATA assumes no responsibility for any errors or misinterpretations of such contents or any loss or damage arising from or related to their use.

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0. INTRODUCTION

0.1 These guidelines give practical advice on the duties placed on employers, employees and self-employed people who use specialist rope access methods for work at a height. These duties are those required for basic health and safety requirements, which have been developed by IRATA into requirements for good practice in Rope Access. Current rope access techniques have developed from those used in caving and climbing, but with additional safeguards to reflect the different attitude and conditions required in the workplace from that normally accepted in these sports. The guidelines include recommendations concerning the type of equipment that could be used, the level of experience and training of the workers and the setting of overall objectives. Future developments in equipment design may provide an alternative means of meeting the objectives.

0.2 The advice in this document may be relevant to work carried out on offshore installations..

1. SCOPE

1.1 These guidelines apply to those techniques whereby access is gained to buildings, other structures (on or offshore) or geological features (such as cliff faces), by means of ropes suspended from the structure or the features concerned. They apply to all cases where ropes are used for rope access work:

a) as the primary means of support;

b) as a primary means of protection in preventing a fall;

c) where people descend or ascend on a rope or traverse along horizontal rope.

1.2 The guidelines are not intended to apply to leisure activities, emergency personal evacuation systems or where rope access techniques are used by the fire brigade and other emergency services for rescue work or for training in connection with these services.

2. References

2.1 European Standards

Although these guidelines are intended to be relevant on a world-wide basis, it is a fact that they have been compiled with specific reference to many European Standards. These are listed below, to assist those working outside Europe to match these standards to those which apply in their countries.

EN 166:1996 Personal eye protection. Specifications
EN 167:1995 Personal eye protection. Optical test methods
EN 168:1995 Personal eye protection. Non-optical test methods
EN 341:1993 Personal protective equipment against falls from a height - Descender devices (for rescue)
EN 352 Hearing protectors. Safety requirements and testing (3 parts) 1-1993, 2-1993, 3-1997
EN 355:1993 Personal protective equipment against falls from a height - Energy absorbers (Under revision July 1999)
EN 361:1993 Personal protective equipment against falls from a height - Full body harnesses (Under revision July 1999)
EN 362:1993 Personal protective equipment against falls from a height. Connectors (Under revision July 1999)
EN 374:1994 Protective gloves against chemicals and micro-organisms
EN 388:1994 Protective gloves against mechanical risks
EN 397:1995 Specification for industrial safety helmets
EN 407:1994 Protective gloves against thermal risks (heat and/or fire)
EN 420:1994 General requirements for gloves + amd. 8515 Feb 1995
EN 567:1997 Mountaineering equipment. Rope clamps. Safety requirements and test methods

EN 795:1997 Protection against falls from a height. Anchor devices. Requirements and testing
EN 813:1997 Personal protective equipment for the prevention of falls from a height. Sit harnesses
EN 892:1997 Mountaineering equipment. Dynamic mountaineering ropes. Safety requirements and test methods
EN 1263-1:1997 Safety requirements, test methods for safety nets
EN 1263-2:1998 Safety requirements for the erection of safety nets
EN 1808:1999 Safety requirements on suspended access equipment - Design calculations, stability criteria, construction - Tests
EN 1891:1998 Personal protective equipment for the prevention of falls from a height. Low stretch kernmantel ropes
EN 12275:1998 Mountaineering equipment. Connectors. Safety requirements and test methods
EN 12277:1998 Mountaineering equipment. Harnesses. Safety requirements and test methods
PrEN 12492 Mountaineering equipment. Helmets. Safety requirements and test methods
PrEN 12841 Personal protective equipment for the prevention of falls from a height: Rope access work positioning systems - Rope adjustment devices

2.2 International Standards

ISO 9000 Quality management and quality assurance standards
UIAA B, C, E, F and J, ropes, karabiners, harnesses, helmets, stitched tape slings

2.3 IRATA

IRATA Training Scheme - General Requirements for certification of personnel engaged in industrial rope access methods
IRATA Statement of Medical Condition

3. DEFINITIONS

For the purposes of these guidelines, the following definitions shall apply:

Anchor; anchorage: place, fixing or fixture to which an anchor line is connected.

Anchor line; Anchorage line: flexible line connected at least at one end to a reliable 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: rope adjustment device which, when attached to a rope of appropriate diameter, will lock under load in one direction and slip freely in the opposite direction.

Back-up device: rope adjustment device for a safety line which accompanies the user during changes of position or allows adjustment of the length of the safety line, and which locks automatically to the rope, or only allows gradual movement along it, when a sudden load occurs.

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

Body support: belt or harness.

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: openable safety device, which enables a person to link himself or herself directly or indirectly to an anchor.

Cow's tail: short strop or sling connected to the main attachment point of the harness.

Descender: manually operated, friction inducing, rope adjustment device, which allows the user to achieve a controlled descent and a stop with hands off anywhere on the anchor line.

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.

Failure load: minimum breaking load of an item of equipment when it is new.

Fall factor: maximum height a person could fall if held by the rope, divided by the length of the rope from the person to the anchor point.

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 ('screwgate 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 attachments 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 .

Low-stretch rope: textile rope with lower elongation and, therefore, less energy absorbing characteristics than dynamic rope.

Maillon rapide; quicklink: type of connector formed as an open loop, which is closed by a threaded sleeve.

Proof load: test load applied to verify that an item of equipment will not exhibit permanent deformation under that load, at that particular time. This result can then be theoretically related to the performance of the test piece under its expected conditions in service.

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.

Rope adjustment device: component which, when fitted to an anchor line, will enable the user to vary their position along it.

Safe working load (SWL): designated maximum working load of an item of equipment under particular, specified conditions. See also working load limit (WLL)

Safety line; safety rope; secondary rope; back-up rope: anchor line provided as a safeguard. This is the rope used to protect against falls if the rope access worker slips or if the primary support (e.g. the working line), anchor or positioning mechanism fails.

Safety method statement: document prepared by the employer describing how a particular job (or types of job where these will be essentially identical) should be undertaken to ensure that any risks to the health and safety of the workers, or others who may be affected, are minimised.

Sentry: person responsible for keeping watch to safeguard the anchorage areas and/or the area of ground below the workers. Such a person should be a full member of the work team but need not be a trained rope access worker.

Static rope: old term for rope with lower elongation characteristics than dynamic rope, superseded by the term 'low stretch rope'. Now only applies to ropes with negligible stretch, e.g. wire, Kevlar, which show little extension at failure and hence have little ability to absorb shock loads

Suspended scaffold: scaffold suspended by means of ropes or chains and capable of being raised or lowered by such means but does not include a boatswain's chair or similar apparatus

Working line; working rope: anchor line used primarily for work positioning and restraint including descending and ascending.

Working load limit: maximum load that can be lifted by an item under conditions specified by the manufacturer

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.

Zero targeting: establishment of a system of working which aims to achieve zero accidents, zero waste and zero defects.

4. LEGISLATION

4.1 The relevance of any act or particular set of regulations may vary depending on the country, location and type of work being undertaken. It is the duty of every employer to ensure that they comply with any particular legal safety requirement which applies to their type of work or to work in that particular country.

4.2 It should be the duty of clients, owners and designers of structures to ensure that, so far as is reasonably practicable, any work to be carried out in the workplace will be able to be performed safely. Employers and those commissioning rope access work are therefore advised to consider if such work can be carried out safely from/on the structure.

4.3 It is essential that employers fully understand the safeguards required when they propose to undertake work that might involve their workers coming into contact with hazardous materials or atmospheres. This applies equally to on and offshore working.

5. GENERAL PRINCIPLES FOR A SAFE AND EFFECTIVE SYSTEM OF WORK USING ROPE ACCESS

5.1 Clear requirements should be set for all aspects of work that is to be undertaken in high exposed situations using rope access techniques. The work situation should also be carefully assessed to ensure that all the risks to safety and the quality of work are fully understood. (See 12.1.2.) These two basic requirements will probably be met if those permitting, planning, supervising and carrying out the work ensure, so far as they are able, that the safety objectives given in 5.2 and 5.3 are met.

5.2 The primary objective is to so organize, plan and manage the work that there will be an adequate margin of safety to minimize any risks, with a goal of zero accidents (zero targeting). See 12 for further advice on this.

The other objectives deal with the setting up of the work method itself. These are to ensure that:

a) methods are chosen that are appropriate for the proposed work .

b) the people chosen for the work have a suitable attitude for working at a height. See 6;

c) those doing the work are thoroughly trained in accordance with IRATA requirements in safe rope access methods. See 7 and 12;

d) the work is properly managed and supervised by competent persons and the workers are regularly monitored to ensure that they continue to work in a safe manner. See 7 and 12;

e) the workers are properly clothed and have suitable personal protective equipment (PPE). See 8;

f) the suspension equipment is adequate for the work. See 8;

g) any tools and equipment used in the work will not endanger the workers' health or safety. See 12.4.

5.3 In planning to meet these objectives, it should be noted that it is mandatory under IRATA requirements to include the provision of at least one alternative means of support to prevent a person falling, e.g. a working line plus a safety line. (See 12.3.3.5 and 12.3.3.6.) This means that, should any one item fail within the suspension system, there will be an adequate back-up to prevent an accident.

5.4 Reporting of injuries, diseases and dangerous occurrences

5.4.1 Reporting accidents and ill health at work is a legal requirement in many countries. Any accident where the time lost by the injured person is over three days, or where a serious incident (dangerous occurrence) has occurred, should be carefully recorded and should include information on the time lost by the injured person and others in the work team.

5.4.2 In order to highlight the industry's safety record, and to assist with IRATA's aim of continuous improvement of working methods, it is essential that the IRATA accident return be completed for all accidents, incidents or near misses, and returned promptly to IRATA, when requested.

6. SELECTION OF WORKERS

6.1 To work safely at a height requires those engaged in the work to have an appropriate attitude and aptitude for such work. Therefore, some form of screening will be required to properly assess all prospective employees.

6.1.1 Those who work at a height need to be confident in exposed places, but not overconfident or reckless. Frequently, these workers will work in remote places or will be out of sight of their supervisors. It is, therefore, especially important that the workers can be always relied upon to behave in a sensible and responsible manner.

6.1.2 Candidates should be carefully assessed as being sufficiently physically fit and free from any disability that may prevent them from working safely. Ideally, all prospective employees should be in possession of an applicable full industrial medical certificate before starting this kind of work and should be re-assessed at regular intervals thereafter. As a minimum, before assessment, candidates are required to complete the IRATA Statement of Medical Condition and to get their doctor to sign it.

6.2 To assess whether a person is suitable for rope access work requires detailed consideration of their previous experience. Where candidates claim to have experience in rope access work, prospective employers should check their personal records and other references. (See 7.2.7. and 7.2.9.)

6.2.1 Other suitable experience could include caving, mountaineering and working at a height using other means of access. Employment with emergency services and possibly defence forces may also be relevant, if a person has been regularly engaged in the use of methods that involve being exposed at a height. Where practicable, references should be taken up to verify claimed experience and levels of competence.

6.2.2 In the absence of relevant experience, an assessment of the candidate's aptitude should be carried out before they are offered work or given training. Unless the employer has the relevant expertise to do this, assistance from a competent outside organisation should be sought (e.g. a recognised provider of training in rope access work: see 7.2.2).

7. TRAINING AND SUPERVISION

7.1 General

Rope access work can only be carried out in a reliably safe manner where people are competent, suitably experienced and trained, capable of inspection of their own equipment and subject to appropriate levels of supervision. Because of the potential hazards associated with this work, it is essential that people are properly trained in the use of the methods of access that they will use. IRATA has developed a formal training scheme and grading structure where workers are grouped into three grades, depending upon their

experience and level of assessment. These are: level 1: technician, level 2: lead technician (more experienced worker) and level 3: supervisor, as defined in the IRATA publication *General Requirements for certification of personnel engaged in rope access methods.* The basic requirements for the three levels are as follows:

Level 1: a technician who is able to perform a limited range of rope access tasks under the supervision of a level 3 supervisor.

Level 2: a lead technician who is capable of rigging working ropes, undertaking rescues and performing other rope access tasks under the supervision of a level 3 supervisor.

Level 3: a technician/supervisor who is capable of complete responsibility for work projects; is able to demonstrate the skills and knowledge required of levels 1 and 2; is conversant with relevant work techniques and legislation; has a comprehensive knowledge of advanced rescue techniques; holds a current first aid qualification and has knowledge of the IRATA certification scheme.

All IRATA members are obliged to use the IRATA scheme. The person responsible for the work site should only allow rope access methods to be carried out by persons who are experienced operatives, trained and assessed to IRATA standards. This includes any representative of the client (but see 7.3.3).

7.2 Training

7.2.1 To become an IRATA level 1 technician, candidates must successfully undertake an IRATA approved training course and assessment. Once this has been satisfactorily completed, the person may then be allowed to work using rope access techniques, although this must be under close supervision.

7.2.2 Training is best provided, or monitored, by a competent outside organisation or person, to ensure that the standard is to a universal level. This recommendation is covered in the IRATA training scheme by the use of an independent IRATA approved assessor to check and validate candidates at the end of a trainee's course.

7.2.3 For newly qualified technicians, additional precautions need to be taken. These include only gradually introducing them to the work. Initially they should only be allowed to carry out the most straightforward operations, under the direct control of a supervisor. As the supervisor becomes satisfied that they are fit to do so, the new technicians should then be allowed to progress gradually to working under the close supervision of an experienced worker. At this stage, the experienced worker would be required to check that all items of the inexperienced worker's suspension equipment were correctly secured before they were allowed to start work.

7.2.4 Most workers will be in the learning process for some time after completing their basic training. Therefore, they should be continuously assessed by the supervisor and not allowed to work without close supervision until the supervisor is satisfied that they have achieved a suitable level of competency. This would occur when they had demonstrated that they had suitable knowledge and experience to carry out the full range of jobs that they were likely to encounter, in a safe and effective manner, and were capable of acting properly, within the limits of their level of competency, in any emergency which might reasonably arise.

7.2.5 To achieve the next level, where the person could be regarded as an experienced worker, i.e. level 2 (or lead technician), level 1 technicians must log at least 500 working hours using rope access techniques. They must then undergo further training and assessment.

7.2.6 Before a level 2 (lead technician) can become a supervisor, at least a further 1000 working hours using rope access techniques must be logged, i.e. a minimum total of 1500 hours. In order to reach level 3 (or supervisor) standard, further training and then assessment by an IRATA assessor is required. This is particularly to ensure that the person has the necessary skills and is competent to supervise others and assess their abilities to work safely.

7.2.7 Employers must consider ways of maintaining their employees' level of ability. To do this, they will need to attend a renewal assessment at least every three years. Refresher training

at shorter intervals is appropriate for workers who have not been continuously engaged in this work. Due to the aptitude and mental conditioning that is required for exposure to height, workers who have not been engaged in rope access work for six months or more should attend a suitable refresher course before being allowed to work in this manner. This may be either a refresher course or a full course at the appropriate level. All refresher courses should include all the techniques covered at level 1. For level 2 and level 3 technicians, the refresher course should concentrate on rigging and rescue procedures. (See *IRATA General requirements for certification of personnel, etc.)*

7.2.8 Rescue procedures should be practised at regular intervals and before the start of any work in situations that are unfamiliar to any of the work team. See 12.3.5.

7.2.9 Workers should be registered under the IRATA training scheme and have a personal record log showing the training received and describing their work experience. This will assist employers in the verification and monitoring of a worker's experience. Employers taking on new workers should assess this log. (See 6.2.)

7.3 Supervision

7.3.1 The level of supervision should be appropriate to the work situation and the numbers and skills of the work team. (See 12.3.1.) The supervisor's role is to ensure that the work and the workers proceed in accordance with the IRATA guidelines: that is to aim for zero accidents, zero waste and zero defects.

7.3.2 As part of their duties to maintain a safe place of work, employers should control any tendency of employees to work in an undisciplined manner by recording this in their personal logbooks. An amending note cancelling any adverse comments would not then be made until the employer was completely satisfied that there would be no recurrence.

7.3.3 Occasions may arise where a client's representatives or other people not employed by the contractor need to inspect the work. Both the contractor and the client should arrange systems to ensure that such persons will be able to do this safely. This could be done, for example, by providing additional top-rope protection. In addition, it would be necessary for the supervisor to check personally that all items of such a person's suspension equipment were correctly secured and of a suitable standard and condition. They would then also supervise them throughout the ascent or descent as though they were new trainees.

7.3.4 It is recommended that companies operating with rope access techniques should nominate one person to be the main contact point for matters relating to the safety training and regulatory aspects of rope access. This 'company nominated person' should be suitably knowledgeable, experienced and qualified in such matters.

7.3.5 Supervisors of offshore working should be familiar themselves with the offshore environment, the working conditions and practices, and particularly the essential liaison necessary with other platform personnel.

8. SELECTION OF EQUIPMENT

8.1 General

8.1.1. **Risk assessment**

Before selecting and/or using equipment, the risks involved to health and safety for each job must be assessed

8.1.2 Standards

8.1.2.1 Equipment should be selected which meets standards (norms) relevant to the intended use. These could be International Standards Organisation (ISO); International Union of Alpine Associations (UIAA); European (EN) (Which now encompass separate national standards such as British (BS), German (DIN), & French (AFNOR) etc); American (ANSI, NFPA. . .) ; Australian/New Zealand (AN/NZS); South African (SABS); etc.

8.1.2.2 IRATA documentation and systems were developed with reference to European Standards, which are listed. For work within Europe equipment complying to EN standards, will be the

appropriate choice. Outside Europe the nearest equivalent nationally recognised standard, or international standards such as ISO or UIAA may be applicable.

8.1.2.3 If there is doubt about whether or not a particular standard is relevant to the intended use, talk it over with the manufacturer of the equipment; they will usually be able to offer advice.

8.1.3 Compatibility

When selecting equipment, ensure that components in any system are compatible and that the safe function of any one component will not be affected by, or interfere with, the safe function of another. Sometimes this is not obvious so it is worthwhile checking with the supplier or the manufacturer.

8.1.4 Knowledge of equipment

Product information must be supplied by the manufacturer. This information should be read and understood by the user **before** using the equipment. This also applies to replacement equipment, because changes might have been made to the original specification or advice given. Knowledge of the strengths and weaknesses of equipment will help to avoid misuse. This knowledge can be enhanced by studying the information provided with the product and other technical brochures and catalogues.

8.2 Clothing and protective equipment

8.2.1 Workers should be properly dressed and equipped, appropriate to the work situation and conditions.

8.2.2 Working at a height can make it difficult for the worker to avoid exposure to harmful substances or extremes of climate. The employer needs to assess carefully what would be the most appropriate clothing to guard against such hazards. This equipment should be provided and appropriate measures taken to ensure that it is worn.

8.2.3 Local legislation for ensuring the health and safety of the workers must be met.. It is advisable to follow these regulations whether the work place is a 'site of construction' or not. Workers will need to wear **protective helmets**: those complying with a standard for helmets for mountaineers - e.gs: European standard *EN 12492* , or the UIAA helmet standard - are recommended, because they have more appropriate performance requirements than those of industrial helmets. Some industrial helmets are not suitable because performance requirements considered necessary for the safety of rope access workers may not be covered. Examples are: side impact resistance and effective Y-chinstraps. Helmets should always be used with the chinstrap fastened.

8.2.4 Persons working to these guidelines are also required to wear:

a) suitable **overalls** that have no loose flaps or attachments which might be caught in any moving equipment. They should be reasonably wind proof and all pockets should also be fitted with zip or Velcro type fastening rather than buttons. Waterproof clothing should be provided for work in wet conditions;

b) suitable **protective footwear** of stout construction, which fits well, provides a good grip and gives suitable protection against water or cold.

8.2.5 If equipment is to be fitted to the user (e.g. a harness), it is important that it is comfortable to wear and fits the wearer properly when correctly adjusted. This should be ascertained in a safe place, before work commences. It is also important that such equipment does not significantly hinder the wearer from carrying out their duties or from properly manipulating the rope ascent/descent devices.

8.2.6 The following items may also be required:

a) **gloves**, to protect against cold weather or where the equipment or materials used might cause injury or harmful effects on the skin.

b) **eye protection**, where debris is being cleared or material is being chipped away, or where drilling, blasting or percussion operations are being undertaken. Eye protection will probably also be required if chemicals are being sprayed or painted which could cause irritation or damage to the eyes.

c) **respiratory protective equipment**, where there is a risk of inhalation of harmful chemicals or dusts. Many building chemicals are liable to be harmful, particularly in a situation where a worker is unable to get quickly to a source of fresh water to dilute or wash the chemical away:

d) **hearing protectors**, when the noise levels in the vicinity could cause a risk of hearing loss to workers.

e) suitable **buoyancy or life jackets** when working over water. These should be of a type capable of being secured to the wearer so that they cannot accidentally come loose in the event of a fall. In addition, they should not obstruct the wearer or prevent the efficient operation of the rope ascent/descent devices.

8.2.7 If working offshore, any intention to depart from installation 'standard' personal protective equipment (e.g. lifejackets, eye protection, rig boots, helmet), for whatever reason, should first be cleared with platform staff (Offshore installation manager, safety officer, area authority, as appropriate).

8.3 Suspension and work positioning equipment for personnel

8.3.1 General

8.3.1.1 All equipment used in the access system requires adequate static and dynamic strength to withstand any loads or forces which may be imposed on it, with an adequate safety margin in addition. Such equipment should only be loaded in accordance with the manufacturer's user instructions. Some equipment is traditionally supplied with a safe working load or a working load limit. Other personal protective equipment (such as low-stretch ropes, harnesses, ascenders etc) is tested to stated minimum breaking loads. This is an acceptable alternative to safe working loads or working load limit. Dynamic rope is supplied with a statement of number of dynamic test-falls held.

8.3.1.2 Rope access equipment generally exceeds the 5:1 requirement for lifting gear. In the case of ropes it is typically over 10:1, thus allowing for the weakening effects of knots and the wear and tear associated with rope use. The behaviour under load of energy absorbing components in the system such as dynamic cows tails, load-limiting back-up devices and semi-static (**not** static) ropes is designed to absorb any impact forces that might reasonably be expected or envisioned. Falls are not acceptable in suspended rope access, and the system generally should be designed to be a work positioning system with fall-avoidance built in. The limited dynamic forces which may be generated, and resisted, arise, for example, from braking whilst abseiling. A lower-stretch system, based on the use, for instance, of ropes to EN1891, allows for adequate energy absorption, whilst in general being the most effective. However where the techniques are extended to include climbing and traversing, falls may be possible and appropriate dynamic equipment should be chosen and precautions taken.

8.3.1.3 Any equipment chosen to support a person at a height should be such that it cannot be accidentally removed, dislodged or become unfastened from the rope while a person is suspended from it. This applies particularly to connectors, descenders, ascenders, back-up devices and harnesses.

8.3.1.4 All equipment should carry a unique marking to allow traceability to any test, inspection, thorough examination or certificate of conformity. If the manufacturer or supplier has not already provided such marking care should be taken not to mark the equipment in a manner that will impair its integrity. (See 9.4.)

8.3.2 Work positioning equipment

If the planned method of work is for the user to be in a partly or entirely supported position, as is the normal case for rope access work, then work positioning equipment may be chosen. In addition to its primary function of providing support, this equipment is designed to be strong enough to arrest a free fall of limited distance and force but will not meet the other essential requirements of a fall arrest system, unless combined with appropriate components. Work positioning body supports for rope access work may be a sit harness or full body harness, dependent upon the precise nature of the work to be carried out. A sit harness is normally used, which may be coupled with a chest harness.

8.3.3 Fall arrest equipment

If the planned method of work is such that should the user lose controlled physical contact with the working surface there will be a free fall, it will be necessary to choose fall arrest equipment. This will include a full body harness which meets the requirements of a standard such as *EN 361*, an energy absorber or a system of a type that will limit the impact force to a maximum of 6 kN (e.g. the use of dynamic mountaineering rope with an appropriate belay device) and other equipment selected for its suitability for the type of work intended.

8.3.4 Travel restriction (work restraint) equipment

If the objective is to restrict the user's travel so that access is not possible to zones where the risk of a fall from a height exists, travel restriction equipment may be used. This could be fall arrest equipment, work positioning equipment, or a simple belt and lanyard of limited length and strength.

8.3.5 Limits of equipment use

Equipment designed specifically for travel restriction should not be used for work positioning or as fall arrest equipment. Equipment designed specifically for work positioning should not be used as fall arrest equipment. Some equipment is designed to allow the attachment or connection of other components in order to meet the requirements of a category of work other than the one for which it was primarily designed. An example is a sit harness (for work positioning) which is designed to accept the connection of a chest harness which will allow these two combined parts to meet the requirements of *EN 361*, the European standard for full body harnesses (for fall arrest).

8.3.6 Harnesses

All harnesses should be designed to support the wearer in a comfortable working position while allowing unhindered operation of other devices in the system. Harnesses should comply with relevant standards such as *EN 813* (sit harnesses) or *EN 361* (full body harnesses). Sit harnesses should only be used on their own for either work positioning (which includes descending and ascending), and work restraint (i.e. travel restriction). In a fall arrest situation, a full body harness should be worn. Most sit harnesses can be converted to a full body harness by the addition of a chest harness. An appropriate chest harness would be one that met the requirements of *EN 12277* (mountaineering harnesses).

8.3.7 Connectors (karabiners, safety hooks, maillons, etc.)

8.3.7.1 Connectors with screwgate or self-locking methods of closure are the only types that can provide the required level of security for rope access work. If used to clip on to steel cables, shackles or eyebolts, connectors are best made of steel or other suitably hard metals. Those that are to clip to any anchor (e.g. hangers, eyebolts or shackles) should be of such a design and size that they are able to rotate freely in them without hindrance and without loosening the anchor. Connectors used for static rigging and personal attachments should have a minimum closed gate strength of at least 15kN, as in *EN 362*. A UIAA standard, *(similar to EN 12275*) contains more detailed connector specifications. They include screw-closure maillon rapides, which may be more appropriate for permanent or semi-permanent connections than karabiners.

8.3.7.2 The strength of a connector is determined by pulling between 12 mm bars. If the connector is of asymmetrical shape the test load is normally applied along a line close to the spine. If the loading in use is not in such a position - for example because of the use of wide tape slings or double ropes - the weaker, gated side of the connector will take more of the load and its failure load may be less than specified. Therefore, care should be taken in use to see that asymmetrical connectors are loaded correctly or have a suitable factor of safety by using connectors of a higher quoted strength than the minimum of 15 kN specified in *EN 362*. A minimum strength of 20 kN is recommended, as in EN 12275.

8.3.8 Rope adjustment devices: descenders

8.3.8.1 These are used to attach the worker to the main working line and to control the descent. It is recommended that only descenders of a design that have a known history of safe use are used.

8.3.8.2 Descenders must give the user suitable control over the speed of descent, should not cause undue shock loads to the working line when braking and be such that, if the user loses control, they will stop, or allow only a slow, automatically controlled descent in the hands-off position. In addition, they should not cause significant abrasion, plucking or stripping of the sheath when suddenly clamped onto the working line. They should be of a type that cannot be accidentally detached from the working line or become detached under any circumstances while carrying a person's weight. If a connector is used to attach it to the user, only an appropriate **locking** connector should be used. For long descents, preferred descenders should be those with good heat dissipating properties to prevent burning of the hands and melting of the working line, and those that reduce cumulative twisting of the rope to a minimum. There is a draft European standard for rope adjustment devices for use in rope access, *PrEN 12841*, which includes descenders. Another standard for descenders exists, *EN 341.* This is for descenders for use in special rescue systems and is not appropriate for descenders for normal rope access work, but may be so for descenders used for rescue in rope access.

8.3.9 Rope adjustment devices: back-up devices

These are devices by which the operator is attached to the safety line. In the event of a failure of the working line or loss of control by the operator, they are intended to lock on to the safety line without causing damage to the line and also to absorb the limited shock load that may occur. Ideally, back-up devices should always be positioned on the safety line so that in the event of a failure in the working line system, the load will be taken immediately on the back-up device without a fall occurring. There is an advantage in using back-up devices that can be released by the operator without de-weighting first. However, correct functioning of this type of back-up device critically relies on the loading being applied via the cam and not the body (i.e. grabbing the body of the device may cause it to slide down the rope and prevent it from functioning properly). It is recommended that back-up devices are of a type that will not slip below a static load of 2.5 kN. Draft European standard *PrEN 12841* for rope adjustment devices for use in rope access includes back-up devices. Ideally, these devices should require minimal operator manipulation.

8.3.10 Rope adjustment devices: ascenders

8.3.10.1 These devices are attached to the working line and are used when the operator wishes to climb up it. They should be chosen bearing in mind the suitability for use in the prevailing environmental conditions, e.g. wet, muddy, icy, abrasive or corrosive conditions. Typically, there are two types of ascender used in the system. The first type is used to connect the operator directly to the working line. The other type is attached to a foot loop to aid climbing, but is also connected back to the harness to provide additional security.

8.3.10.2 Ascenders should be of a type that cannot be accidentally detached from the line and should be chosen so that the risk of damage to the line is minimised when in use. Any dynamic loading should be avoided as damage could result to either the ascender or the line. There is a UIAA/European standard for ascenders for use in mountaineering which may be appropriate: *EN 567*. Ascenders meeting this standard may also meet the technical requirements of *PrEN 12841*, the draft European standard for rope adjustment devices for use in rope access, which includes ascenders.

8.3.11 Ropes

8.3.11.1 In the present state of materials science, only ropes made from polyamide (Nylon) or polyester will normally be suitable as working or safety lines. Ropes of other man-made materials may be useful in specific situations. In such cases, caution should be exercised in verifying their suitability for the work intended.

8.3.11.2 Ropes made from high modulus (HM) polyethylene, high tenacity (HT) polypropylene and 'Kevlar' are types of ropes which may be considered in exceptional circumstances and when the appropriate descent devices etc. have been developed. Ropes made from these materials might be useful where there is severe chemical pollution. However, HM polyethylene and HT polypropylene have much lower melting temperatures than polyamide or polyester and may be affected by frictional heat from descenders. Dangerous softening of polypropylene occurs at temperatures as low as 80ºC. Kevlar has a very high melting point but poor resistance to abrasion, UV light (including sunlight) and repeated bending.

8.3.11.3 Wire ropes may be a suitable material for use in particular situations, providing that other appropriate components needed for the system are available and that any other system requirements are met.

8.3.11.4 Textile ropes should ideally be constructed with a load-bearing core and an outer protective sheath (kernmantel). The sheath should be resistant to wear from the descent/ascent devices and tight enough to resist the ingress of dirt and grit. However, rope with other types of construction may be used if the contractor has thoroughly verified that these will give a similar level of safety.

8.3.11.5 Efficiency in descending, ascending and, to some extent, working in one place for any length of time depends on the elongation characteristics of the working line. Therefore, in most cases, the working line should be low-stretch rope (and normally also the safety line) and should meet the requirements of the European standard for low-stretch kernmantel ropes, *EN 1891, or an equivalent standard.* There are two categories of rope covered by this standard: A and B. Only type A ropes should be used for rope access, including rescue.

8.3.11.6 Ropes meeting the requirements of *EN 1891 type A* are recommended for use as working lines or safety lines. When new type A rope is dynamically tested to the standard using a 100 kg mass, it must not exceed an impact force of 6 kN at fall factor 0.3 and must then hold a minimum of five falls at fall factor 1. While appropriate for normal rope access techniques, i.e. descending, ascending and working from ropes, such ropes are not designed to sustain major dynamic loads, particularly because of the undesirable impact forces that could be generated. Therefore, in situations where the possibility of a substantial dynamic load exists, (e.g. when using lead climbing techniques), a dynamic rope to UIAA or *EN 892* standard should be used. These standards cover three categories of rope: single, half and twin. For rope access, the use of 'single' rope with a nominal diameter of 11mm is recommended.

Note. In choosing the type of rope to be used, it is important to balance the needs of energy absorption with the need to avoid excessive elongation or rebound which could result in the person striking the ground or structure, or ending up fully immersed in water or other liquid.

8.3.12 Webbing

Webbing used in equipment, which includes slings, lanyards and harnesses, is best chosen so that any mechanical damage (e.g. abrasion) will become readily visible well before any loss of strength becomes significant. Stitching should be in a contrasting shade or colour to that of the webbing to facilitate its inspection.

8.3.13 Cow's tails

'Cow's tails' used to connect the worker's harness to the safety line via the back-up device should be able to withstand any dynamic forces that may be imposed upon them in times of emergency. They should be of a quality and dynamic strength at least equal to that of a 'single' dynamic rope to EN892. If an energy absorber is incorporated into the system (other than that provided by the energy absorbing qualities of the material used in the construction of the cow's tail), it should meet the requirements of *EN 355.* In normal use, the length of the cow's tail should be limited to the person's reach, which will vary from user to user.

9. CERTIFICATION AND TRACEABILITY OF EQUIPMENT

9.1 Wherever rope access equipment is used in the world, it is clear that, if defective, it could result in mortal danger to the user. Quality assurance similar in effect to the European system is thus essential. European law and regulation requires equipment which is classified as personal protective equipment (PPE) to be CE marked, which means that it has met the requirements of the European PPE directive. Most equipment used in rope access will be category III according to this directive. This requires independent type testing of the product to a Standard and either the installation by the manufacturer of a quality management and assurance standard such as *ISO 9000*, which is monitored by an 'approved body' (i.e. an independent auditor), or by regular batch testing by an approved test house. In both circumstances, a certificate of conformity, which states that the product

meets the requirements of the PPE directive and conforms to any Standard it claims to meet, should be sufficient documentation for the purchaser.

9.2 If the product is not classified as PPE, yet is considered to be within the realms of safety equipment, suitable certificates, which give confidence in its quality and suitability, should be obtained.

9.3 Lifting equipment is normally required to be clearly marked to indicate the safe working load. However, rope access equipment is usually provided with other information e.g. working load limit, breaking load (or static strength), etc in lieu of this. Where possible, this information should be marked on the equipment. Where this is not possible, a coding system should be used which easily provides the user with a unique cross-reference to appropriate records, e.g. the 'tagging' of ropes etc. These records should be readily available to users. PPE should not be proof tested to determine a safe working load or margin of safety.

9.4 There is little point in using certified equipment unless it can be individually traceable to the relevant test certificates or certificates of conformity, and matched to the record of its use in order to facilitate its care properly. Karabiners and other metal items should be indelibly marked in a manner that will not affect their integrity. Metal items should not be marked by stamping, unless by agreement of the manufacturer. Ropes and harnesses etc. could be indelibly marked by various methods, e.g. by marking their identification on a tape, which is then fixed in place by a heat-shrunk clear plastic cover. Lengths cut off a main rope could have the identity transferred to them sequentially; e.g. the number A1 when cut off could be numbered A1/1, A1/2 etc.

10. INSPECTION OF EQUIPMENT

10.1 All load-bearing equipment must be given a visual and tactile inspection before each use to ensure that it is in a safe condition and operates correctly. Information should be provided by the manufacturer on how to do this. Any item showing any defect should be withdrawn from service, immediately if possible.

10.2 Lifting equipment should be *thoroughly examined* by a competent person before first use and at intervals not exceeding six months, or in accordance with an *examination scheme*. Where significant repairs have been carried out, or where circumstances liable to jeopardize safety have occurred, lifting equipment should also be thoroughly examined. *Thorough examinations* should be recorded in a *report*. Otherwise, the lifting equipment should not be used.

10.3 Inspections of lifting equipment should be carried out, over and above the pre-use check, at suitable intervals between thorough examinations, where a risk assessment has identified risks that could be addressed by inspection, e.g. in the case of items subject to high levels of wear, such as textiles.

10.4 Procedures should be established to record details of inspection and maintenance, and how this is carried out. Records listing all the items of equipment issued should be kept. These should refer to the safe working load, working load limit, declaration of conformity, etc. and should be kept up to date. It could be helpful to have relevant comments noting where the equipment was used, its storage conditions, and any incidents that could affect its life (e.g. unusual loadings, use in chemical or gritty atmospheres, etc.). Such information could help to determine when to take an item out of service.

11. CARE AND MAINTENANCE OF EQUIPMENT

The manufacturer should provide information on use, care and maintenance and this should be strictly followed. What follows is additional general advice.

11.1 Textile equipment (ropes, webbing, harnesses etc.)

11.1.1 It is important that ropes and webbing are carefully checked, both before being stored and before being taken back into use, by being run through the hands to combine a visual and tactile examination. Kernmantel ropes should be examined visually to check that the sheath has not been cut and by feeling the rope for any damage to the core. Cable-laid ropes may be carefully twisted open at intervals along their length to inspect for internal damage.

Harnesses and webbing should be checked for cuts, abrasions, broken stitches and undue stretching.

11.1.2 Textiles deteriorate with age regardless of use and this effect is accelerated by heavy and dynamic loading. However, the most common cause of strength loss in textile equipment is through abrasion (either by grit working into the strands or by chafing against sharp or rough edges) or mechanical damage. In order to minimize grit content, or simply to keep the product clean, soiled textile items may be washed in clean water (maximum temperature 40ºC) with pure soap or a mild detergent, (within a pH range of 5.5 to 8.5) after which they should be thoroughly rinsed in cold, clean water. The use of a washing machine is permissible but it is recommended that the equipment be placed in a suitable bag to protect against mechanical damage. Wet equipment should always be allowed to dry naturally in a warm room away from direct heat.

11.1.3 Textiles that have been in contact with rust should be washed. Textiles with permanent rust marks should be treated with suspicion: recent tests indicate that rust has a definite weakening effect on polyamides (Nylon).

11.1.4 Contact with any chemical that could affect the performance of the equipment must be avoided. These include all acids and strong caustic substances (e.g. vehicle battery acid, bleach, drilling chemicals etc.). The equipment should be withdrawn from service if contact does occur or is even suspected.

11.1.5 Deterioration in ropes from contact with chemicals, or from mechanical damage, is often localized and not obvious, and can be missed during inspection. Chemical deterioration is often not detectable visually until the rope starts to fall apart. The safest course of action is to scrap any rope about which there is any doubt. Sample testing from the scrapped rope may then be undertaken for information purposes only. Proof testing should not be allowed.

11.1.6 Ropes, webbing or harnesses which have glazed or fused areas could have suffered excessively high temperatures and are suspect. If the fibres appear powdery or if there are changes in colour in a dyed rope, this may indicate severe internal wear or contact with acids or other damaging chemicals. Swellings or distortion in a rope may be a sign of damage to the core fibres or of sheath/core movement. Cuts, chafes, plucking and other mechanical damage will weaken ropes and webbing, the degree of weakening being directly related to the severity of the damage. Loosening or excessive breaks in the yarns could indicate internal wear or cuts. Advice should be sought from the supplier or manufacturer but if there is any doubt as to the condition of the rope, it should be withdrawn from service and destroyed.

11.1.7 Most man-made textiles are affected by high temperatures and begin to change their character, and thus their performance, at temperatures exceeding 50ºC. Therefore, care should be taken to protect against this. (The rear parcel shelf of a car in hot weather, for example, can exceed this temperature.)

11.1.8 Textile equipment which has suffered a high shock load or has had a load dropped on to it should be scrapped.

11.1.9 Textile equipment should not normally be dyed, except by the manufacturer. Many dyes contain acids, which could cause strength losses of up to 15%.

11.1.10 Textile equipment used infrequently may deteriorate with age, so employers are advised to set a period of time after which such equipment will no longer be used. This could be ten years for new equipment stored in ideal conditions, with a reducing time commensurate with the amount of usage.

11.2 Metal equipment (connectors, descenders, ascenders, etc.)

11.2.1 Metal items such as rings, buckles on harnesses, karabiners, descenders etc. require checking to ensure that hinges etc. work smoothly, bolts and rivets are tight and to look for signs of wear, cracks, deformation or other damage. They should be kept clean and, when dry, moving parts should be lubricated using a light oil or silicone grease. Avoid lubricating areas which will come into contact with webbing fastening straps (e.g. the slide bar of a harness buckle), ropes slings, etc. Any item showing any defect should be taken out of service.

11.2.2 Equipment made totally from metal can be cleaned by submerging in clean hot water (max. 100ºC) and detergent or soap for a few minutes. Sea water should not be used for cleaning. After cleaning, the equipment should be thoroughly rinsed in clean water and then dried naturally away from direct heat.

11.2.3 Some chemical products used in building work can cause excessive corrosion to items made of aluminium alloys. Advice on this can be obtained from product manufacturers.

11.3 Disinfection

It may be considered necessary to disinfect equipment, for example after working in a sewer, although normally cleaning as described earlier will suffice. There are two things to consider when choosing a disinfectant: its effectiveness in combating disease and whether or not there will be any adverse effect on the equipment after one or several disinfections. Advice should be sought on these two points before carrying out any disinfection. After disinfection, the equipment should be rinsed thoroughly in clean, cold water and then dried naturally in a warm room away from direct heat.

11.4 Marine environment

If used in a marine environment, equipment should be thoroughly soaked in clean fresh water, rinsed, then dried properly and inspected, before storage.

11.5 Storage

After any necessary cleaning and drying, equipment should be stored unpacked in a cool, dry, dark place in a chemically neutral environment away from excessive heat or heat sources, high humidity, sharp edges, corrosives or other possible causes of damage. **Equipment should not be stored wet.**

11.6 Equipment withdrawn from service

It is important that there is a quarantine procedure for ensuring that defective or suspect equipment that has been withdrawn from service does not get back into service without the inspection and approval of a competent person. Any equipment considered to be defective should be cut up or broken before being disposed of, to ensure that it cannot be retrieved by pilferers and used again.

11.7 Modifying equipment

Equipment should not be altered without the prior approval of the manufacturer or supplier because its performance may be affected.

12. METHODS OF WORK

12.1 Suitability of rope access versus other means of access

12.1.1 The advantage of rope access work lies chiefly in the speed people can get to or from difficult locations. In some cases, the cost or difficulty of using other means of access can be prohibitive. While methods have been developed to deploy heavy drilling equipment while using rope access techniques, rope access tends to be at its most efficient when used for inspection and similar light to medium duty purposes. In most cases, the economic advantage offered by rapid access will be lost where the job involves prolonged and repeated working in one place, where heavy or complicated tools must be handled and where large quantities of material are to be used.

12.1.2 Before adopting rope access techniques for a particular job, the owners of buildings, the main contractors and others responsible for commissioning the work are required to carry out a risk assessment. The risk assessment should include considering whether or not the use of rope access techniques would be appropriate.

Other aspects that will require particular attention are:

a) how easily and safely a suspended person will be able to use any materials, equipment or tools necessary for the work, and in particular whether the reaction from any tool may place the person at risk;

b) whether the work may loosen material which could fall on to people or equipment below;

c) whether the work at any one location will be so slow that there may be a risk or unacceptable levels of exposure;

d) whether it would be possible to rescue quickly those workers using rope access techniques from any potential position in which they may find themselves.

12.2 Safe working methods

12.2.1 To ensure that everyone concerned with rope access work can be clearly informed of all the implications and requirements for doing it safely, employers will need to review carefully the procedures to be followed in doing this work, examining how they can reduce the risks involved to an acceptable level. They should then set down suitable working procedures in a safety policy, written in the clearest manner possible, which will control these risks. The policy should identify all the foreseeable risks that might arise from the work, including those to people other than their employees, and it could set out the steps to be taken to minimize these. It may also include reference to the standards of training, competence of the workers, organisation of work teams and rescue procedures.

12.2.2 Before starting a particular job, the employer will need to assess carefully the work to be undertaken and ensure that all the potential hazards are identified (i.e. risk assessment). A site survey may be required to determine the means of access and egress, risks to people other than the employees and the nature of the working environment. Consideration should be given as to how any rescue could be safely and efficiently carried out.

12.2.3 From this assessment, and based on the safety policy, employers can then prepare a suitable work plan or 'safety method statement'. Where necessary, separate work plans may be prepared for each particular aspect of the job. This statement should set out the general principles and working procedures for one particular situation which are to be followed by their employees and self-employed people contracted to work for them. In many cases where types of jobs are similar, the safety method statements could be identical and might, therefore, be in the form of a general document. Where the work includes the use of tools such as welding torches, flame cutters, abrasive wheels etc., which may constitute a potential hazard to the operative and his access equipment, a more detailed method statement needs to be provided prior to the commencement of work.

12.2.4 In addition to the above documents, permits to work may be required, particularly where hazards such as live electrical conductors, hot metal ducts or vents for steam or gases exist. Such permits would be designed to effectively isolate the hazard before work starts and to ensure that it remains isolated while work is in progress and not become effective again until the workers are clear of the danger area. Virtually all rope access work offshore will be controlled by a permit to work.

12.2.5 In working environments where site emergencies may occur at any time (nuclear, offshore, refineries, etc.), clear instructions should be given for dealing with all situations should they occur while persons are on ropes.

12.3 Working practices

12.3.1 Work teams

12.3.1.1 Because of the locations and the specialized nature of the work, all teams should be properly supervised and be self-supportive. A team should, therefore, consist of at least two members. One member of the work team must be qualified as an IRATA level 3 supervisor (see section 7), and both that person and their company should ensure before work commences that the rescue procedures are adequate for that situation. Sufficient personnel and resources need to be readily available to carry out those procedures should the necessity arise. When operating on a work site with more than one discrete working area, adequate supervision should be provided for each of those discrete areas.

12.3.1.2 Where the work takes place in a particularly hazardous or restricted area, such as those which could give rise to poisoning, asphyxiation etc., then the training, abilities, experience,

competence and size of the work team should be of a level that is suitable to deal with any emergency arising out of undertaking the work.

12.3.1.3 In some circumstances, the work team may require additional support members for safety reasons; e.g. where there is a need to prevent the public entering an area that could be threatened by falling objects, or to guard against vandals tampering with suspension equipment. The additional persons required to act as guards need not be trained in rope access work, provided that they are not counted as being a member of the rope access team. (See 12.3.2.5.)

12.3.1.4 Where work is carried out over water, suitable rescue equipment should be provided and measures adopted to arrange for prompt rescue of anyone in danger of drowning.

12.3.2 Pre-work checking (or at the start of each day)

12.3.2.1 If a permit for the work is required, this should already have been obtained and checked. Any special precautions required should be put into effect (e.g. standby boat alerted, radio check, gas checks, etc.). At the start of each day, the work team should review the risks that could affect the safe, efficient and effective outcome of the job. This review should refer to the method statement and risk assessment already prepared.

12.3.2.2 Suspension equipment will need to be carefully checked before starting and during the course of a job. At the beginning of each working day and at other times as appropriate (e.g. when the suspension equipment is relocated during the day), the supervisor should visually check that all the anchors and ropes (wire and textile) and structures and packings used to support them are satisfactory.

12.3.2.3 It is possible, in some unusual circumstances, that wet ropes may become a tracking path for electrical discharges. If rope access is used in such circumstances, suitable precautions, such as earthing, should be taken.

12.3.2.4 The supervisor will be required to ensure that workers follow suitable pre-descent/ ascent procedures. Workers should carefully examine their own harness, descent and ascent devices and ropes to check that they are in good condition. Before each fresh descent/ascent, additional visual checks could be made of the anchors and any points on the rope where chafing could occur.

12.3.2.5 Sentries should be appointed to guard the anchorage area if there is any risk of interference by vandals or unauthorized people. Alternatively, the area could be made safe by locking it off or by erecting suitable barricades capable of preventing unauthorized access to the work area.

12.3.2.6 Sometimes, an announcement that the work is commencing will have to be made to warn other workers. This is common practice offshore and is often a requirement of the permit to work.

12.3.3 Work procedure

12.3.3.1 The supervisor should designate a danger zone at anchor level that is large enough to ensure that people beyond it are not at risk of falling over any working edge etc. Anchors should normally be established beyond the zone so that the workers can put on their harnesses and helmets and attach themselves to the descent lines before entering into the zone. No one should be allowed to enter the zone for any purpose unless they are wearing a harness and are attached to an anchored safety line.

12.3.3.2 Work should start from properly protected safe areas or areas made safe by the installation of temporary guarding or scaffolding. Such areas should also have a safe means of access.

12.3.3.3 Appropriate precautions will need to be taken to prevent damage to the suspension equipment, when in use. Ropes should be rigged so as to avoid running over sharp edges, particularly of steelwork, stone, concrete or masonry, or hot surfaces. Where this cannot be done, the rope should be suitably protected. This should ensure that the radius of any bend is at least twice the diameter of the rope. Such precautions could include the use of packings, rollers or other types of rope protector.

12.3.3.4 Except where work is rigged to allow horizontal traversing, workers will normally descend vertically with the minimum amount of penduluming to minimize the risk of chafing the rope or overloading the rope or anchors. On long drops, running belays or deviations could possibly be fitted on the ropes to enable the workers to maintain their position without being buffeted too much by the wind. Running belays or deviations will also prevent ropes from becoming entangled, as will the placing of any excess rope (in the drop) in a bag and suspending it beneath the user.

12.3.3.5 Everyone working using full rope access methods (i.e. where a rope is used as a primary support or for positioning) must use two completely independent ropes arranged so that, in the event of a failure of one, the worker cannot suffer a fall. (Also see 5.3.)

12.3.3.6 To meet the above recommendations, workers will need a separate working rope and safety rope, i.e. a working line and a safety line. Each line should have its own separate anchor. However, both anchors may be connected to each other for added security. Supervisors are responsible for checking that the ropes are correctly rigged so that if one should fail, a shock load would not be passed on through the system.

12.3.3.7 The anchors themselves should be unquestionably reliable. Examples might be lift-shaft housings on tower blocks, large beams or sound concrete and geological features. Where anchor-weight systems are used, (also known as dead-weight anchor systems) the appropriate recommendations for similar systems used with suspended access equipment may apply and particular account should be taken of cantilever or frictional effects. Be aware that wet conditions can significantly affect the frictional performance of anchor-weight systems. The frictional resistance of any anchor weight should be assured by being capable of not moving when subjected to a load of four times that which will be applied in a work positioning situation. A higher factor will be required if a fall arrest situation is envisaged. Users should also consider the possibility of rescue, which may involve the weight of two persons.

12.3.3.8 The attachments to the anchors should at least equal the strength of the rope(s) attached to them. Redirection of ropes from an anchor should not exceed 20 degrees unless some account is taken of the side loads that are produced at the redirection point. Similarly, where the included angle at the attachment is high and produces a multiplier effect, such as when anchor cables are wrapped around lift-shaft housings, account must be taken of the extra forces that are produced.

12.3.3.9 The principle of double protection also applies to the attachment of workers to the working line and safety line. Descenders and back-up devices should be fixed separately to the worker's harness. Workers normally descend down the working line by means of the descender with the back-up device trailing along the safety line. (However, this can be modified to become a top rope protection, where particular supervision or care of the worker is required).

12.3.3.10 The possibility of being able to inadvertently descend off the end of the working line or safety line should be prevented. A suitable knot – e.g. a figure of eight knot – tied at an appropriate point in each of the ropes will usually achieve this.

12.3.4 Rest periods

In calculating rest periods, consideration should be given to the effects of adverse climatic conditions and/or difficult or very exposed work sites, because these can affect efficiency and tiredness levels. Working in high and exposed places is likely to subject the worker to wind chill or other factors which will have a significant effect on output, at even quite moderate wind speeds. A table in appendix F gives an indication of the effect of wind speed on available working time in an eight hour shift in unprotected and protected situations. Information from this appendix is given in appendix D. In addition, appendix D gives some further sources of information, which may assist in the consideration of maximum wind speeds.

12.3.5 Rescue

Even though great care and attention may be given to safe working, accidents can still happen. The survival of an injured or otherwise immobile person often depends on speed of rescue and the care given to the casualty during and after rescue. Consequently, great

importance should be attached to examining the work site at appropriate times, e.g. each day or at each change of job, to assess all feasible emergency scenarios, and to plan how any resulting rescues would be carried out. Operatives should be skilled in appropriate rescue techniques, which should form part of their basic and ongoing training.

12.4 Use of tools and other work equipment

12.4.1 Appropriate training should be given in the correct use of tools and other work equipment

12.4.2 It is important that all tools and equipment are suitable for the work intended and compatible with rope access work. In particular, they should not present a danger to the safe operation or integrity of the suspension system. Guards provided to moving parts or electrical conductors etc. should not be removed.

12.4.3 Where tools and equipment are carried by the workers, appropriate steps should be taken to prevent them being dropped or falling on to people below.

12 4.4 All electrical equipment, plugs, sockets, couplers, leads etc. should be suitable for the environment in which they will be used.

12.4.5 For offshore working, special rules may apply and all power tools may be subject to scrutiny and/or test by the platform management before use. In some cases, clearance for use may need to be obtained prior to the equipment going offshore.

12.4.6 Small tools

12.4.6.1 Work using rope access techniques is generally more exposed than most other work methods and requires the worker to be in close proximity to the work itself and to any power source being used. As a result, certain tools, which can be used quite safely with conventional access systems, could cause risks to the worker or to their suspension equipment, unless great care is taken.

12.4.6.2 In many cases, the greatest danger is of dropping the tools on to people below. Therefore, to guard against this, small tools such as hammers, trowels etc. and drills, perhaps weighing up to 8 kg, could be securely attached to the worker's harness by lanyards. Alternatively, small items could be carried in a bucket or bag securely attached to the worker's harness. Where tools are carried like this, it is assumed that they will not be of such a weight that they might cause a significant reduction in the factor of safety of the suspension system either as a whole or any part of it. Where a tool needs to be pressed hard against the work face, or where the reaction from the tool could unbalance the worker, a light anchor could be pre-drilled or clamped on to the face and the tool attached to it.

12.4.6.3 Moving parts of tools should be kept clear of the operator, power leads and the suspension equipment.

12.4.7 Power leads

12.4.7.1 Power leads (e.g. electrical cables or pneumatic hoses) could become entangled with the suspension system or be cut or fractured through abrasion or by any tools being used. Therefore, they should be kept clear of the worker and of the tool's moving parts.

12.4.7.2 The connections between the various lengths of a lead should be constructed or assembled to be self-supporting for the length of their drops. In some cases, they might need to be adequately supported or secured at their upper suspension point to enable them to carry their own weight. For instance, they could be secured to and supported by a suitable suspension rope. Particular care should be taken to avoid placing tensile or dynamic loads on plugs, terminals etc.

12.4.7.3 Cordless power tools avoid the difficulties associated with leads and are recommended where they are suitable for the work to be carried out.

12.4.7.4 Conventional double-insulated hand-held electrically powered tools are probably not suitable for use in a wet environment or where conductive dust may be drawn through the ventilation slots into the tool itself.

12.4.7.5 All electrically operated hand tools, other than cordless ones, should be supplied from a 110 volt centre-tapped-to-earth system in accordance with an appropriate standard.

12.4.7.6 Where, due to the tool design, the supply voltage must be greater than 200 volts AC, the supply to each tool could be controlled at source by a residual current device with a rated tripping current not exceeding 30 mA in accordance with an appropriate standard. Where such devices are used, they should be tested for electro-mechanical operation, by means of the test button, each day before use.

12.4.8 Large powered tools

12.4.8.1 Equipment weighing more than eight kilograms should be fitted with a separate suspension system secured to an independent anchor. Anchors and suspension ropes used for equipment should be clearly identified to avoid confusion with those used to support persons.

12.4.8.2 Equipment should be suspended correctly balanced so that it can be positioned and moved easily to its various work locations. It should be properly supported against the work face and be stable while in use. Several suspension lines may have to be fitted to the tool to enable it to be moved easily about the work face. Light anchors to support such tools could normally be drilled around the work face.

12.4.8.3 Workers using this equipment should be able to position themselves and their suspension equipment well away from any moving parts. If this is not possible, then extra guards or shields should be fitted. Effective communications between those working the tools and those manipulating the suspension ropes will be essential.

12.4.8.4 Where the equipment to be used is operated by air or water, consideration should be given to supporting or guarding the hoses etc., where appropriate, to ensure that they will not be damaged or become uncoupled through carrying their own weight.

12.4.8.5 Tools, such as a grit blaster, that could cause injury to the user should be fitted with a 'dead man's handle', so that the power will be cut off in the event of a mistake, accident or emergency.

12.5 Communications systems

12.5.1 An efficient communications system should be established between all workers and, where necessary, third parties (e.g. the control room, if offshore). It will be necessary for this to be agreed and set up before work starts and to remain effective for all the time that people are at work.

12.5.2 It is recommended that a radio system, or suitable alternative, is used for communication purposes, unless the area of work is such that all those involved (including any sentries) are always visible to each other and within audible range.

12.5.3 Hand or voice signals are liable to be misunderstood. Therefore, any special signals should be agreed and well rehearsed before work begins.

12.6 Use of temporary suspended work platforms and supports in conjunction with rope access techniques

12.6.1 There are certain situations where the use of some additional platform or other support will enhance the comfort and safety of a rope access worker on site (e.g. when work is going to be carried out in one position for a long time). If such a platform or support is required, it should be included in a properly planned system of work, including risk assessment. Anchors for platforms should be totally separate from those used for the operatives' anchor lines. When the support takes the form of a seat incorporated into a harness system, the seat should be fitted in such a way that the harness remains the primary means of support from the anchor line.

12.6.2 Where conventional suspended access equipment is used (i.e. powered cradles and similar that do not necessarily require rope access methods), reference should be made to the appropriate local codes of practice and standards.

12.7 Protection of other people

12.7.1 Where required, precautions must be provided to prevent equipment or materials falling in a way that they could be a danger to other people. These precautions will be appropriate for the situation.

12.7.2 Methods of providing precautions include securing all tools to either the worker or to separate lines (see also section 8), an exclusion zone established at ground level or other means. Alternatively, scaffold fans, temporary roof structures or containment nets or sheets could be provided to contain falling materials etc. into safe and confined areas. These should be strong enough to retain any equipment or debris that might fall.

12.7.3 When work is carried out over or near public places, advice should be obtained from the appropriate local authority. Normally, items weighing over eight kilograms could be attached to a separate line, while those below this weight may be secured to the worker.

12.7.4 Any exclusion zone established should be big enough to keep people clear of any risk from falling objects: in normal circumstances, the width should be at least equal to the height of the work position. Account should be taken of the possibility of material deviating from a straight fall as a result of wind or after bouncing off the structure or the ground. People can be discouraged or prevented from entering the exclusion zone by posting suitable notices, providing warning signs, erecting appropriate barriers, posting sentries or installing alarms. Access ways, passageways or doors leading into the zone could be locked or barriered off.

12.8 Provisions of suitable welfare facilities

Workers will require adequate facilities where they can rest in the dry, protected from the cold, and where they can obtain fresh water, store any additional clothing and be able to wash. They should also be provided with, or be able to obtain, adequate toilet facilities.

12.9 Completion of work

12.9.1 Shift work

At the end of each shift, equipment such as ropes, tools, components, etc. should be secured or stored safely. A formal hand-over to the next shift should take place according to local procedures and rules, at which time any relevant information should be passed on.

12.9.2 Termination of a job

At the termination of a job, care should be taken to clear the site properly, with a final inspection of the area before any permit to work is handed back.

APPENDIX A

Recommended list of information to be on site

a) a copy of the employer's employment liability insurance;

b) a copy of a letter from the insurance company acknowledging that they will give third party cover for the method of work (i.e. rope access);

c) an equipment log, (or other suitable records) which lists all the equipment on site and which gives equipment identification numbers with cross reference to batch or individual test certificates, or certificates of conformity, with recommended safe working load, where appropriate. (On projects of short duration, under about eight weeks, these logs may be kept at the head office.);

d) information about the use and care of any chemicals that may be used on site;

e) a safety method statement including typical work details and standard practices;

f) personal log books, to be carried by all persons who are working using rope access techniques.

APPENDIX B

The effect of wind and height on working times

The information given below is based on work shown in the Toronto University Wind Study Report on the Hong Kong and Shanghai Bank H. Q. and from a survey of anticipated working period factors at varying heights in windy and inclement conditions**.**

The table is intended only to be an example, as the actual height where work is being done and the temperature of the surrounding air will make major modifications to the figures given.

The figures give a comparison of what might be a reasonable length of shift under various weather conditions when the work situation - a platform in this case - is unprotected, and an estimate of the benefits that might be obtained from the use of containment netting or containment sheeting as a protection.

Available working time in an 8 hour shift in various wind conditions

Wind speed metres per second	Unprotected hours	Netting hours	Sheeting hours
2	8	8	8
5	5	7	8
7	4	6	7
9	3	5	6
11	2	4	5
14	1.5	3	4
28 (1)	0.5	0.5	0.5 (2)

Notes

(1) Emergency work only

(2) Sheeting may be in danger of blowing away

APPENDIX C

Further reading

The following documents are not mentioned in the main text of the guidelines, but are included here because they could provide additional useful information:

Standards

EN 136:1998	Respiratory protective devices. Full face masks. Requirements, testing, marking
EN 141:1991	Specification for gas filters and combined filters used in respiratory protective equipment
EN 143:1991	Specification for particle filters used in respiratory protective equipment
EN 149:1992	Specification for filtering half masks to protect against particles
EN 354:1993	Personal protective equipment against falls from a height - Lanyards
EN 358:1993	Personal protective equipment for work positioning and prevention of falls from a height – Belts for work positioning and restraint and work positioning lanyards.)
EN 363:1993	Personal protective equipment against falls from a height. Fall arrest systems
EN 364:1993	Personal protective equipment against falls from a height. Test methods
EN 365:1993	Personal protective equipment against falls from a height. General requirements for instructions for use and for marking
EN 371:1992	Specification for AX gas filters and combined filters against low boiling organic compounds used in respiratory protective equipment
EN 372:1992	Specification for SX gas filters and combined filters against specific named compounds used in respiratory protective equipment
EN 405:1993	Respiratory protective devices: valved filtering half masks to protect against gases or gases and particles
EN 566: 1997	Mountaineering equipment. Slings
EN 919:1995	Ropes. Fibre ropes for general service. Determination of certain physical and mechanical properties

IRATA

List of members
Membership Audit Manual

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(alphabetical, using clause numbers)

Bold number indicates main entry

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