IRATA International code of practice for industrial rope access

Part 2: Detailed guidance

July 2014

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IRATA International
First Floor, Unit 3
Eurogate Business Park
Ashford
Kent
TN24 8XW
England

Tel: +44 (0)1233 754600

Email: info@irata.org

Website: www.irata.org

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Part 2: Detailed guidance

Introduction

Part 2 builds on the principles and controls given in Part 1 and gives detailed guidance on how IRATA International provides a safe system of work.

This part should be read in conjunction with the other parts, in particular with Part 1 and relevant annexes in Part 3.

2.1 General

2.1.1 All work at height should have a goal of no accidents, incidents or dangerous occurrences. It is essential, therefore, that the entire work project is operated as a safe system of work.

2.1.2 There can be many different aspects to each work project that could influence the level of safety, e.g. the type of work to be carried out; site location; ease of access and egress; facilities for emergencies; interaction with other work going on at the site. All such potentially influencing factors should be taken into account, as each factor is likely to rely on the proper implementation of the others for a safe system of work to be achieved. These factors should be considered when determining whether rope access is an appropriate method of work. The rope access method and the rescue plan chosen initially may need to be modified when all factors have been considered.

2.1.3 To achieve a safe system of work, there needs to be good planning and an effective management system, including appropriate supervision for both the overall site and for the safety of the rope access team.

2.1.4 Different skills are required by rope access personnel, depending on their specific responsibility, i.e. manager, rope access safety supervisor and rope access technician. It is essential that each person has a skill level appropriate for the work to be undertaken and the environment in which they are likely to be working.

2.1.5 Different work environments can present different levels of complexity or risk. Rope access methods can vary in their complexity due to the work environment but should be kept as simple as possible. The level of complexity and degree of risk influences the:

a) planning, management and supervisory skills required;

b) skill levels and experience required by the rope access technicians;

c) choice of access method and equipment to be used.

2.1.6 To help achieve a safe rope access system, the following essential subjects are covered in this code of practice, each in its own section or sections:

a) planning and management, see **2.2**;

b) selection, competence, training and supervision of rope access technicians, and appropriate composition of the team, see **2.3**, **2.4**, **2.5** and **2.6**;

c) equipment selection, use and maintenance, see **2.7**, **2.8**, **2.9** and **2.10**;

d) work methods, see **2.11**.

2.1.7 Planning and management should take account of the legislation applicable where the work is being undertaken. Legislation varies from country to country and sometimes from region to region. See **Part 4** for relevant national legislation for the UK. Legislation to be covered for other jurisdictions might include:

a) work at height;

b) manual handling;

c) lifting;

d) hazardous substances;

e) personal protective equipment;

f) incident reporting;

g) first aid;

h) control of noise;

i) risk assessment (also known as job safety analysis; job hazard analysis);

j) emergency procedures;

k) plant, machinery and tools;

l) confined spaces;

m) electricity at work.

2.2 Planning and management

2.2.1 Objective

The primary objective behind the planning and management of rope access projects is to create a work environment that maximizes safety and minimizes the risk of error, possible incidents and injury, i.e. to provide a safe system of work.

2.2.2 Planning

Before any rope access project is considered, a documented system should be in place to define or provide for at least the following:

a) a clear line-management structure showing the responsibilities of personnel;

b) a safety management policy, including procedures for effective internal audit monitoring and review, which should incorporate corrective and preventative actions to be taken, and procedures adequate to control the work;

c) appropriate insurance, e.g. for the rope access technicians, public liability and other aspects relevant to the worksite;

d) a risk assessment, which covers identification of hazards, assessment of the likelihood of an incident occurring and control measures to minimize the risk;

e) specific planning of the project, including the safety method statement and rescue plan;

f) prior agreement of operating procedures if rope access technicians from another company are working in the same team;

g) confirmation that the rope access safety supervisor has the company's authority to act whenever necessary to ensure the safety of the rope access technicians, the public and the worksite;

h) the selection of competent personnel;

i) records of the competence of personnel, e.g. skill levels and experience;

j) how proper communication of relevant information to all staff is to be provided;

k) the selection of appropriate equipment;

l) a list of equipment with inspection records;

m) specific procedures to deal with hazardous materials, machinery, fixtures and tools, and environmental hazards.

2.2.3 Pre-work analysis

A pre-work analysis should be carried out before rope access work is undertaken on a project to confirm that rope access is a suitable method and to ensure control systems are in place to allow the work to be carried out safely. Examples of typical points to be covered are:

a) how the work area can be accessed and exited safely;

b) the ease and degree of safety with which a rope access technician will be able to use tools and equipment while suspended;

c) whether there might be a risk of loose materials or equipment falling onto people below;

d) whether the duration of the work in a location might put the rope access technician at risk, e.g. prolonged exposure to extremes of heat or cold;

e) whether rope access technicians could be rescued quickly from any potential position in which they might find themselves.

2.2.4 Risk assessment

2.2.4.1 Once it has been decided that rope access is a suitable method to carry out the intended task, employers should review carefully the procedures to be followed for carrying out the work. They should identify any hazards and examine how they can be removed or, if this is not possible, how the risk can be reduced to an acceptable level. This is determined by carrying out a risk assessment, which is also known as a job safety analysis (JSA). For more information on risk assessment, see **Part 3, Annex A**.

2.2.4.2 The detail provided in the risk assessment should be in proportion to the risk. Once the risks are assessed and taken into account, insignificant risks can then often be ignored, unless the type of work to be carried out would increase those risks.

2.2.4.3 Hazard identification should comprise identification of anything with the potential to cause harm, for example:

a) power cables, which could pose a high risk of electric shock;

b) any hazard placing the public or other workers at risk, in particular, persons working on the ground on to which debris or tools could be dropped;

c) the presence of other trades;

d) the tools being used;

e) moving or carrying heavy machinery, tools or other equipment;

f) repetitive use of tools or equipment;

g) the unavailability of anchor points of suitable size, shape and strength for the proposed access method and work to be carried out;

h) sharp or rough edges on which the anchor lines could be cut or abraded;

i) hot surfaces or hot work that could damage anchor lines or injure rope access technicians;

j) hazardous substances, e.g. toxic gases, acids, asbestos;

k) radio waves, radiation;

l) adverse weather conditions.

2.2.4.4 After the hazards have been identified, the risk assessment should continue with a careful study of all the hazards identified, to determine the level of risk posed by each. As a first step, wherever possible, hazards should be eliminated. If this is not possible, precautions should be taken to minimize the likelihood of persons being harmed. Thus, the chance of an incident occurring in the first place is reduced. In addition, the undesirable possibility of having to deal with an incident and its consequences is also reduced.

2.2.4.5 The hazard identification and risk assessment should be site specific. They should be documented and should cover all aspects of the work to be undertaken. The document(s) should be available to personnel working on-site and should be regularly reviewed formally by them during the course of the work, to take account of changing circumstances, e.g. weather conditions and other work being carried out. Operations such as oil platforms, refineries, power stations and railways have a formal written permit-to-work system to address hazards, by requiring certain precautions to be taken. Examples are: electrical isolations; restriction of other work; communication requirements; specified personal protective equipment.

2.2.4.6 The risk assessment should include detailed consideration of foreseeable emergency scenarios and planning as to how any rescue would be carried out.

2.2.5 Safety method statements

2.2.5.1 Planning should not only include the selection of appropriate working methods, equipment and competent personnel but should also include the preparation of a safety method statement. Safety method statements are an effective way of producing an action plan for a safe system of work and are useful in bringing together the assessments of the various hazards that may arise on a job.

2.2.5.2 The safety method statement should set out working procedures to be followed for each particular job. All safety method statements should include a specific rescue plan, e.g. rigging for rescue.

2.2.5.3 In cases where types of jobs are similar, the safety method statements could be identical and may, therefore, be in the form of a general document. However, separate safety method statements may be necessary for each particular aspect of the job. Where the work includes the use of hazardous tools (e.g. welding torches, flame cutters, abrasive wheels), a more detailed safety method statement should be prepared. For advice on preparing a safety method statement, see **Part 3, Annex B**.

2.2.6 Procedures and personnel to be in place before work begins

2.2.6.1 Procedures

Before work begins, at least the following procedures should be in place to enable a rope access team to carry out a task safely:

a) a documented system of work;

b) a documented safety method statement;

c) permits to work, where necessary;

d) site induction requirements;

e) hand-over procedures, e.g. between shift changes or site contractors;

f) site-specific documentation, e.g. rope access technicians' log books; end of shift documentation; hours worked/accident/incident report forms; work log; equipment user instructions. For a recommended list of information to be kept on site, see **Part 3, Annex N**;

g) worksite facilities, e.g. for resting; for emergency washing; showers; toilets;

h) where appropriate, a documented site inspection, including suitable provision for anchors, and a rigging/rescue plan;

i) planning for emergencies, e.g. fire; entrapment (including rescue), including any equipment required;

j) protection of third parties, e.g. exclusion zones; barriers; warning signs.

2.2.6.2 Personnel

Before work begins, there should be at least the following personnel in place to enable a rope access team to carry out a task safely:

a) a rope access manager with overall responsibility for the rope access site;

b) an appropriate number of trained, assessed and suitably equipped rope access technicians, with a minimum of two, one of which is a Level 3 rope access safety supervisor;

NOTE It may be necessary for there to be more than one Level 3 rope access safety supervisor, depending on the number of rope access technicians on site.

c) additional assisting personnel as required, e.g. sentries; traffic monitors.

2.2.7 Management and supervision of the rope access site

2.2.7.1 Rope access worksites should be properly managed and supervised to ensure the safety of those involved in the rope access project.

2.2.7.2 There should be a rope access manager, who is responsible for determining that rope access is an appropriate method of work and for defining, planning, implementing and reviewing the operation of a safe system of work.

2.2.7.3 Worksites using rope access require the supervision of rope access safety and of the work project itself. These two types of supervision may be the responsibility of different people or the same person. This code of practice covers only the supervision of rope access safety.

2.2.7.4 For more information on rope access managers and rope access safety supervisors, see **2.6**.

2.3 Selection of rope access technicians

2.3.1 General

2.3.1.1 To work at height safely requires personnel to have an appropriate attitude, aptitude, physical capability and training. Therefore, some form of screening is required to assess properly all prospective employees.

2.3.1.2 It is important that rope access technicians can be relied upon to behave in a sensible and responsible manner.

2.3.1.3 Rope access technicians should be physically fit and free from any disability that might prevent them from working safely at height. Contra-indications include:

a) alcohol or drug dependence;

b) diabetes; high or low blood pressure;

c) epilepsy, fits, blackouts;

d) fear of heights;

e) vertigo/giddiness/difficulty with balance;

f) heart disease/chest pain;

g) high or low blood pressure;

h) impaired limb function;

i) musculoskeletal issues, e.g. a bad back;

j) obesity;

k) psychiatric illness.

2.3.1.4 It is the responsibility of the trainee or their employer to ensure that the trainee is physically and medically fit to undergo rope access training.

2.3.1.5 Employees have a responsibility to their employers and their work colleagues to notify any changes in their physical and medical condition which may affect their work. This includes the effects of alcohol or drugs.

2.3.1.6 Rope access technicians should be given the opportunity not to work at height if they do not feel fit enough to do so.

2.3.2 Experience, attitude and aptitude

2.3.2.1 All persons working at height need to have at least elementary background awareness of different fall protection methods, e.g. fall arrest; work restraint; safety net systems; air bags; mobile elevating work platforms, in addition to that required for rope access.

2.3.2.2 To assess whether a person is suitable to work in rope access requires detailed consideration of their previous experience. References should be taken up to verify claimed experience and levels of competence.

2.3.2.3 Employers should also consider relevant trade experience and skills, to ensure safe use of tools and equipment.

2.3.2.4 Employers should seek to ensure that rope access technicians, including trainees, have a suitable attitude and aptitude in addition to their IRATA International qualification. These include:

a) a head for heights;

b) a natural ability or potential for rope access work;

c) the ability to work in a team;

d) a responsible attitude to safety;

e) a willingness to improve their skills;

f) a professional standard of behaviour.

2.3.2.5 Consideration should be given to the composition of a rope access team, as teamwork, work skills, rescue capability and the correct level of supervision are essential.

2.3.2.6 The selection of team members should take into account the specific tasks to be undertaken.

2.4 Competence

2.4.1 Rope access work can only be carried out in a reliably safe manner where people are competent. To be considered competent, a rope access technician needs to have sufficient professional or technical training, knowledge, actual experience and authority to enable them to:

a) carry out their assigned duties at the level of responsibility allocated to them;

b) understand potential hazards related to the work under consideration and be able to carry out appropriate workmate rescue procedures;

c) detect technical defects or omissions in their work and equipment, recognize implications for health and safety caused by such defects or omissions, and be able to specify a remedial action to mitigate those implications.

2.4.2 Rope access technicians should have adequate skill and experience to:

a) understand the limitations of their level of training with regard to work practices;

b) understand the various uses of the equipment they use and its limitations;

c) select equipment correctly;

d) use the equipment properly;

e) inspect their equipment;

f) maintain and store the equipment they use.

2.4.3 It is essential that rope access personnel maintain their knowledge of industry best practices, equipment developments and current legislation.

2.5 Training

NOTE Wherever the terms Level 1, Level 2, Level 3, assessor, auditor and trainer are used, these refer to IRATA International qualifications, whether it states so or not.

2.5.1 General

2.5.1.1 As a general rule, training should be either provided or monitored by an expert external organization or person, to ensure that the standard is to an externally certificated level. Training routes should be clearly defined. Assessments should only be carried out by assessors who are commercially independent of the candidate, the candidate's company and the organization providing the training.

2.5.1.2 Procedures should be in place to document the work at height and rope access experience of rope access technicians, and to allow certification bodies to verify the rope access technicians' experience. Documented experience is also useful for prospective employers to enable them to judge the suitability of personnel for various tasks.

2.5.2 IRATA International training, assessment and certification

2.5.2.1 IRATA International has a formal training syllabus, assessment and certification scheme, and grading structure, which meets the criteria set out in **2.5.1.1** and **2.5.1.2**. All IRATA International members are obliged to use this scheme. Rope access technicians are grouped into three technical grades, depending upon their experience and level of assessment as set out in the publication *IRATA International training, assessment and certification scheme for personnel engaged in industrial rope access methods* (TACS). The three technical grades are:

a) **Level 1**

This is a rope access technician who is able to perform a specified range of rope access tasks under the supervision of a Level 3 rope access safety supervisor.

b) **Level 2**

This is an experienced rope access technician who has Level 1 skills plus more complex rigging, rescue and rope access skills, under the supervision of a Level 3 rope access safety supervisor.

c) **Level 3**

This is a rope access technician who is able to demonstrate the skills and knowledge required of Levels 1 and 2; is conversant with relevant work techniques and legislation; has an extensive knowledge of advanced rigging and rescue techniques; holds an appropriate and current first aid certificate and has knowledge of the IRATA International training, assessment and certification scheme. Subject to a Level 3 having the necessary supervisory skills, he/she can become a rope access safety supervisor with responsibility for rope access safety in work projects: see **2.5.2.6** and **2.6.**

2.5.2.2 To become an IRATA International Level 1 rope access technician, candidates have to undertake an IRATA International approved training course of a minimum of four days followed by a one-day assessment by an independent IRATA International assessor. Once the training course and assessment have been satisfactorily completed, the person may then be allowed to work using rope access techniques, although this has to be under close supervision.

2.5.2.3 Special precautions should be taken for newly qualified rope access technicians. These include only gradually introducing them to the work and initially only allowing them to carry out the most straightforward operations, under the direct control of a rope access safety supervisor. As the rope access safety supervisor becomes satisfied that they are fit to do so, the new rope access technicians should then be allowed to progress gradually to more complex work, although still under close supervision. At this stage, the rope access safety supervisor should check that all items of the inexperienced rope access technician's suspension equipment are correctly secured before they are allowed to start work.

2.5.2.4 Rope access technicians are in the learning process for some time after completing their basic training. They should, therefore, be continuously assessed by the rope access safety supervisor and not allowed to work without close supervision until the rope access safety supervisor is satisfied that they have achieved a suitable level of competency. This would be when they had demonstrated that they had suitable knowledge and experience to carry out the full range of tasks 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 and in any emergency that might reasonably arise.

2.5.2.5 To achieve the next level, i.e. Level 2 rope access technician, where the person could be regarded as an experienced worker, Level 1 technicians have to log at least 1 000 working hours using rope access techniques and have worked for a minimum of one year at Level 1. They have then to undergo a minimum of four days further training plus an assessment by an independent IRATA International assessor.

2.5.2.6 Before a Level 2 can become a Level 3 rope access technician, a minimum of one year at Level 2 and at least a further 1 000 working hours using rope access techniques have to be logged, i.e. a combined minimum total of two years and 2 000 hours at Level 1 and Level 2. A minimum of four days of further training and then assessment by an independent IRATA International assessor are required. This is particularly to ensure that the person has the necessary technical skills for this level and may be ready to prove their competence to supervise rope access safety. It is the employer's responsibility to ensure that Level 3s are competent to supervise. See **2.6** for information on rope access safety supervisors.

2.5.2.7 It is essential that employers ensure their employees are competent. To ensure that all levels of rope access technician maintain their skill level, a further training course followed by reassessment is required every three years.

2.5.2.8 Due to the aptitude and mental conditioning that are needed for exposure to height, rope access technicians who have not been engaged in rope access work for six months or more are required to 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. The refresher courses should include all the techniques covered during Level 1 training. For Level 2 and Level 3 rope access technicians, the refresher course should concentrate on rigging and rescue procedures (see the publication *IRATA International training, assessment and certification scheme for personnel engaged in industrial rope access methods* (TACS).

2.5.2.9 As part of on-going training, 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 **2.11.11**).

2.5.2.10 Rope access technicians are registered under the IRATA International training, assessment and certification scheme and are issued with a personal logbook that is used to document their work experience and any relevant training received. As detailed within the scheme, logbook entries should be countersigned by an IRATA International rope access safety supervisor. Employers taking on new rope access technicians should assess and, where necessary, verify the information contained in their logbooks to confirm suitability for the work to be undertaken (see **2.3.2**).

2.5.3 Additional skill levels

2.5.3.1 General

In addition to becoming a rope access safety supervisor, IRATA International Level 3 rope access technicians may specialize in up to four categories of additional skills. These are trainers, instructors, assessors and auditors.

2.5.3.2 Trainers and instructors

2.5.3.2.1 IRATA trainer member companies appoint suitable Level 3 rope access technicians to act as trainers, who are then employed to train applicants to the three rope access technician grades, i.e. Levels 1, 2 and 3.

2.5.3.2.2 IRATA Level 3 rope access technicians with extensive training experience may gain additional certification as IRATA rope access instructors (Level 3/I).

2.5.3.2.3 Level 1 and Level 2 rope access technicians may be engaged in training as assistants to a Level 3 rope access trainer or Level 3 rope access instructor. Such Level 2 assistant trainers may register with IRATA as trainee instructors and begin to log their training experience, but may not teach (or log) Level 2 or Level 3 topics until they are qualified at IRATA Level 3.

NOTE The qualifications of the rope access technicians carrying out training (i.e. trainer, assistant trainer, instructor, assistant instructor) and the qualification levels of the trainees determine the maximum number of trainees allowed to be trained in any one group at any one time.

2.5.3.2.4 It should be noted that only IRATA qualified rope access technicians are allowed to assist in training courses.

2.5.3.2.5 Trainee instructors are required to log at least 400 hours of training experience before they are eligible to apply for full instructor status.

2.5.3.2.6 Rope access technicians wishing to become trainee instructors first need to gain the sponsorship of an IRATA trainer member company.

2.5.3.2.7 For details of trainer and instructor requirements, see the publication *IRATA International training, assessment and certification scheme for personnel engaged in industrial rope access methods.*

2.5.3.3 Assessors (Level A/3)

2.5.3.3.1 IRATA International appoints assessors, who are then employed by IRATA International trainer member companies to carry out independent assessments of rope access technicians who have completed an IRATA International training course operated by an IRATA International member company.

2.5.3.3.2 The primary rôle of the assessor is to ensure that each candidate demonstrates performance of the required tasks in a safe manner, in accordance with the current edition of the *IRATA International training, assessment and certification scheme for personnel engaged in industrial rope access methods* and this code of practice.

2.5.3.3.3 Assessors are responsible for rope access assessment to Levels 1, 2 and 3.

2.5.3.3.4 To be eligible to become an assessor, applicants are required to have been working as a Level 3 rope access technician for a minimum of six years.

2.5.3.3.5 Assessors are appointed at the discretion of the Executive Committee on the recommendation of the Training Committee.

2.5.3.3.6 Applicants are required to provide credentials at the time of application and are expected to retain the necessary knowledge, skills and physical fitness required during the full period of the appointment. This includes the Level 3 qualification.

2.5.3.3.7 Once appointed, assessors may conduct assessments on behalf of IRATA International only in conformance with the current editions of the *IRATA International training, assessment and* *certification scheme for personnel engaged in industrial rope access methods,* this code of practice and any amendments published on the IRATA International website.

2.5.3.3.8 IRATA International assessors are required to abide by the IRATA International document *Requirements and guidance for IRATA assessors and assessments*.

2.5.3.3.9 To retain their status, assessors are required to:

a) attend at least one assessors' workshop per year;

b) assess twenty candidates per year (unless a lower figure has been previously agreed), covering all levels of rope access technician;

c) hold valid Level 3, first-aid and insurance certificates.

2.5.3.4 Auditors

IRATA International appoints auditors to carry out audits of companies applying for membership of IRATA International and re-audits, which are required every three years. Auditors undergo external auditor training.

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2.6 Rope access managers, rope access safety supervisors and other supervisory/management items

2.6.1 Rope access managers

2.6.1.1 Rope access managers are responsible for determining that rope access is an appropriate method of work, and for defining, planning, implementing and reviewing the operation of a safe system of work. They should have:

a) competence and experience for the work being managed;

b) the ability to communicate requirements to rope access safety supervisors;

c) the ability to create, implement and review control systems, and be able to assess which control measures are appropriate for each project;

d) the ability to ensure correct operation of the rope access management system.

2.6.1.2 Rope access managers have a duty to ensure that rope access safety supervisors and other rope access technicians are competent for the particular rope access task in hand.

2.6.1.3 Employers should ensure that rope access managers have the necessary management skills before they are given such a rôle. Some form of training in management plus an assessment is recommended. There should be a clearly defined reporting system to senior management.

NOTE In a small organization, the senior manager, rope access manager and rope access safety supervisor might be the same person.

2.6.2 Rope access safety supervisors

2.6.2.1 This code of practice covers only the supervision of rope access safety and not the work project itself.

2.6.2.2 The rope access safety supervisor's rôle is to ensure that the work and the workers proceed in accordance with this code of practice, in the manner set out in the documentation for the work project and with the aim of no accidents, no waste and no defects (known as zero targeting).

2.6.2.3 It is essential that rope access safety supervisors have the experience and competence to supervise the rope access work and any potential rescue for each rope access project under their supervision.

2.6.2.4 Under the IRATA International scheme, only Level 3 rope access technicians are permitted to be rope access safety supervisors. Employers should ensure that Level 3s have the necessary supervisory skills before they are given such a rôle, as rope access technical skills alone are no assurance that a Level 3 is competent to supervise. Some form of training in supervision plus an assessment is recommended.

2.6.2.5 Level 3 rope access safety supervisors require:

a) the experience and competence to supervise the rope access work and any potential rescue for each rope access project under their supervision;

b) the ability to communicate to rope access technicians the rope access safety requirements for the project and to manage day-to-day problems on the site;

c) leadership abilities appropriate to the work team;

d) the ability to monitor closely both worksite and personnel for rope access safety and to be able to identify any shortfalls in the required competence of those personnel;

e) a thorough knowledge of hazard identification and risk assessment, and methods of site management;

f) the ability to understand and implement the content of safety method statements;

g) the ability to complete and maintain relevant documentation;

h) the authority to make decisions to ensure the safety of rope access technicians, the public and the rope access worksite, e.g. the withdrawal of equipment from service if thought to be inappropriate or unsafe.

2.6.2.6 Different levels of rope access safety supervisor skills may be required for different access tasks, dependent upon the precise nature of the work. This could apply when the work task is unfamiliar, complex or possibly hazardous, e.g. working in confined spaces; working with chemicals; working with potentially dangerous tools, and in relation to the ability to provide adequate cover for emergencies.

2.6.2.7 In every case, the level of supervision should be appropriate to the particular work situation and the numbers and skills of the work team.

2.6.2.8 The rope access safety supervisor should ensure every rope access technician and other members of the work team under his/her supervision understand the work procedures prior to work commencing.

2.6.2.9 Rope access safety supervisors should be familiar with their work environment, the working conditions and practices, and, in particular, the essential liaison necessary with other workplace personnel.

2.6.2.10 There should be a clearly defined reporting system to the rope access manager.

2.6.3 Other supervisory/management items

2.6.3.1 Disciplined working

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 and should not cancel any adverse comments until completely satisfied that there would be no recurrence.

2.6.3.2 Access by non-IRATA International qualified personnel

The person responsible for the work site should only allow rope access methods to be carried out by experienced rope access technicians, trained and assessed to IRATA International standards. This includes any representative of the client. However, 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 (i.e. protect the person with an additional safety line from above). In addition, the rope access safety supervisor should check personally that all items of such a person's suspension equipment are correctly secured and of a suitable standard and condition. They should then supervise them throughout the ascent or descent as though they were new trainees.

2.6.3.3 Company nominated person (the technical contact)

Companies employing rope access techniques should nominate one person to be the main contact point between IRATA International and the company for matters relating to IRATA International safety training, this code of practice and other IRATA International documentation. This *company nominated* *person*, also known as the *technical contact*, should be suitably knowledgeable, experienced and qualified in such matters or have access to a person or persons within the company who are.

2.7 Selection of equipment

2.7.1 General

2.7.1.1 Application-specific assessment

An assessment should be carried out before each job to select the most appropriate equipment to be used. Where the suitability of a piece of equipment is unknown, it should be thoroughly evaluated and/or tested before it is used. Rope access equipment should be selected only for its intended purpose as specified by the manufacturer. If equipment is to be used for other applications, confirmation should be obtained from the manufacturer that it is acceptable to do so and any caveats should be taken into account. The assessment should also pay special attention to the probability and consequences of misuse of equipment, taking into account any known incidents, e.g. as detailed in IRATA International safety bulletins. The selection and purchase of equipment should be carried out by, or approved by, a competent person, who has sufficient knowledge of the technical specifications required.

2.7.1.2 Legal requirements

2.7.1.2.1 Equipment should be chosen which satisfies legal requirements in the country of use. These requirements vary from country to country and sometimes from region to region. See **Part 4** for relevant national legislation.

2.7.1.2.2 Generally, it is not a legal requirement for equipment to conform to standards. However, it should be noted that they may be used to support the law.

2.7.1.3 Standards

2.7.1.3.1 Generally, equipment should be selected that conforms to national or international standards. It is important that the selected standards are relevant to the intended use. For a list of standards referred to in this code of practice, see **Part 3, Annex C**.

2.7.1.3.2 For many years, workplace standards did not cover much of the equipment used in rope access and equipment meeting standards for mountaineering and caving was often used. There are now workplace standards that cover almost all personal fall protection equipment used in rope access. Equipment conforming to these standards should be chosen, wherever possible.

2.7.1.3.3 Equipment that conforms to an appropriate standard is important, but is not the sole factor in the selection criteria. Sometimes, a standard might not cover all the requirements advisable for rope access use and equipment with the desired features might render it out of conformance with the standard. In some cases, equipment that conforms to a combination of requirements from more than one standard, e.g. a hybrid of two standards, might be more appropriate. The equipment manufacturer or his authorized representative should be able to provide information.

2.7.1.3.4 Similarly, just because a piece of equipment does not claim conformity to a particular standard, it does not necessarily mean that it is unfit for use. For example, when a revision, i.e. an update, of a standard is published, it does not necessarily mean that equipment that conforms to the old version can no longer be used. This would only be the case if serious safety issues had been detected in products conforming to these earlier standards and/or in the standards themselves. However, if a product has been tested to the most recent version of an appropriate standard, it should give some confidence that it will be safe for its intended use. The same points apply to equipment not conforming to local legislative requirements, e.g. CE marking; OSHA.

2.7.1.3.5 Manufacturers should not claim product conformity to draft standards but, in cases where there is no appropriate standard of any kind, this is sometimes the only feasible option. Purchasers should be aware that a draft standard could change.

2.7.1.3.6 If there is any doubt about whether or not a particular standard is relevant to the intended use, guidance should be sought from the manufacturer of the equipment or his authorized representative.

2.7.1.4 Load ratings/minimum static strength

2.7.1.4.1 Manufacturers' specifications for the permissible loading of equipment should be taken as the starting point for the selection of equipment. Some equipment, e.g. descending devices; back-up devices, may be supplied with maximum and/or minimum rated loads (RL_{MAX} and RL_{MIN}). Other equipment may be supplied with different types of load ratings, e.g. a safe working load (SWL); working load limit (WLL). These are sometimes in addition to the minimum static strength provided, e.g. connectors, and sometimes in place of it. Most personal fall protection equipment used in rope access work, such as low-stretch ropes, harnesses and ascending devices, is tested using the minimum static strength specified in the relevant standards. Dynamic rope is supplied with a statement of the number of dynamic falls held during type testing.

NOTE It is reiterated that, apart from safe working loads, working load limits and minimum and maximum rated loads, static strength requirements in standards are usually minimums. Equipment with a higher static strength is likely to provide a higher level of protection.

2.7.1.4.2 Some countries or regions, e.g. USA, have statutory minimum strength requirements for equipment, which might be higher than those given in this code of practice. Purchasers of equipment should check their local legislation.

2.7.1.5 Equipment for work restraint, work positioning and fall arrest

2.7.1.5.1 Work restraint (travel restriction) 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, work restraint equipment may be used. This could be fall arrest equipment, work positioning equipment, or even a simple belt and lanyard of limited length and strength. Different countries or states may have their own regulations with regard to what is acceptable. To ensure the user is working in restraint, there should be no fall hazards within reach of the user. For more information on work restraint, see **Annex L**.

2.7.1.5.2 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. Information on limited free falls will be provided at some future date in Part 3. Work positioning harnesses 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. In work positioning, there should be minimal slack in the system, e.g. dynamic rope anchor lanyards used in horizontal aid climbing or with a horizontal traverse line should be attached above the rope access technician's harness attachment point in such a way as to ensure little or no slack, therefore minimizing the consequences of a fall. For more information on work positioning, see **Annex L**.

2.7.1.5.3 Fall arrest equipment

If the planned method of work is such that should the user lose controlled physical contact with the working surface there would be a significant free fall (outside the normal bounds of rope access, e.g. lead climbing, see **2.11.16**), it is necessary to choose fall arrest equipment. This includes an appropriate full body harness and a system that limits the impact load to an acceptable level. This level varies internationally between 4 kN and 8 kN. Maximum impact loads are usually controlled by the use of commercially made energy absorbers. For more information on fall arrest, see **Annex L**.

2.7.1.6 Limits of equipment use and compatibility

2.7.1.6.1 Equipment designed specifically for work restraint 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 a full body harness (for fall arrest).

2.7.1.6.2 Purchasers should ensure that components in any system are compatible and that the safe function of any one component does not interfere with the safe function of another.

2.7.1.6.3 Equipment should only be used in accordance with the information supplied by the manufacturer.

2.7.1.6.4 The equipment chosen should be able to withstand any loads or forces that might be imposed on it, plus an additional adequate safety margin, and the rope access system itself should be designed to minimize the potential loads placed upon it. The rope access system generally should be designed to avoid a fall.

2.7.1.6.5 No item of rope access equipment should be capable of being accidentally removed, dislodged or become unfastened from the anchor lines during use.

2.7.1.6.6 When choosing equipment for a particular application, account should be taken of weakening factors, such as the loss of strength at knots (see **2.11.5**).

2.7.1.6.7 Rope access technicians should be aware that climatic conditions can affect the performance of some equipment or combinations of equipment. For example, humidity can alter (reduce) the friction provided between the descending device and the anchor line, and thus the performance is altered. This also applies to some ascending devices. Cold conditions can also affect performance, e.g. icy anchor lines can affect the grip of anchor line devices on them. Wet anchor lines can exhibit greater elongation characteristics than dry ones and wet polyamide anchor lines tend to be less resistant to abrasion. In very cold conditions, the strength of some metals is affected. Rope access technicians should check the information provided by the manufacturer to determine the acceptable operating conditions.

2.7.1.6.8 Purchasers are recommended to check with equipment suppliers that equipment made from man-made fibres, e.g. polyamide; polyester; polyethylene; polypropylene; aramid, is protected against ultra-violet light (UV). Most standards do not have requirements for resistance to UV degradation, so it is up to the purchaser to find out. UV is emitted by sunlight, fluorescent light and all types of electric-arc welding. The normal way to provide protection is by the inclusion of UV inhibitors at the fibre production stage but there are other possibilities, such as the type and colour of any dye used or the use of a protective covering.

2.7.1.7 Knowledge of equipment

The manufacturer of personal fall protection equipment is required to supply product information. 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 can help to avoid misuse. This knowledge can be enhanced by studying the information provided with the product, catalogues, other technical brochures and the manufacturer's website, which often provides more detail.

2.7.2. Ropes (e.g. for anchor lines)

2.7.2.1 In the present state of materials science, only ropes made from polyamide or polyester are suitable for anchor lines for rope access. Other man-made materials might be useful in special situations but care should be taken to verify their suitability for the intended use.

2.7.2.2 Ropes made from high modulus polyethylene, high tenacity polypropylene and aramid may be considered for use in exceptional circumstances, and only if appropriate anchor line devices (e.g. descending devices) are available. Ropes made from these materials might be useful where there is severe chemical pollution. However, polyethylene and polypropylene have much lower melting temperatures than polyamide or polyester and are more easily affected by frictional heat, for example from descending devices. Dangerous softening of polypropylene occurs at temperatures as low as 80 °C. Aramid has a very high melting point but poor resistance to abrasion, ultraviolet light and repeated bending. Both polyester and aramid fibres have lower elongation characteristics than polyamide, aramid being the lowest.

2.7.2.3 Some new ropes can shrink by around 10% when wet, which could be a problem if egress and access at the bottom of an anchor line is required. Rope lengths should be chosen with this in mind. It may be advisable to uncoil a new rope and immerse it in water for a few hours and then allow it to dry naturally in a warm room away from direct heat. The length of the rope should be checked periodically with shrinkage in mind.

2.7.2.4 Wire rope might 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. Attention is drawn to wire rope made from stainless steel. Great care should be taken when selecting or specifying anchor lines made from stainless steel as some types of stainless steel can have unpredictable fatigue and corrosion characteristics.

2.7.2.5 Textile ropes constructed with a load-bearing core and an outer protective sheath are recommended, e.g. kernmantel construction. Ropes should be resistant to wear from the anchor line devices and should resist the ingress of dirt and grit. It is likely that the majority of anchor line devices used in rope access are compatible only with rope of kernmantel construction. However, ropes with other types of construction may be used if it is thoroughly verified that these give a similar level of safety and there are compatible anchor line devices.

2.7.2.6 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 (and normally also the safety line) should be a low-stretch kernmantel rope.

2.7.2.7 Low-stretch kernmantel ropes are used almost universally for both the working line and the safety line. However, these ropes are not designed to sustain major dynamic loads, and should never be used in situations where a fall greater than fall factor one could be sustained. For more information on fall factors, fall distances and associated risks, see **Part 3, Annex Q**. On very long drops, the use of ropes of even lower elongation might be appropriate but, as these have minimal energy absorption, the user would need to incorporate an energy absorber in the back-up system.

2.7.2.8 In situations where the possibility of a substantial dynamic load exists, a dynamic rope should be used. Within the International Mountaineering and Climbing Federation (UIAA) Standards and the European Standards (ENs), there are three categories of dynamic rope: single, half and twin. For rope access, the use of 'single' rope with a nominal diameter of 11 mm 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 rope access technician striking the ground or structure, or ending up fully immersed in water or other liquid.

2.7.2.9 Important factors for the selection of ropes for use as anchor lines include:

a) compatibility with chosen anchor line devices, e.g. descending devices; ascending devices; backup devices.

b) resistance against chemicals; ultra-violet degradation; wear and abrasion;

c) the ease with which knots can be tied, e.g. to form terminations;

d) the static strength of the rope after terminations have been made is a minimum of 15 kN, e.g. when tested in accordance with EN 1891:1998 Type A;

e) having a substantially higher melting point than could be generated during rope access, including rescue;

f) performance in relevant environmental conditions, e.g. cold; hot; wet; dirty.

2.7.2.10 Examples of appropriate standard for ropes are:

a) for low-stretch kernmantel ropes: EN 1891; CI 1801;

b) for dynamic kernmantel ropes: EN 892; UIAA-101;

c) for all types of kernmantel rope: CI 2005.

NOTE CI 1801 provides requirements for low stretch and static kernmantel ropes. The elongation requirements for low stretch kernmantel rope in CI 1801 are not the same as those in EN 1891: low stretch kernmantel rope conforming to CI 1801 is likely to be more elastic. The elongation requirements for low stretch kernmantel rope in EN 1891 are closer to those for static kernmantel rope in CI 1801.

2.7.3 Harnesses

NOTE Historically, rope access technicians used a sit harness coupled with a chest strap or chest harness, which served a dual purpose of holding the chest ascender in its correct orientation and in assisting the user to be supported in a more upright position than typically a sit harness would do alone. Although this combination is still common, an alternative is to use a specially designed full body harness that combines the necessary sit harness support function with the facilities described above and which also provides a high attachment point for the backup device (typically via a short device lanyard). In the unlikely event of a fall, the wearer is always maintained in an upright position and, arguably, the potential for hyperextension of the head (whiplash) is reduced. These harnesses usually conform to appropriate fall arrest harness standards and thus meet legislative and other authority requirements or recommendations for harnesses to be used for work where a fall could occur.

2.7.3.1 Work positioning harnesses for rope access work may be a sit harness or full body harness, depending upon the nature of the work to be carried out and the regulations applicable where the work is being undertaken.

2.7.3.2 Work positioning harnesses are generally designed to be strong enough to arrest a free fall of limited distance and force, but might not conform to the other essential requirements for a fall arrest system (e.g. for use in lead climbing), unless combined with appropriate additional components.

2.7.3.3 For ergonomic reasons, it is recommended that a low front attachment point on the harness is used to connect descending devices, ascending devices (via appropriate device lanyards) and anchor lanyards. Back-up devices are generally best connected to the anchor line via a high front attachment point. This is to minimize any whiplash effect in a fall; to keep the body upright after a fall and to facilitate self-rescue.

2.7.3.4 Harnesses used should be capable of supporting the wearer in a comfortable position, e.g. while working or awaiting rescue, while allowing unhindered operation of other devices in the system. Before using a harness for the first time, the user should carry out a suspension test in a safe place to ensure that the harness is comfortable and has sufficient adjustment. For details of an appropriate test, see **Part 3, Annex D**.

2.7.3.5 Selection criteria for harnesses include:

a) the ability to be adjusted to fit the rope access technician for size and comfort when wearing a maximum and a minimum of clothing;

b) whether to use a sit harness or a full body harness (check industry and legislative requirements);

c) suitability for the amount of support needed, dependent upon the person and the work to be done;

d) suitability of the harness attachment points for ascending devices, descending devices, back-up devices, device lanyards and anchor lanyards;

e) the ability to connect and work with a seat;

f) resistance of creep (slow slippage) of straps through their adjusters;

g) resistance to ultra-violet degradation;

h) resistance to chemicals, wear and abrasion.

2.7.3.6 Examples of appropriate standards for harnesses are:

a) for sit harnesses: EN 813;

b) for full body harnesses: EN 361; ISO 10333-1; ANSI/ASSE Z359.1 (maximum fall distance 0.6 m and maximum impact load 4 kN for sternal attachment).

2.7.4 Connectors

2.7.4.1 Connectors with a gate locking mechanism such as a screwed sleeve or an automatic locking mechanism are the only types that can provide the required level of security for use in rope access. Connectors made of steel should be used if connecting to steel cables, shackles or eyebolts. Connectors that are to be used to attach to an anchor should be of such a design and size that they are able to rotate in the anchor and sit correctly, without hindrance and without loosening the anchor.

2.7.4.2 Screwlink connectors might be more appropriate than other types of connector for infrequently operated connections or where there might be a loading against the gate.

2.7.4.3 The strength of a connector is determined by applying an outward force along its length (the major axis) using two round metal bars (see **Figure 2.1**). If the connector has an 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 could be less than specified. Static strength tests resulted in strength losses of up to 45%. Therefore, care should be taken in use to see that asymmetrical connectors are loaded correctly, i.e. in a line close to the spine, or have a suitable factor of safety. See **Figure 2.1**.

2.7.4.4 The weakest part of most connectors is the gate and loading against it should be avoided. Unintentional loading against the gate is usually caused by the movement of straps or other connecting components from their intended position while unloaded. Connectors with a captive eye, which holds the lanyard in place, can partially overcome this problem and are recommended, where appropriate. Alternatively, triangular or semi-circular shaped screwlink connectors or other specially designed connectors that have a high minor axis strength (i.e. across the gate) may be chosen.

2.7.4.5 The minimum recommended static strengths for connectors are given in **Table 2.1**.

2.7.4.6 When selecting a connector, users should take account of its gate locking system and how and where the connector is going to be used in the rope access system, to protect against *roll-out*. Roll-out is the result of pressure on the gate by another component connected to it, such as an anchor line device, a harness attachment point (especially if made from metal), a webbing lanyard, an anchor line or another connector. If the safety catch mechanism on the locking gate is actioned while this pressure is applied, it can cause the inadvertent opening of the connector gate and the roll-out (i.e. release) of the component from the connector.

2.7.4.7 In roll-out, the safety catch is usually accidentally tripped in one of two ways, depending upon the type of locking gate. These are:

a) by rope or webbing running over the top of some types of gate which incorporate a twist-action safety catch;

b) unintentional pressure against the user's body or the structure on the safety catch of double-action safety hooks.

Table 2.1 — Recommended minimum static strengths for connectors

Type of connector	**Major axis with gate closed and unlocked (kN)**	**Major axis with gate closed and locked (kN)**	**Minor axis with gate closed* (kN)**
All connectors except those used where there is likely to be a loading across the minor axis, e.g. to connect twin harness attachment points, i.e. so-called multi-use connectors and screwlink connectors, which are often used for the same purpose.	15	20	7
Multi-use connectors	15	20	15
Screwlink connectors	Not applicable	25	10
* Certain types of connector are unable to be tested across the minor axis because of their special design.			

2.7.4.8 The potential problems of loading against the gate and subsequent roll-out can generally be avoided by careful thought of how pressure could be applied unintentionally to the connector during use and then choosing the correct connector to take account of this.

2.7.4.9 Other selection criteria for connectors include:

a) resistance to corrosion, wear, abrasion and fracturing;

b) robust enough to work in cold, dirty or gritty conditions;

c) ability to be opened, closed and locked in difficult circumstances, e.g. with gloved hands;

d) gate-open size and design to suit the work in hand, e.g. connection to scaffold tubes.

2.7.4.10 Examples of appropriate standards for connectors are:

a) for all types (including self-closing and self-locking types): EN 362;

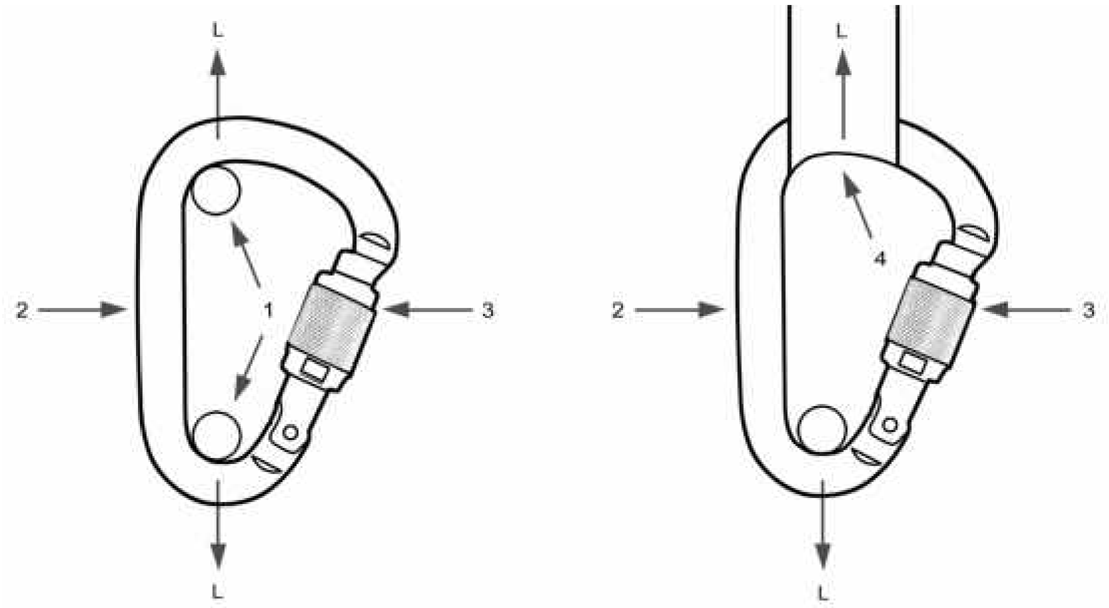
b) for self-closing and self-locking types only: ISO 10333-5; ANSI/ASSE Z359.12.

2.7.5 Descending devices

NOTE This code of practice does not cover powered descending devices (e.g. powered by battery or petrol), although the principles that apply to the safe use of manually-operated descending devices are likely to apply also to powered versions.

2.7.5.1 Descending devices are used to attach the rope access technician to the working line and to control the descent. If a connector is used to connect the descending device to the user, only an appropriate locking connector should be used. This may be a manual or automatic locking connector. Automatic locking connectors should have protection against roll-out (see **2.7.4.6**, **2.7.4.7** and **2.7.4.8**).

2.7.5.2 When selecting a descending device, it is essential that the probability of foreseeable misuse and the consequences of such misuse are assessed. When such an assessment has been made, a residual risk of misuse may exist, which should be addressed by identifying and applying



a) Loading during the static strength test

b) Possible loading (closer to weaker, gated side) during use with a wide webbing lanyard

Key

1 Bars 12 mm diameter
2 Connector spine
3 Gate
4 Webbing lanyard
L Direction of load

Figure 2.1 — Example of the loading positions of a connector in a static strength test and the difference in use, e.g. when loaded with a wide webbing lanyard

specific control measures, such as the selection of alternative equipment, extra training, modification of work practices, increased supervision or a combination of these.

2.7.5.3 Special consideration should be given to the suitability and performance of descending devices during rescue, when potential loads could be significantly higher than the manufacturer’s maximum rated load.

2.7.5.4 Descending devices should:

a) be selected such that the anticipated loading is appropriate for the mass of the rope access technician, including any equipment worn, i.e. in accordance with the manufacturer’s maximum and minimum rated loads;

b) be appropriate for the length of the descent;

c) be capable of two-person loading and provide appropriate control over the speed of descent if workmate retrieval is going to be carried out using this device;

d) be suited to the prevailing environmental conditions, e.g. wet; icy; muddy; abrasive; corrosive;

e) be capable of giving the rope access technician appropriate control over the speed of descent and should not cause undue shock loads to the working line when braking;

f) automatically stop the descent if the rope access technician loses control, i.e. lock automatically in the hands-free mode (noting that it is common and acceptable for some minor creep of the descending device along the anchor line to occur);

g) preferably fail to safe in all modes of operation, e.g. stop the descent automatically when gripped too tightly in panic (panic locking);

h) be simple to attach to the working line and have protection against incorrect attachment (e.g. via design; marking; warnings);

i) minimize damage, wear or twist to the working line;

j) have good heat dissipation characteristics (important on long descents or descents in high ambient temperatures);

k) be compatible with the anchor line type and diameter;

l) not be capable of inadvertent detachment from the working line or becoming detached under any circumstances while carrying a rope access technician’s weight or while supporting the weight of two persons during a rescue.

2.7.5.5 Examples of appropriate standards for descending devices are:

a) EN 12841, Type C; ISO 22159.

b) For rescue only: EN 341.

2.7.6 Ascending devices

NOTE This code of practice does not cover powered ascending devices (e.g. powered by battery or petrol), although the principles that apply to the safe use of manually-operated ascending devices are likely to apply also to powered versions.

2.7.6.1 Ascending devices are attached to the working line and are used when the rope access technician wishes to climb up it. Typically, there are two types of ascending device used in a rope access system. The first type is used to connect the rope access technician directly to the working line via the harness; the other type is attached to a foot loop to aid climbing and is also connected back to the harness with a device lanyard to provide additional security.

2.7.6.2 Ascending devices should be of a type that cannot be detached accidentally from the working line and should be chosen so that the risk of damage to the working line is minimized when in use. Any dynamic loading should be avoided, as damage could result to either the ascending device or the working line.

2.7.6.3 Ascending devices should be chosen bearing in mind suitability for use in the prevailing environmental conditions, e.g. wet; muddy; icy; abrasive; corrosive.

2.7.6.4 Other selection criteria include:

a) simplicity of connection to the working line;

b) ease of adjustment when moving it up and down the working line;

c) effective grip on the working line;

d) resistance to abrasion, e.g. caused by dirty working lines;

e) minimal potential for damage to working lines under foreseeable loads, e.g. the sharpness of teeth on the cam that grips the working line;

f) suitability for specific use, e.g. mounting on the chest when ascending;

g) ability to connect device lanyards and other devices.

2.7.6.5 An example of an appropriate standard for ascending devices is EN 12841, Type B.

2.7.7 Back-up devices

2.7.7.1 Back-up devices are used to attach the rope access technician to the safety line. This is normally done by linking the back-up device to the user's harness with a device lanyard. In the event of a failure of the working line or loss of control by the rope access technician, back-up devices are intended to lock on to the safety line without causing catastrophic damage to the safety line and also to absorb the limited shock load that might occur.

2.7.7.2 When back-up devices are dynamically tested in accordance with standards, the tests only represent a (vertical) free-fall. In certain circumstances, an uncontrolled descent may not be a free fall and the back-up device may not activate, e.g. if the user loses control of the descending device during descent, if a fall is impeded by the structure or while descending at an angle other than vertical. Back-up devices should be selected which are known to perform in such a way that an uncontrolled descent at all angles likely to be encountered during use would be prevented or minimized.

2.7.7.3 When used in accordance with the manufacturer's instructions, the combination of back-up device, device lanyard, connectors and harness should be able to limit the force on the user to a maximum of 6.0 kN in the event of a working line failure.

NOTE 6 kN is a recognized threshold of injury.

2.7.7.4 It is recommended that back-up devices used are of a type that will not slip at a static load of less than 2.5 kN to allow for two persons to be supported from it, which may be necessary in a rescue situation.

2.7.7.5 When selecting a back-up device, it is essential that the probability of foreseeable misuse and the consequences of such misuse are assessed. When such an assessment has been made, a residual risk of misuse may exist, which should be addressed by identifying and applying specific control measures, such as the selection of alternative equipment, extra training, modification of work practices, increased supervision or a combination of these.

2.7.7.6 Special consideration should be given to the suitability and performance of back-up devices if they might be used during rescue, because potential loads could be significantly higher than the manufacturer's maximum rated load.

2.7.7.7 Additional selection criteria for a back-up device include:

a) that the anticipated loading is appropriate for the mass of the rope access technician including any equipment worn, i.e. in accordance with the manufacturer's maximum rated load;

b) the suitability with regard to arresting the mass of the user, including any equipment worn or carried;

c) the ability to keep any fall as short as possible;

d) that it does not cause catastrophic damage to the safety line when arresting a fall;

e) the suitability with regard to arresting a two-person load if workmate retrieval is going to be carried out;

f) that it cannot be inadvertently disconnected from the safety line;

g) compatibility with the safety line type and diameter;

h) the ability to position the device anywhere on the safety line;

i) the suitability for the prevailing environmental conditions, e.g. wet; icy; dirty; abrasive; corrosive;

j) minimal manipulation required by the rope access technician;

k) preferably fail to safe in all modes of operation, e.g. prevent or arrest a fall even when gripped in panic.

2.7.7.8 An example of an appropriate standard for back-up devices is EN 12841, Type A.

2.7.8 Lanyards and slings

2.7.8.1 General

2.7.8.1.1 Lanyards and slings are made in various forms and may be used for one or more applications. See **Figure 2.2** for examples.

2.7.8.1.2 Some lanyards are used to provide a link between the user's harness and certain anchor line devices, namely the foot ascender and the back-up device. In this code of practice, they are referred to as *device lanyards*. Such lanyards are generally made from dynamic mountaineering rope and are fitted with knotted terminations but are sometimes other types of energy absorber or energy-absorbing lanyard.

2.7.8.1.3 Other lanyards, also generally made from dynamic mountaineering rope and fitted with knotted terminations, are used to connect the rope access technician directly to an anchor point via a connector. In this code of practice, they are known as *anchor lanyards*.

*NOTE The lanyards described in **2.7.8.1.2** and **2.7.8.1.3**, both of which are often commonly called cow's tails, have been separated into the two types (and renamed) because their specific use and requirements are or can be different.*

2.7.8.1.4 Slings are used to provide a link between structural anchors, e.g. a steel beam, or anchor devices, e.g. an eye bolt, to the attachment point for anchor lines (via a connector or connectors), and are normally made from textile webbing, textile rope or wire rope and, sometimes, chain. These are known as anchor slings.

2.7.8.1.5 Lanyards and slings can be a fixed length or the length can be adjustable.

2.7.8.1.6 Webbing and rope made from man-made fibres used in the manufacture of lanyards and slings should be 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. The webbing, rope and stitching should be protected against ultra-violet degradation, e.g. by the use of ultra-violet inhibitors and/or by a protective covering.

2.7.8.1.7 The construction of webbing should be such that it does not unravel if one of the edges is cut. This applies to all components made from webbing.

2.7.8.1.8 Wire rope used in the manufacture of lanyards and slings should have a minimum static strength of 15 kN.

2.7.8.2 Device lanyards and anchor lanyards

2.7.8.2.1 Device lanyards and anchor lanyards should be able to withstand any dynamic forces that might be imposed upon them in times of emergency. Device lanyards and anchor lanyards made of rope should have a performance at least equal to that of a “single” dynamic mountaineering rope, e.g. one conforming to European Standard EN 892 or the equivalent standard by the International Mountaineering and Climbing Federation (UIAA). Both these standards require the rope to have energy absorbing properties. Knots to be used for the terminations should be chosen for their energy absorbing characteristics as well as their strength and should be tied only by competent persons. The energy absorption provided by the materials used in the construction of the lanyard is enhanced by the knots used to terminate them and knotted terminations are therefore recommended. An example of a knot that is particularly good at absorbing energy is the scaffold knot (often referred to as a barrel knot), see **Figure 2.3**, which is frequently used in the end of the anchor lanyard. The knot in **Figure 2.3** shows the knot tied with two turns of the rope. There is a version that uses three turns. Both versions are acceptable. It is good practice to re-tie, dress and set (i.e. hand tighten) knots periodically as part of the inspection process.

2.7.8.2.2 Device lanyards and anchor lanyards made from dynamic rope with knotted terminations should have a minimum static strength of 15 kN. The strength of the combination of chosen rope and knots should be confirmed, e.g. by testing the lanyard or by reference to information supplied by the manufacturer.

2.7.8.2.3 Other types of lanyard may be appropriate for use in rope access, e.g. lanyards conforming to standards where the minimum static strength requirement is typically 22 kN and energy absorption is not considered. For proprietary lanyards, the information supplied by the manufacturer should be consulted.

2.7.8.2.4 If an energy absorber is incorporated into the system (other than that provided by the energy absorbing qualities of the material and termination knots used in the construction of the device lanyard or anchor lanyard), it should conform to an appropriate standard for energy absorbers.

2.7.8.2.5 To minimize any fall potential and to aid manoeuvres in a rescue situation, it is important that the length of device lanyards is kept as short as possible and limited to the rope access technician’s reach. This will vary from person to person.

2.7.8.2.6 Anchor lanyards are normally used in two lengths; the shortest typically when changing from one anchor line to another during descent, e.g. at a re-anchor, and the longest typically when changing from one anchor line to another during ascent, e.g. at a re-anchor. The lengths of the anchor lanyards should be as short as possible, i.e. no longer than is necessary to enable the rope access technician to carry out the required manoeuvres. This is not only for maximum efficiency in carrying out the manoeuvres but also to minimize the potential for high impact forces in any fall that might occur.

2.7.8.3 Anchor slings

2.7.8.3.1 Anchor slings may be used where there are no suitable anchors to which the anchor lines can be attached directly. If made from man-made fibres, anchor slings should have sewn joints and have a minimum static strength of 22 kN. Anchor slings made from wire rope should have a minimum static strength of 15 kN.

2.7.8.3.2 Where the included angle at the anchor point (the Y angle) is high and produces a multiplier effect (i.e. it increases the loading on the anchor sling), the extra forces that are produced need to be taken into account. An example is when an anchor sling is wrapped around a lift-shaft housing. See **Figure 2.4**.

2.7.8.4 Selection criteria for device lanyards, anchor lanyards and anchor slings

Selection criteria for device lanyards, anchor lanyards and anchor slings include:

a) adequate strength;

b) energy absorbing characteristics, particularly for device lanyards and anchor lanyards;

c) compatible with the connectors being used, e.g. fits through the connector gate and does not bunch and distort unduly under load;

d) suitable length (adjustable or fixed);

e) suitable for attachment to the harness, where appropriate;

f) protected at wear points;

g) manufactured from appropriate materials for the task in hand, e.g. in some cases, steel cable might be more suitable than rope or webbing, and for the work environment;

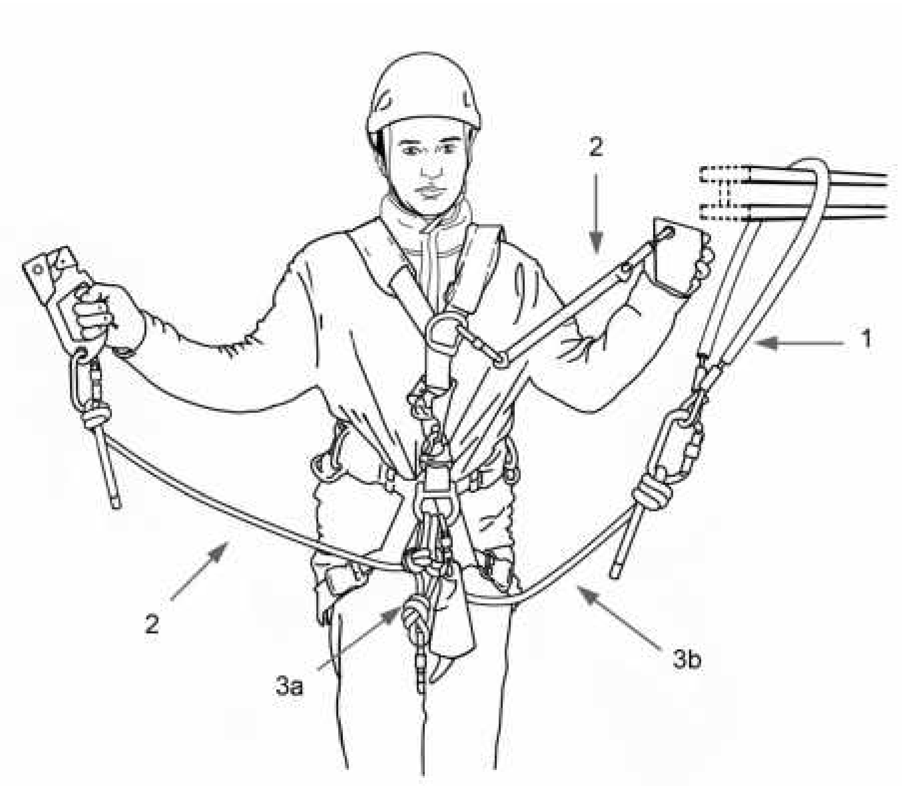
2.7.8.5 Other information on lanyards

2.7.8.5.1 Information on other types of lanyards is given in **Part 3, Annex E.**

2.7.8.5.2 Examples of appropriate standards for lanyards are:

a) EN 354; ISO 10333-2; ANSI/ASSE Z359.1;

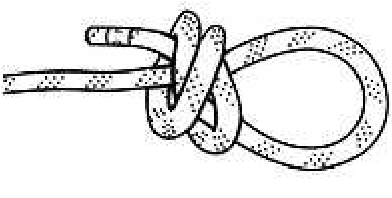
b) For the construction of device lanyards and anchor lanyards: EN 892; UIAA-101.



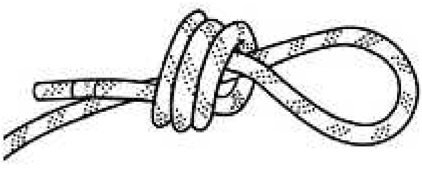
Key

1 Anchor sling (may be a round sling or a strop)
2 Device lanyard
3a Short anchor lanyard
3b Long anchor lanyard

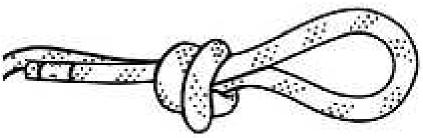
Figure 2.2 — Illustration to show an example of an anchor sling and examples of different types of lanyard



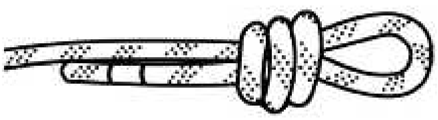
a) Scaffold knot with double twist: loose



c) Scaffold knot with triple twist: loose



b) Scaffold knot with double twist: set



d) Scaffold knot with triple twist: set

Figure 2.3 — Example of a scaffold knot (often referred to as a barrel knot)

2.7.9 Anchors

NOTE The word anchor in this code of practice is used as a general term to describe, as a noun, a fitted or unfitted anchor device, or a structural anchor containing an anchor point and, as a verb, the act of connecting to a fitted anchor device or structural anchor. Various terms relating to anchors are explained in Part 1 by way of definitions and the accompanying Figure 1.1 in that part.

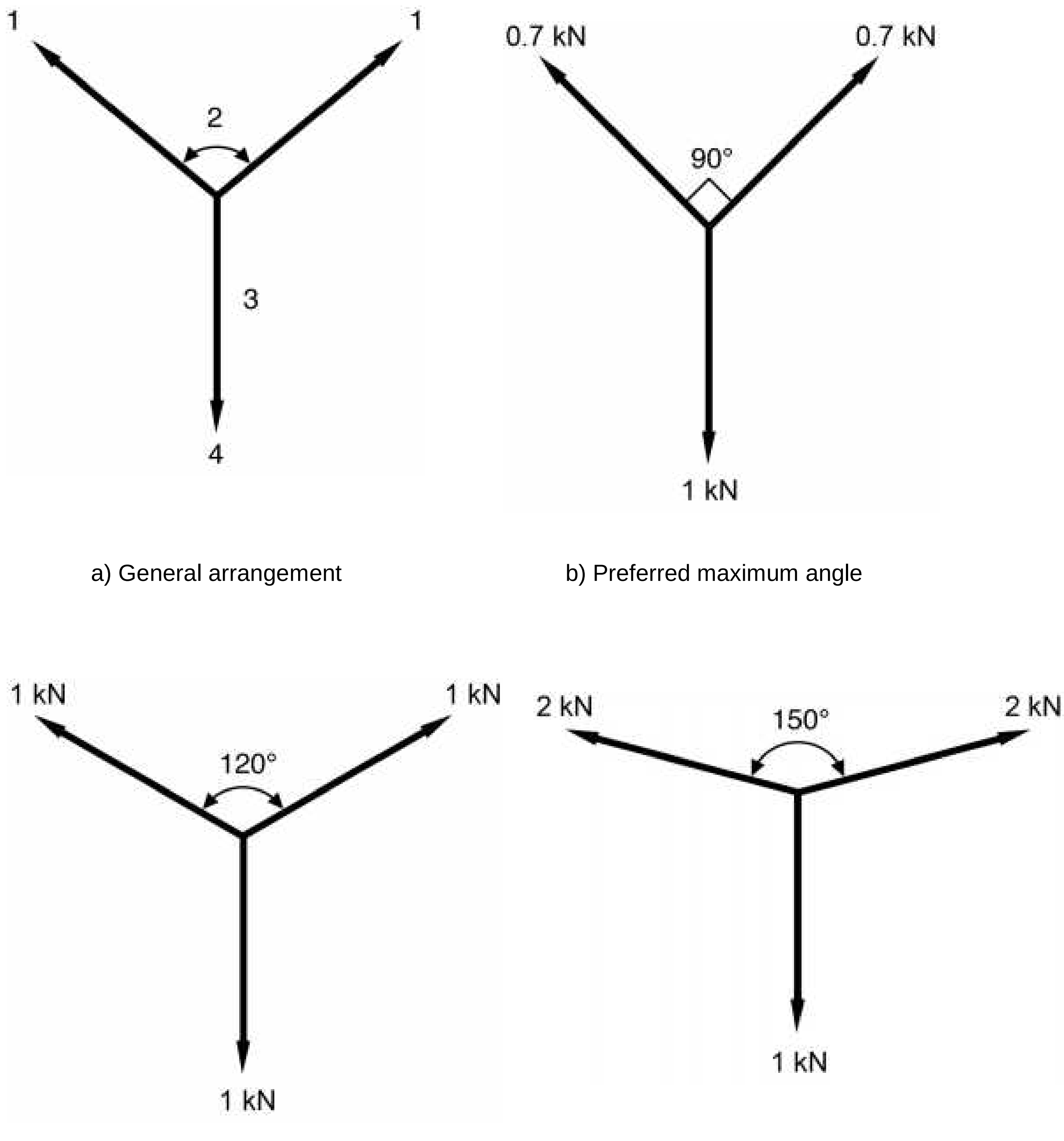
2.7.9.1 Anchors are used via their *anchor point(s)* for the attachment of anchor lines (i.e. the working line and the safety line) to the structure or natural feature and also for other purposes, e.g. to reposition the anchor lines to avoid abrasion; to alter the direction of the anchor lines (deviation anchors); to maintain the anchor lines in their intended position; for the attachment of persons, either directly or indirectly. Anchors are fitted to *anchorages* at an *anchorage point,* i.e. the particular place on the anchorage used for the attachment of the anchor device.

2.7.9.2 There are many different types of anchors. Examples are: eye bolts; anchor slings; specially designed rail anchor systems (which typically are permanently fitted around the perimeter of the roof of a building so that attachment can be made anywhere along them); ground anchor stakes (fixed into the ground); deadweight anchors; counterweight anchors; beam clamps. Examples of anchorages are: structures made from steel beams; lift-shaft housings on tower blocks; sound concrete and natural geological features such as a rock face or a tree. Anchors and anchorages should be unquestionably reliable.

2.7.9.3 It is essential that great care is taken when selecting anchor devices that they are appropriate to the situation in which they are fitted or to be fitted and used, e.g. that they are the correct type of anchor device for the given situation and that they are positioned and fitted correctly. It is also essential that anchor devices are fitted, tested, inspected and used by competent persons and strictly in accordance with manufacturer's instructions.

2.7.9.4 The selection of anchors largely depends on whether anchors such as appropriate eyebolts could be fitted or are already in place and in the correct place, and whether opportunities exist to use other types of anchor, e.g. anchor slings fitted around the structure.

2.7.9.5 Anchors should be of an adequate strength, bearing in mind the mass of the user including any equipment worn or carried. See **2.11.2.6** to **2.11.2.8** for more advice.



a) General arrangement

b) Preferred maximum angle

c) Loading at 120°

d) Loading at 150°

Key

1 Anchor
2 Y angle
3 Anchor line
4 Load

Figure 2.4 — Examples of the increase in loading on anchors, anchor lines and anchor slings caused by an increase in the Y angle

2.7.9.6 When selecting, fitting and using anchors, the principle of double protection (see **2.11.1**) applies and, therefore, at least two anchors should always be used.

2.7.9.7 Rope access technicians and rescue services should be aware that additional anchors may be required to facilitate workmate retrieval. These should be of adequate strength for at least a two-person load.

2.7.9.8 The subject of selection, fitting and use of anchors is complex. See **2.11.2** and **Part 3, Annex F** for further information.

2.7.9.9 Examples of appropriate standards for anchor devices are: BS 7883 and EN 795.

2.7.10 Protectors for anchor lines

NOTE This guidance on the protection of anchor lines against hazardous surfaces may also be applied in context to the protection of lanyards and slings.

2.7.10.1 Wherever possible, anchor lines should be rigged so that they hang free and do not come into contact with hazardous surfaces, e.g. edges or abrasive or hot surfaces, at any time during the rope access activity. Where this cannot be done, e.g. where it is not possible to arrange a natural free hang or use deviations or re-anchors, it is essential that anchor lines are suitably protected against the hazard. This can be achieved in various ways, e.g. by the use of *edge protectors* such as rollers; metal edge plates; edge padding, or by *anchor line protectors* such as a textile sheath which encapsulates the anchor line, or by a combination of both types of protector. See **2.11.3** and **Annex P** for more information on the protection of anchor lines.

2.7.10.2 Selection criteria for edge protectors and anchor line protectors include:

a) suitability for the particular site conditions, e.g. provides adequate protection against cutting, abrasion, excessive heat or chemical contamination;

b) suitability for compatibility with anchor line type, e.g. construction; diameter; number of anchor lines;

c) a features to allow them to be tied off (if required) to keep the edge protectors and anchor line protectors in their intended place and to maintain the anchor line(s) in position within or on them;

d) a design that allows the rope access technician to place and to pass the edge protector or anchor line protector;

e) the ability to inspect the anchor line(s) while located in or on the edge protector or anchor line protector.

NOTE There are no known standards for edge protectors and anchor line protectors.

2.7.11 Work seats

2.7.11.1 When there is a need for rope access technicians to remain suspended in one place for more than a few minutes, support additional to that provided by the harness is recommended. The use of even a simple work seat can enhance the comfort, health and safety of a rope access technician, possibly including a reduction in the risk of experiencing the symptoms of suspension intolerance. For more information on suspension intolerance, see **Part 3, Annex G**.

2.7.11.2 The work seat should be fitted in such a way that the harness remains the primary means of attachment to the anchor lines, should the work seat fail.

NOTE There are no known appropriate standards for work seats.

2.7.12 Helmets

2.7.12.1 Rope access technicians should wear protective helmets that are suitable for the type of work being undertaken. Helmets that conform to standards for either mountaineering or industrial use might be suitable. Some industrial helmets might not be suitable because they might not have sufficient side impact protection or strong enough chinstraps.

2.7.12.2 Chinstraps on helmets used in rope access work should prevent the helmet from coming off the head. This is typically achieved by the incorporation of “Y” shaped straps in the design of the helmet. Helmets should always be used with the chinstrap fastened.

2.7.12.3 Selection criteria for helmets include:

a) light weight, but without compromising safety;

b) good fit, i.e. adjustable to the wearer’s head size;

c) the ability to mount ancillary equipment such as communications equipment; headlamp; ear protectors; visors;

d) unrestricted vision (downwards, sideways and upwards);

e) good ventilation, particularly in hot climates.

2.7.12.4 Examples of appropriate standards for helmets (when the caveats in the notes are taken into account) are:

a) Industrial: EN 397; EN 14052;

b) Mountaineering: EN 12492.

NOTE 1 Users should check carefully the performance of industrial helmets conforming to European Standard EN 397 as they might not have the all the performance requirements for the safety of rope access technicians, e.g. front, side and rear energy absorption capacity (not specified in EN 397); appropriate chinstrap and fastening arrangement; low temperature use and ventilation (optional in EN 397).

NOTE 2 Helmets utilizing expanded polystyrene shells (common in helmets conforming to European Standard EN 12492) are unlikely to withstand the rigours of industrial use and, therefore, are generally not recommended.

2.7.13 Pulleys

2.7.13.1 Pulleys are used in a variety of rope access manoeuvres. They should be appropriate for their intended use, i.e. by personnel, and be suitably load-rated. Rope access technicians should be aware of the possible increase of loadings on anchors in some rigging situations.

2.7.13.2 Examples of appropriate standards for pulleys are: EN 12278; UIAA 127.

2.7.14 Clothing and protective equipment

2.7.14.1 Rope access technicians need to be appropriately dressed and equipped for the work situation and conditions.

2.7.14.2 It can be difficult for rope access technicians to avoid exposure to changing climatic conditions or harmful substances when working at a height. Employers should assess carefully what the most appropriate clothing would be to guard against such hazards. This protective clothing should be provided and measures taken to ensure that it is worn.

2.7.14.3 Rope access technicians should wear the following:

a) protective clothing (e.g. overalls) that have no loose parts, which might become caught in any moving equipment. Pockets should be fitted with zip or touch-and-close type fastenings rather than buttons. Waterproof and/or windproof clothing should be provided where necessary. Flame proof or flame resistant overalls should be provided for welding, burning or cutting work;

b) suitable footwear, which fits well, provides a good grip and gives an adequate level of protection for the task being undertaken. Special protective boots may be needed when grit blasting or ultra-high pressure water-jetting to prevent injury.

2.7.14.4 If equipment is to be fitted to the user, it is important that it is comfortable to wear and fits the wearer properly when correctly adjusted. This should be checked in a safe place, before work commences. Such equipment should not significantly hinder the wearer from carrying out their duties or from properly operating the anchor line devices.

2.7.14.5 The following protective items might also be required:

a) gloves, to protect against cold weather, injury or other harmful effects;

b) eye protection, where debris is being cleared or material is being removed, or where drilling, blasting or percussion operations are being undertaken. Eye protection is usually also required if chemicals are being sprayed or painted, which could cause irritation or injury to the eyes. IRATA International work and safety statistics have shown numerous lost time incidents due to eye injury, including where visors or safety glasses have been worn. It is likely that the wearing of goggles would have prevented these injuries;

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

d) hearing protectors, when noise levels could cause a risk of hearing loss to rope access technicians;

e) 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 anchor line devices;

f) protection against sunburn, e.g. by the use of a sunscreen.

2.7.14.6 Any variation in normal procedures in the use of protective equipment on the worksite (e.g. lifejackets; eye protection; safety footwear; helmet), for whatever reason, should first be cleared with the site management.

2.8 Marking and traceability

2.8.1 Load-bearing rope access equipment should carry sufficient marking:

a) to enable identification of the manufacturer and, where appropriate, the model/type/class of equipment;

b) so that it can be easily associated with its respective documentation, e.g. certificates of conformity, examination and inspection records;

c) to allow further traceability, e.g. to enable the isolation of a rogue batch of components;

d) to meet any requirements of legislation, e.g. national regulations.

This is achieved typically by the use of an identifier, e.g. a manufacturer's serial number, or by batch marking with additional forms of identification, e.g. a coding system.

2.8.2 Equipment that does not have adequate marking made by the manufacturer should be indelibly marked in a manner that does not affect its integrity, e.g. by the use of: plastic or metal tags, which can be stamped with data and fixed with cable ties; a suitable paint; a suitable adhesive tape. (The paint or adhesive should be of a type that is not capable of damaging the component being marked and should be applied and positioned so that it cannot obscure any defect.)

2.8.3 Equipment such as ropes and harnesses 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. a piece of rope cut off a main rope numbered A1 could be numbered A1/1, A1/2 etc. Connectors are often colour coded to indicate an in-date inspection period, as older items often lack unique identification and marking by the user can be difficult.

2.8.4 Metal items should not be marked by stamping, unless by agreement with the manufacturer. This is because stamping can cause the potential for cracking of certain metals under certain conditions and, therefore, great care should be taken if this method of marking is chosen. The marking of metal items by engraving should only be carried out in such a way that it does not affect the integrity of the equipment, e.g. by marking in a non-safety-critical area of a component. It should be noted that stamping and engraving may damage any applied corrosion-resistant surface, e.g. electroplating, and it is recommended that steps be taken to avoid this potential for damage, e.g. by coating the indentations made by the stamping or engraving with paint.

2.8.5 Helmets should not be marked with adhesive labels or adhesive tape without permission from the manufacturer, as some solvents used in adhesives can adversely affect the helmet's performance. Care should be taken that equipment made from webbing or rope is not marked with damaging chemicals, e.g. inks, or products containing potentially harmful adhesives.

2.8.6 The identification and traceability details should be matched to records of use to help in the equipment's care and maintenance. This also applies to hired or sub-contractors' equipment.

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2.9 Records

2.9.1 Records should be kept to track the use of individual pieces of equipment, its inspection and its maintenance. These should include at least the following:

a) the name of the manufacturer;

b) the name of the model, type or class of the equipment, as appropriate;

c) the purchase date;

d) the date of entry into service;

e) the obsolescence date;

f) the manufacturer's serial number or batch marking to enable traceability, e.g. to the production stage;

g) the information supplied by the manufacturer, including instructions for use;

h) the safe working load, working load limit or maximum and minimum rated loads, whichever is provided;

i) any certificate of conformity, e.g. to a standard;

j) the duration of active use, e.g. number of days;

k) current location and where it is stored normally;

l) any arduous conditions in which the equipment has been used, e.g. exposure to chemicals; abrasion; heavy grit; any unusual loads or damage imposed;

m) any workmate retrieval carried out;

n) the date and result of inspections, the type of inspection carried out (detailed or interim) and the date the next inspection is due;

o) details of servicing, repairs or modifications.

Such information could help to determine when to take an item out of service.

2.9.2 Records of inspections should be kept at least until a subsequent inspection is carried out and copies of inspection records should be made available for viewing by relevant persons (see **Part 3, Annex N**). Local legislation may determine the specific retention period for records.

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2.10 Inspection, care and maintenance of equipment

2.10.1 General procedures

2.10.1.1 The manufacturer should always provide information on the inspection, care and maintenance of equipment and this should be strictly followed. This section details good practice for rope access purposes.

2.10.1.2 Procedures should be established by employers for the inspection and maintenance of equipment and the method by which this is to be recorded. The inspection and maintenance of equipment should only be carried out by competent persons. Inspection and maintenance may be carried out by the manufacturer's representative or specialist third parties if required.

2.10.1.3 There are three types of inspection to which all rope access equipment should be subjected, to decide if the equipment can continue to be used or if it should be removed from use and destroyed. These are the pre-use check, the detailed inspection and, in certain circumstances, the interim inspection. Any item showing any defect during these inspections should be withdrawn from service, immediately if possible.

2.10.1.4 It is essential that all load-bearing equipment is given a visual and tactile inspection by the user before each use to ensure that it is in a safe condition and operates correctly. In addition, there should be a formal process for detailed inspection of equipment by a competent person or persons. For an inspection checklist, see **Part 3, Annex H**.

2.10.1.4.1 ***Pre-use check***

The pre-use check consists of a visual and tactile inspection, which should be carried out before first use each day. Formal documentation for daily inspections should not be necessary, although some users may wish to include a checklist in daily inspection documentation. It is advisable to continue to monitor the condition of equipment throughout the duration of the task and not just at the start of the day.

2.10.1.4.2 ***Detailed inspection***

There should be a formal inspection procedure to ensure that equipment is thoroughly inspected by a competent person before equipment is used for the first time and then at intervals not exceeding six months, or in accordance with a written inspection scheme. This should be carried out in accordance with any manufacturer's guidance. The results of detailed inspections should be recorded. For a recommended list of information to be recorded following a detailed inspection, see **Part 3, Annex I**.

2.10.1.4.3 ***Interim inspection***

Where equipment is used in arduous conditions or exceptional events liable to jeopardize safety have occurred, further inspections (called *interim inspections*) should be carried out. These are inspections in addition to the detailed inspection and the normal pre-use check. They should be carried out by a competent person at intervals determined by the risk assessment. Suitable times for interim inspections can be decided by taking into account factors such as whether items are subject to high levels of wear and tear (e.g. unusual loadings or a gritty environment) or contamination (e.g. in a chemical atmosphere). Interim inspections should be recorded.

2.10.1.5 It is essential that the person carrying out a detailed or interim inspection has the authority to discard equipment and is sufficiently competent, independent and impartial to allow objective decisions to be made. A competent person may exist within a rope access company, or could be a specialist supplier, manufacturer or a specialist repair organization. Companies should detail their arrangements for nominating the competent person or persons in their management system.

2.10.1.6 Should there ever be any doubt about the continued serviceability of an item of equipment, the matter should be referred to a competent person or the equipment should be quarantined or discarded. It is good practice to try to establish how the damage occurred so that it can be prevented from happening again.

2.10.1.7 Equipment subjected to a high impact force, e.g. in a fall or by a load being dropped on to it, should be withdrawn immediately from use.

2.10.1.8 It is recommended that rope access equipment, indeed any personal fall protection equipment, is not subjected to proof load testing by the user.

2.10.2 Equipment manufactured from man-made fibres

2.10.2.1 All equipment manufactured from man-made fibres, e.g. ropes; webbing; harnesses; lanyards, should be chosen, used and inspected with particular care as it is susceptible to varying types and amount of damage, some of it not very easy to identify.

2.10.2.2 Man-made fibres used in equipment for rope access are usually polyamide or polyester. Materials other than polyamide or polyester might be more suitable for certain working conditions but all have their limitations. Examples are:

a) high performance polyethylene or high tenacity polypropylene, which might be more suitable where there is severe chemical pollution. However, polyethylene and polypropylene have much lower melting temperatures than polyamide or polyester and are more easily affected by frictional heat (dangerous softening of polypropylene occurs at temperatures as low as 80 °C);

b) aramid, which is resistant to high temperatures, might be more suitable where equipment with a high melting point is required. However, aramid has low resistance to abrasion, repeated bending and to ultraviolet light.

Users should, therefore, take account of these properties, including the melting point, resistance to abrasion and flexing, resistance to ultraviolet light and chemicals, and the elongation characteristics, when selecting, using and inspecting such equipment.

2.10.2.3 Ultraviolet light (UV) degrades and thus weakens most, if not all, man-made fibres. UV is emitted by sunlight, fluorescent light, which also contains ultraviolet light, and all types of electric-arc welding. The normal way to provide protection is by the inclusion of UV inhibitors at the fibre production stage but there are other possibilities, such as the type and colour of any dye used or the use of a protective covering. It is recommended that confirmation is obtained from the manufacturer that all man-made fibres in their equipment, including sewing threads, contain sufficient ultraviolet inhibitor for the conditions in which the equipment is to be used (ultraviolet light levels vary in intensity dependent upon location) and that the fibres have not been subjected to any dyeing or finishing process that could have detrimentally affected the level of protection. As ultraviolet inhibitors do not offer total protection, even man-made fibres that include them should not be exposed unnecessarily to sunlight, fluorescent light, and the light emitted by all types of electric-arc welding. It should be noted that many equipment standards for personal fall protection equipment do not address explicitly the potential for degradation by UV (or abrasion) during use of the product, relying instead on its strength including a safety factor when new. There is no guarantee that this approach will give sufficient protection against UV (or abrasion).

2.10.2.4 Man-made fibres react in different ways when exposed to different chemicals at different concentrations and temperatures. For example, polyamide has good resistance to some alkalis, but the resistance is not total, does not apply to all alkalis and not at all concentrations or at all temperatures. Similar limitations apply to polyester, which has good resistance to some acids. Users should be aware of the chemicals present in the work environment and the potential effect on their equipment when selecting, using and inspecting it. For the properties of some man-made fibres used in the manufacture of rope access equipment, see **Part 3, Annex J**.

2.10.2.5 The performance of some materials changes when they become wet. An example is polyamide fibre, which, when wet, loses between 10 % and 20 % of its strength. Fortunately, the loss is temporary and the strength is recovered when the material dries. In drop tests on dynamic rope that had been soaked in water for different periods, the impact loads increased by up to 22 % above those for dry ropes (typically by between 8 % and 12 %). Although the use of equipment made of webbing or rope in wet conditions does not usually need to be a cause for concern, it would be sensible to take extra care, particularly if the equipment is being used in conditions where it is subjected to loads close to its maximum rated load.

2.10.2.6 Components made from man-made fibres should be checked carefully before being stored and during the pre-use check by passing them through the hands to combine a tactile and visual examination. Kernmantel ropes should be checked to see that the sheath has not been cut and by feeling the rope for any damage to the core. Cable-laid ropes should 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.

2.10.2.7 Man-made fibres deteriorate slowly with age regardless of use and this ageing is accelerated by heavy and dynamic loadings. However, the most common cause of strength loss in equipment made from man-made fibres is through abrasion (either by grit working into the strands of webbing or rope or by chafing against sharp or rough edges) or by other damage, such as cuts.

2.10.2.8 Equipment made from man-made fibres should be carefully and regularly inspected for signs of abrasion. This applies to both external abrasion and internal abrasion. External abrasion is easy to see but sometimes it is difficult to determine the extent of its detrimental effect. Internal abrasion is more difficult to spot but can often be substantial, particularly if grit has penetrated the outer surface. All levels of abrasion lower the strength of this equipment: as a general rule, the greater the abrasion the greater the loss of strength. The effects of UV degradation and abrasion combined weaken the materials even further.

2.10.2.9 To minimize grit content, or simply to keep the product clean, soiled items should be washed in clean water (maximum temperature 40 ºC) 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 be dried naturally in a warm room away from direct heat.

2.10.2.10 Internal abrasion can also occur without any ingress of grit, simply by the action of the fibres rubbing together when flexing during normal use. For most textile materials, this is a slow process and is not significant. An exception is material made from aramid, which is very susceptible to this type of damage.

2.10.2.11 Equipment made from man-made fibres that have been in contact with rust should be washed. Such equipment with permanent rust marks should be regarded as suspect and scrapped. Tests have indicated that rust may have a weakening effect on polyamides.

2.10.2.12 Any component with a cut or substantial abrasion should be scrapped. The presence of a few small loops of fibres pulled up from the surface (plucks) is not a cause for concern. However, plucks can be susceptible to snagging, thereby causing additional damage, and should be kept under observation.

2.10.2.13 It is essential to avoid contact with any chemical that could affect the performance of the equipment. These include all acids and strong caustic substances (e.g. vehicle battery acid, bleach, drilling chemicals and products of combustion). The equipment should be withdrawn from service if contact does occur or is even suspected. Vigilance is necessary as contamination can come from unusual sources. In a climbing fatality in France, the effect of formic acid emitted by ants was cited as part of the reason for the failure of the climbing rope.

2.10.2.14 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 component starts to fall apart. The safest course of action is to scrap any component about which there is any doubt. Proof load testing should not be carried out on components made from man-made fibres.

2.10.2.15 Anchor lines, 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 component, this can indicate severe internal wear or contact with acids or other damaging chemicals, or it can indicate ultra-violet degradation. Swellings or distortion in a rope can be a sign of damage to the core fibres or of movement of the core within the sheath. Cuts, chafes, plucking and other mechanical damage 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 equipment, it should be scrapped.

2.10.2.16 Most man-made fibres are affected by high temperatures and begin to change their character, and thus their performance, at temperatures exceeding 50 °C. 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.)

2.10.2.17 Equipment made from man-made fibres should not normally be dyed, except by the manufacturer. Many dyes contain acids or require the use of acids to fix the colour permanently to the fibres, which could cause strength losses of up to 15 %.

2.10.3 Metal equipment

2.10.3.1 Most metal equipment, e.g. connectors; descending devices; ascending devices, is made of steel or of aluminium alloys, although other metals, such as titanium, are sometimes used. Aluminium alloys and most steels, with the exception of stainless steel, all look the same. However, the performance of these metals can vary greatly, particularly in terms of their corrosion resistance. It is essential, therefore, that the user knows from what the equipment is made, so that relevant precautions can be taken.

2.10.3.2 Equipment made from aluminium alloys sometimes has a polished surface finish, but usually it is anodized. Anodizing provides a thin electrochemical coating, which is harder than the base material. This coating protects the base metal against corrosion and also, to a small extent, against wear.

2.10.3.3 The various aluminium alloys used in rope access equipment have different characteristics. Generally, the stronger the alloy, the more susceptible it is to corrosion, so greater care in use, maintenance and inspection is required. Aluminium alloys are particularly susceptible to corrosion when in contact with seawater.

2.10.3.4 Contact between different metals can cause galvanic corrosion to occur, especially when wet, as a result of electrolytic action. This is one reason why equipment should not be stored wet (see **2.10.7**). Galvanic corrosion can affect many metals, including aluminium and some stainless steels and can cause the rapid destruction of protective coatings such as zinc. Long term contact of dissimilar metals (e.g. copper and aluminium) should be avoided, especially in wet conditions and, in particular, in a marine environment.

2.10.3.5 Some metals that are under tensile stress and in a corrosive environment can develop surface cracks. This is known as stress corrosion cracking. It is time dependent and can take many months to become apparent. This highlights why the need for regular inspection of equipment is so important.

2.10.3.6 Metal items such as rings, buckles on harnesses, connectors and descending devices 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. Lubrication should be avoided in areas that might come into contact with webbing fastening straps (for example, the slide bar of a harness buckle), ropes, slings, etc. because it could affect the proper functioning of any fastening arrangement. Any item showing any defect should be taken out of service.

2.10.3.7 Equipment made totally from metal can be cleaned by submerging in clean, hot water containing detergent or soap for a few minutes. High-pressure steam cleaners should not be used because the temperature could exceed the recommended maximum of 100 ºC. Seawater should not be used for cleaning. After cleaning, the equipment should be thoroughly rinsed in clean, cold water and then dried naturally away from direct heat.

2.10.3.8 Some chemical products used in building work can cause excessive corrosion to items made of aluminium alloys. Advice on dealing with this should be obtained from the product manufacturer.

2.10.4 Protective helmets

The shells of protective helmets should be checked for cracks, deformation, heavy abrasion, scoring or other damage. The chinstraps and cradles should be checked for wear, as should the security of any attachment points between different elements, such as sewn or riveted areas. Any helmet showing any defect should be taken out of service. Helmets made from polycarbonate should not have stickers placed on them unless it has been confirmed by the manufacturer that it is safe to do so. This is because the solvent used in the adhesive of some stickers can detrimentally affect the polycarbonate.

2.10.5 Disinfection of equipment

It may be considered necessary to disinfect equipment, for example after working in a sewer, although normally cleaning as described in **2.10.2.9** or **2.10.3.7** is sufficient. 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 from the manufacturer or supplier of the equipment 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.

2.10.6 Equipment exposed to a marine environment

If used in a marine environment, equipment should be cleaned by prolonged immersion in clean, cold fresh water, then dried naturally in a warm room away from direct heat and inspected before storage.

2.10.7 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, unauthorized access, rodents, ants (which emit formic acid) or other possible causes of damage. Equipment should not be stored wet because of the possibility of fungal attack or corrosion.

2.10.8 Equipment withdrawn from service

2.10.8.1 It is important that there is a quarantine procedure for ensuring 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.

2.10.8.2 Equipment found to be defective at inspection, or if its serviceability is compromised or in doubt, should be withdrawn from service and referred for further inspection or repair. Such equipment should be marked as not fit for service and, if not repairable, should be destroyed to ensure it cannot be used again. Records should be updated immediately.

2.10.9 Lifespan

2.10.9.1 It is very difficult to know by how much equipment is deteriorating (particularly equipment made from man-made fibres), without testing to destruction, which rather defeats the objective. Therefore, it is advisable to set a period after which such equipment should no longer be used. This period is known as the lifespan. The information supplied by the manufacturer for the equipment should be referred to when deciding on the lifespan. It is also important that a history is kept of the use of equipment, which should ideally log the conditions in which it was used, as this could be useful in any review of the lifespan set for the equipment.

2.10.9.2 Some equipment is given a lifespan (e.g. an obsolescence date) by the manufacturer. Equipment that has reached such a limit and has not already been rejected for another reason should be withdrawn from service and not used again, unless or until confirmed by a competent person, in writing, that it is acceptable to do so. Records should be updated immediately.

2.10.10 Alterations to equipment

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

2.11 Primary rope access work methods

2.11.1 Double protection

2.11.1.1 A rope access system actually consists of an access (sub) system and a back-up (sub) system, which are used together. The access system provides the primary support for access, egress and work positioning. It comprises a working line and descending and ascending devices, which are attached to the working line and which are always connected to the rope access technician's harness. The back-up system provides security additional to that provided by the access system, e.g. should there be a failure of the access system. The back-up system comprises a safety line and a back-up device, which is attached to the safety line and which is always connected to the rope access technician's harness. This system of double protection, which was developed by IRATA International, is one of the key elements of a safe rope access system.

*NOTE For an example of a typical method of ascending and descending using IRATA International rope access techniques, see **Part 3, Annex K**.*

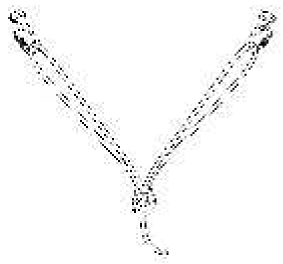
2.11.1.2 The working line and the safety line are known collectively as anchor lines. Each anchor line should be attached to its own anchor point. The working line and the safety line are normally connected to each other for added security, as well as allowing the anchor lines to be positioned between the anchors. Load sharing between anchors reduces the load on each one. This minimizes the likelihood of failure of either anchor but, in the unlikely event of a failure of one of them, there would only be a minimal impact force on the second anchor. A single element of a structure, (e.g. structural steelwork), a natural geological feature or a tree might have adequate strength to provide a place for anchor points for both the working line and the safety line. This should be verified by a competent person. Rope access safety supervisors are responsible for checking that anchor lines are correctly rigged. See **Figure 2.5**.

2.11.1.3 The principle of double protection also applies to the attachment of rope access technicians via their anchor line devices to the working line and safety line and to any anchors by their anchor lanyards. For example, descending devices and back-up devices should be fixed to the rope access technician's harness with separate connectors, in accordance with the information supplied by the manufacturer. (It is not necessary to wear two harnesses).

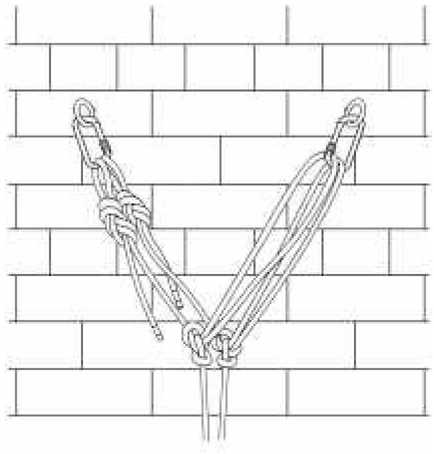
2.11.1.4 Rope access technicians normally descend the working line by means of the descending device, with the back-up device attached to the safety line. During ascent, ascending devices are attached to the working line, with the back-up device attached to the safety line. During both ascent and descent, the back-up device should be positioned so that the distance of any potential fall and its consequences are minimized. The system can be modified to become a top rope protection, where particular supervision or care of the rope access technician is required.

NOTE Sometimes, rope access methods are used in conjunction with conventional suspended access equipment. In such cases, the principle of double protection still applies to the rope access work. The anchors for rope access should be independent of the anchors for the conventional suspended access equipment. For the safety requirements for work on conventional suspended access equipment, reference should be made to the appropriate standards.

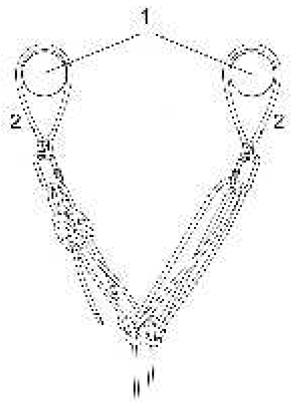
2.11.1.5 When carrying out rope access manoeuvres, e.g. passing a re-anchor; passing a knot, the action should be carried out in such a way that at least two independent points of attachment are maintained at all times.



a) Example of two equally loaded anchors



b) Example of double protection being provided by the use of eyebolts



Key

1 Structural steel
2 Anchor sling

c) Example of double protection being provided by the use of anchor slings

Figure 2.5 — Typical arrangements in a rope access anchor system

2.11.2 The anchor system (anchors and anchor lines)

2.11.2.1 The anchor system is of primary importance in the rope access system and should be unquestionably reliable.

2.11.2.2 When selecting, positioning and using anchors, the principle of double protection (see **2.11.1**) applies and, therefore, at least two independent anchors, i.e. at least one for the working line and at least one for the safety line, should always be used.

2.11.2.3 The recommendation to use two independent anchors applies even when attachment is to be made to an anchorage (i.e. a structure or natural feature) where it is apparent that the anchorage has more than adequate strength, e.g. a large steel beam.

2.11.2.4 Anchors should be positioned in such a way that rope access technicians can maintain their work position without difficulty and so that connection can be made to or from the rope access system in an area where there is no risk of a fall from a height.

2.11.2.5 The foreseeable directions of loading and anticipated potential loads should be established and taken into account when setting up the anchor system.

2.11.2.6 To determine the minimum anchor strength recommendation, this code of practice uses a safety factor of 2.5. The maximum impact load on the user in the event of a fall should not exceed 6 kN; therefore, as a general rule, the static strength of anchors, with the exception of some deviation anchors, should be at least 15 kN.

NOTE The anchor may yield but should not fail at this load.

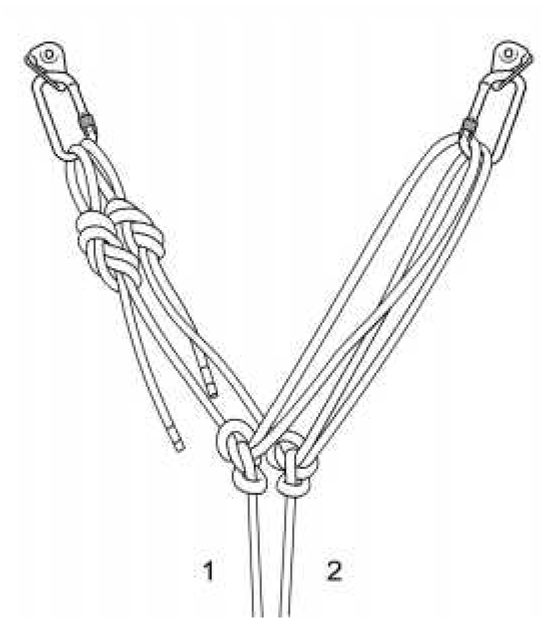
2.11.2.7 There is no requirement for designers (e.g. building designers) to add a further safety factor but, of course, the static strength may be increased if it is considered prudent or necessary to do so.

2.11.2.8 The values have been determined assuming a rope access technician with a mass, including equipment, of 100 kg, which is a typical standard test mass used in product standards for personal fall protection equipment. Rope access technicians with a mass that is greater than 100 kg including equipment should take appropriate steps to ensure that their anchors are of sufficient strength, e.g. by ensuring that there is sufficient energy absorption in the anchor system to keep the impact load on them and the anchors down to 6 kN or less in the case of any fall, and/or by increasing the strength of the anchors above the recommended minimum of 15 kN.

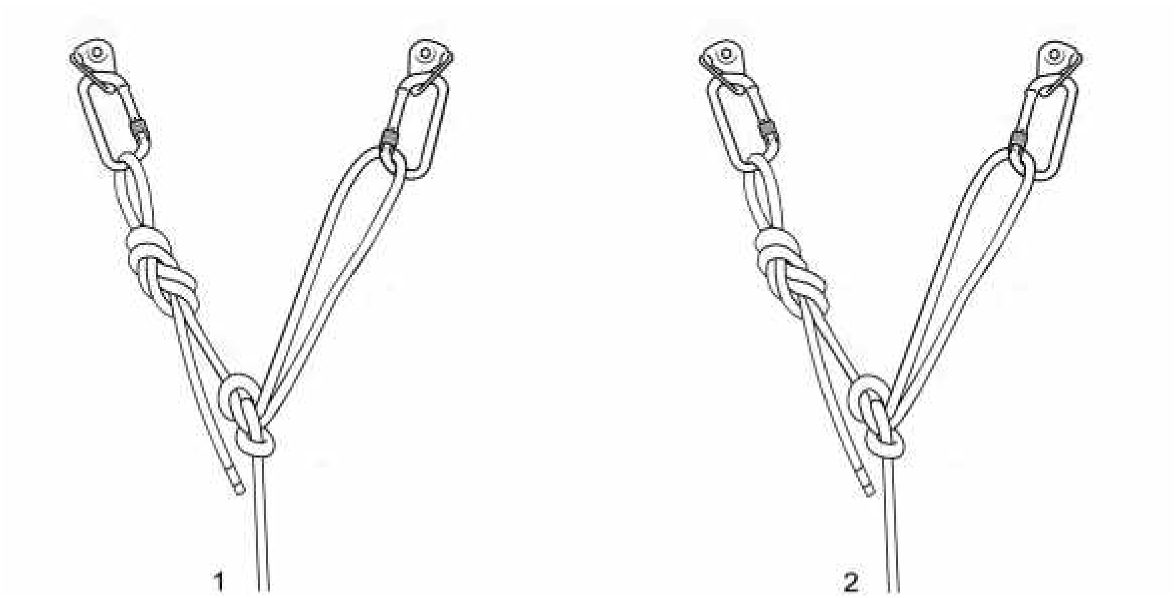
NOTE The recommendations regarding situations where the mass could be more than 100 kg applies especially in the case of rescue, where there could be more than one person attached to the anchor system. However, during rescue, IRATA rope access technicians are required and trained to follow procedures which restrict the potential for dynamic loading of the anchor system.

2.11.2.9 Wherever feasible, the two independent anchors – one for the working line and one for the safety line, and each with a static strength of 15 kN or more – should be linked together for added security. This link can be achieved, for example, by the use of a double figure-of-eight knot on the bight (also known as a bunny knot) or a combination of a figure-of-eight knot on the bight and an alpine butterfly knot, see **Figure 2.6a**.

2.11.2.10 Where the minimum recommended static strength of 15 kN for a single anchor is not achievable, it is acceptable to link together a number of anchors of a lower static strength, e.g. by the use of a Y hang, to act effectively as a single independent anchor for either the working line or the safety line, as long as the load on each group of anchors is equally shared and the combined static strength is a minimum of 15 kN, see **Figure 2.6b.** To allow for foreseeable misuse, e.g. unequal loading, it is recommended that the minimum static strength of each anchor in this combination is 10 kN.



a) Example of a Y hang arrangement where the strength of each individual anchor is 15 kN or greater



b) Example of a Y hang arrangement where the strength of each individual anchor is less than 15 kN and is equal to or greater than 10 kN

Key

1 Working line
2 Safety line

Figure 2.6 — Typical arrangements in a rope access anchor system to achieve minimum strength recommendations

2.11.2.11 The contained angle formed by the ropes linking the anchors in a Y hang (the Y angle) should be as low as possible and should generally not exceed 90°. This is the *preferred maximum angle,* see **Figure 2.4**. The greater the angle beyond this, the weaker the connection will be. If circumstances dictate the need for an angle greater than 90°, account should be taken of the increased loads at the anchors, at the anchor line terminations and on other components in the system. The angle should not exceed 120° because at angles greater than 120° the loads increase very significantly. There is an exception to this advice on preferred-maximum and maximum Y angles, which concerns flexible horizontal anchor line systems. These systems require special expertise to set up and use safely. Also see **2.11.2.21**. Further information is provided in **Part 3, Annex L**.

2.11.2.12 Anchors of the type that are fixed in masonry should only be installed (and inspected) by competent persons, who are aware of the numerous safety issues, e.g. minimum distance required between two fixed anchors, minimum distance from any edge, correct depth, solid or hollow masonry. Where possible, anchors should always be installed so that they are loaded in shear. For safety considerations when installing anchor devices, see **Part 3, Annex F**.

2.11.2.13 Anchor slings, which typically are used where there are no suitable anchors to which the ropes can be attached directly, should have a minimum breaking strength of 22 kN if they are made from man-made fibres and a minimum breaking strength of 15 kN if they are made from steel wire or chain. In the USA, the minimum breaking strength for both textile and metal anchor slings is 5000 lbs.

2.11.2.14 Anchor slings intended to be looped through themselves (known as lark's-footing or choking) should be strong enough to allow for the weakening effect. Lark's footing should generally be avoided, unless the anchor sling and the structure or natural feature to which it is to be attached are known to be suitable. See **Figure 2.7**.

2.11.2.15 Where the anchor system comprises one or more anchor slings, care should be taken to ensure that their intended position is maintained at all times and that, when a load is applied, they cannot slide out of place vertically or horizontally, e.g. on a smooth linear structure such as a steel beam, or a tree trunk. Examples of ways to prevent ropes or anchor slings sliding are:

a) a webbing sling choked around a structure (i.e. where one side is threaded through the other) provides more friction than one simply passed around it, but also causes a loss of strength in the sling. Wide slings usually provide more friction than narrow slings. Slings used for choking should be designed for this application;

b) a rope wrapped several times around the structure or natural feature or a multi-wrapped sling is likely to have more friction than a single loop;

c) a link to another opposing anchor to prevent sliding.

2.11.2.16 If anchors are placed for permanent use, they should be clearly marked with:

a) the manufacturer's/installer's name and contact details;

b) service/inspection details, e.g. due date for the next inspection;

c) the maximum rated load;

d) the intended direction of loading;

e) the need for users to read the instructions for use.

2.11.2.17 The static strength of each anchor line including terminations (all types, e.g. sewn and knotted) should be a minimum of 15 kN.

2.11.2.18 When it is necessary to re-anchor an anchor line, e.g. to avoid abrasion or to allow a change of direction, the anchors should be installed or placed so that any potential loads are in shear. Where installation is only possible such that any forces on them would be axial, account should be taken of any reduction in strength caused by such placement and of any advice or limitations given by the anchor manufacturer.

2.11.2.19 Where anchor lines need to be redirected, the angle and loading at the deviation anchor and supporting equipment used should be taken into account before use, together with what might happen in the case of failure. Failure could cause an out-of-control swing fall (a pendulum), which could result in injury to personnel or damage to equipment or property. An example of the effect of the angle on the loading is given in **Figure 2.8**, based on a mass of 100 kg (which is equivalent to a force of approximately 1 kN). Masses smaller or larger than this would give different loadings from those shown in the example. A large deviation angle could increase the difficulty for the rope access technician in manoeuvring past the deviation anchor, so a re-anchor might be more appropriate.

2.11.2.20 Where anchor lines are rigged some distance apart and failure of one could lead to a large pendulum and subsequently an impact with the structure or natural feature, the use of two anchors for each anchor line is recommended, see **Annex F, Figure F.11.**

2.11.2.21 When anchor lines are tensioned, for example, as they are in horizontal anchor line systems, the increased loads in the system, e.g. at the anchor, anchor line terminations and at other components, should be taken into account. An incorrectly tensioned system can result in loads that are potentially catastrophic. The loads in these systems should be calculated by a competent person before use and any other necessary checks and adjustments should be made to ensure that the system is safe.

2.11.2.22 Rope access technicians and rescue services should be aware that additional anchors may be required to facilitate workmate retrieval.

2.11.2.23 Where rope access techniques are carried out from suspended platforms, anchors for the rope access technicians' anchor lines should be totally separate from those used for the platform.

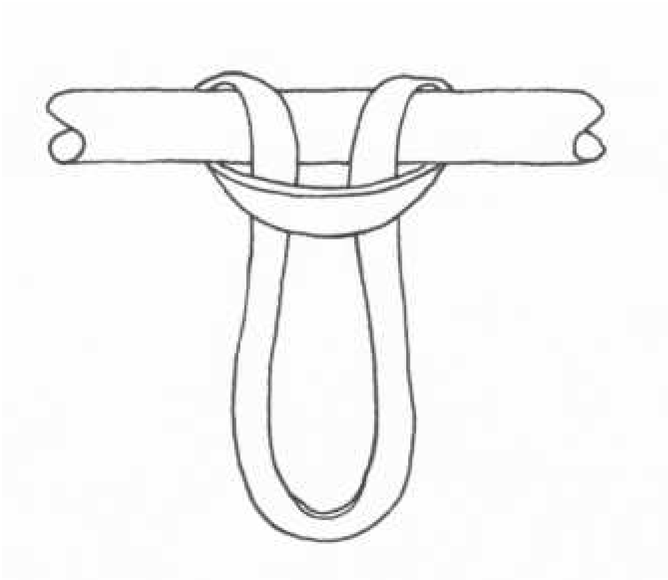
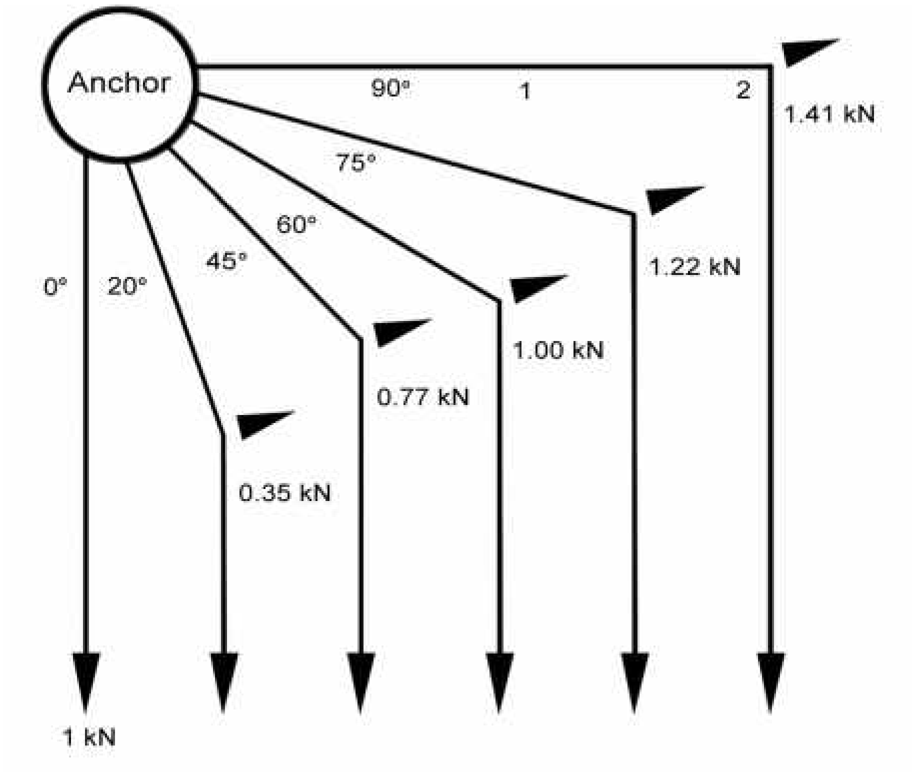


Figure 2.7 — Example of a lark's-footed (choked) sling



Key

1 Anchor line
2 Position of deviation anchor

Figure 2.8 — Example of how the angle at a deviation anchor affects its loading

2.11.3 Use of anchor lines

2.11.3.1 Rigging and de-rigging

2.11.3.1.1 Anchor lines should be rigged to avoid any surface that could damage them (see **2.7.10**).

2.11.3.1.2 Rope access technicians should not ascend or descend any anchor lines without confirmation from the rope access safety supervisor that it is safe to do so, following pre-descent/pre-ascent checks.

2.11.3.1.3 Rope access technicians should normally descend vertically with the minimum amount of swing (pendulum) to minimize the risk of abrasion to the anchor line or putting unnecessary stress on it or the anchors.

2.11.3.1.4 On long descents, anchors providing lateral restraint (e.g. deviation anchors) could be fitted on the anchor lines to enable the rope access technicians to maintain their position without being buffeted too much by the wind.

2.11.3.1.5 Deviation anchors are also used to avoid hazards, e.g. sharp edges; hot surfaces. They should be robust enough not to fail at any potential load to which they could be subjected (see **Figure 2.8**).

2.11.3.1.6 The effects of wind on the free end of anchor lines should be taken into account. Care should be taken to ensure that the tail end of anchor lines cannot snag on dangerous objects, such as working machinery, power lines or a moving vehicle. This could lead to the need for additional monitoring.

2.11.3.1.7 The placing of any excess anchor line for the descent in a bag and suspending it beneath the rope access technician can prevent anchor lines from becoming entangled or damaged by any falling debris, e.g. when removing rock during slope stabilization, but checks should be made first to ensure the anchor lines are long enough. In such situations, care is necessary to remove loose material before descending and it is important to be aware of the possibility that any movement of the anchor line could dislodge material above, which could fall onto the rope access technician. Steps should be taken to remedy this, e.g. by the use of containment netting.

2.11.3.1.8 Bags used to contain and suspend anchor lines (and other equipment) at height should be equipped with appropriate attachment points and should be of sufficient strength to ensure they do not fail when subjected to anticipated loads. Rope access technicians should take precautions to ensure that bags cannot snag on objects and potentially increase the load on the bag attachment points.

2.11.3.1.9 Anchor lines are particularly vulnerable to damage caused by abrasion, cutting, melting or chemical contamination. Damage can be exacerbated by vertical or horizontal movement of the anchor lines, especially when they are under load, such as when a rope access technician is ascending, descending, making sideways movements or in a fall. Contact with any potentially hazardous surface should be avoided but, where this is not possible, e.g. where it is not possible to rig a free hang, it is essential that anchor lines are adequately protected. For more information on edge and anchor line protectors and protection, see **2.7.10** and **2.11.3.2**.

2.11.3.1.10 Damage by chemical contamination is often not easily noticed, so frequent and assiduous checking is strongly recommended when working in areas where the risk of contamination by chemicals is suspected, see **2.10.2**. For information on the resistance to chemicals of some man-made fibres, see **Part 3, Annex J**.

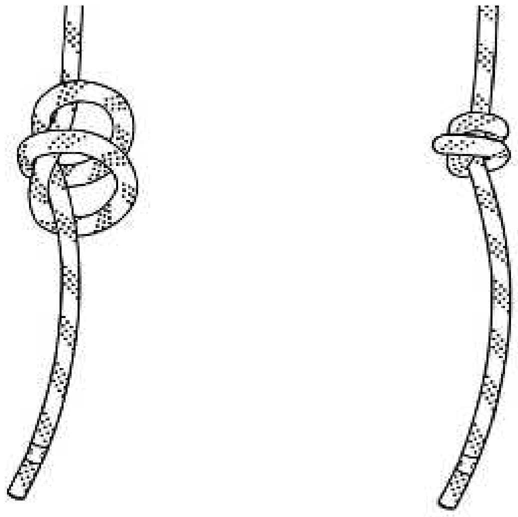
2.11.3.1.11 Anchor lines should be configured so that a rope access technician cannot inadvertently descend off the end of them. Where the anchor line is free hanging, this may be achieved by the use of a simple stopper knot (see **Figure 2.9**). The stopper knot should be properly dressed and then set (i.e. hand tightened). After the knot has been set, the length of the tail below the knot should be at least 300 mm. In use, care should be taken to ensure the knot cannot become snagged with potential obstructions (see the examples given in **2.11.3.3**). It should be understood that a simple stopper knot is unlikely to arrest an out-of-control descent, e.g. when the user has lost control of their descending device and the descent is effectively a fall. If it is thought necessary to protect against such a possibility, a proven stopper system, e.g. one incorporating a stopper disc that has been tested with the descending device being used, should be fitted to the anchor line.

2.11.3.1.12 If exit from the bottom of the anchor lines is planned, a check should be made to ensure that the anchor lines reach the bottom, or if being carried in a bag, that they are long enough. It may require a sentry or grounds-man to check this.

2.11.3.1.13 Slack in the safety line should always be avoided to minimize the length of any potential fall.

2.11.3.1.14 To minimize the length of any potential fall, connections to safety lines should, wherever possible, always be positioned above the rope access technician's harness attachment point, with the least amount of slack achievable in the device lanyard. This may not be possible with back-up devices intended to follow the user. However, in all cases, when the rope access technician is not in motion, the back-up device should be positioned as high as possible.

2.11.3.1.15 Attaching to or detaching from anchor lines at mid-height may present problems. Anchor lines should be checked carefully to ensure there is no build-up of slack between the anchors and attachment point that could become snagged and release suddenly. Where the whole length of the anchor lines can be seen, these checks can be visual. When the anchor



a) knot tied loosely b) knot set

Figure 2.9 — Example of a stopper knot for use at the end of anchor lines (in this example, half a double fisherman's knot)

lines are not fully visible, the checks should be physical, e.g. by carrying out a descent from the top (preferable) or by pulling and shaking the anchor lines from either end.

2.11.3.1.16 Where there are long anchor lines above a short drop, previously unloaded anchor lines may stretch suddenly when loaded, allowing a rope access technician to drop a distance proportional to the length of anchor line above, possibly causing him/her to hit an obstruction or the ground. In addition, if the working line were to fail at this point, the stretch generated in the safety line could result in insufficient protection, irrespective of the type of back-up device used. A solution is for the rope access technician to re-anchor both anchor lines and thus remove the problems of excessive elongation.

2.11.3.1.17 On sloping surfaces such as rock slopes, or on pendulums, care should be taken to avoid anchor lines snagging, e.g. during any lateral movement to be followed by a further descent. If the rope becomes un-snagged during these manoeuvres, e.g. if the feature causing the anchor lines to snag fails or if the anchor lines slip off it, the rope access technician could fall as the rope is released and it reverts to being in a straight line with the anchor – see **Figure 2.10**.

2.11.3.1.18 The use of anchor lines to haul equipment should be avoided or great care taken to avoid mid-rope snagging if they are lowered again for further use. Dangerous snagging may be prevented by tying equipment in the centre of the rope and using the lower half as a back-rope to keep the equipment away from the surface of the slope or structure.

2.11.3.1.19 In some unusual circumstances, wet anchor lines may become a tracking path for electrical discharges. In such circumstances, suitable precautions should be taken, e.g. temporarily stop work if electrical storms are imminent.

2.11.3.1.20 If anchor lines are to be left unattended, e.g. if work extends over one day and anchor lines are to be left in place, precautions are necessary to avoid abrasion or chafing to them caused by repeated movement and contact with hazardous surfaces due to the wind. The anchor lines could be pulled up and bagged while still being left anchored, or could be sufficiently tensioned to prevent abrasion.

2.11.3.1.21 Before any anchor lines are de-rigged, it is essential that all members of the team confirm that they are safe and aware that de-rigging is about to take place.

2.11.3.2 Protection methods for anchor lines

2.11.3.2.1 It is essential that precautions are taken to prevent damage to anchor lines, when they are in use. See **2.7.10** for advice on the selection of protectors for anchor lines and **Annex P** for recommended actions for the protection of anchor lines.

2.11.3.2.2 The potential for movement of the anchor lines in both the vertical and horizontal planes while in use should be taken into account when assessing the surface to be protected against, the choice of protection to be used and where the protection is to be positioned.

2.11.3.2.3 Wherever feasible, any hazard that could cause damage to the anchor lines should be removed. If this is not possible, anchor lines should be rigged so that they hang free for their entire length and for the duration of the rope access task, and do not contact or have the potential to contact edges, or abrasive or hot surfaces.

2.11.3.2.4 Where anchor lines cannot be rigged to hang free directly from their anchors, they should be suitably protected. One way of achieving this is by the use of a specific engineered solution, such as a scaffolding barrier made from smooth undamaged tubing over which the anchor lines can run and which is positioned to keep the anchor lines well away from the hazard(s). Other options are the use of *edge protectors* and *anchor line protectors*. A combination of more than one type of protector may sometimes be necessary to provide adequate protection.

2.11.3.2.5 Edge protectors, e.g. commercially-made rollers; metal edge plates; other cut-resistant or heat-resistant edge protectors, with large radius surfaces offer the best protection at any edge in a drop. These devices should be equipped with a means of maintaining their intended position. Suitably arranged scaffold tubing, heavy-duty carpet (with a high natural fibre content, such as wool) or thick canvas padding can also offer good protection and are commonly used.

2.11.3.2.6 Anchor line protectors, which typically comprise a sheath made of a suitable material which encapsulates the anchor line, may be used to protect the anchor lines against contact with abrasive or hot surfaces (but not edges).

2.11.3.2.7 Great care should be taken when choosing an anchor line protector that it is going to offer sufficient protection against the surface with which it may be in contact. It should be able to withstand use in the chosen location without wearing through or melting and exposing an anchor line to the abrasive or hot surface. Anchor line protectors used to protect against hot surfaces should be of a type intended for this purpose.

2.11.3.2.8 It should be noted that some anchor line protectors can obscure the anchor lines from view and thus make it difficult or impossible to see whether or not damage is being caused to them, e.g. because the anchor line protector has been worn through.

2.11.3.2.9 Anchor line protectors made from a single or even double thickness of material might not offer sufficient protection against sharp edges and are not recommended for such use unless the manufacturer specifically states in the user information that they are.

2.11.3.2.10 The use of anchor line protectors made from polyvinyl chloride (PVC) coated textiles should be avoided where the design is such that this material is in direct contact with the anchor line, due to potential heat caused by friction, which can cause melting of the PVC.

2.11.3.2.11 If anchor line protectors are to be used to protect against surfaces that are significantly abrasive or if they are to be used to protect against hot surfaces, it is recommended that each anchor line is protected by its own anchor line protector, unless the manufacturer states otherwise or unless there is another good reason not to do so. In the event of the failure (e.g. wearing through) of a single anchor line protector which is being used for both anchor lines, damage is likely to be caused to both anchor lines at the same time, with the potential for a catastrophic failure of both if an incident were to occur, e.g. a fall.

2.11.3.2.12 Where one anchor line protector is used for both anchor lines, and is to be tethered to an anchor line rather than to the structure, it is normally attached to the safety line only, as the safety line is less likely to stretch than the working line, thus minimising the chance of accidental abrasion.

2.11.3.2.13 Sometimes, it may be appropriate to rig the safety line in a position away from the working line**,** e.g. to avoid any potential hazardous area and the possibility of both the working line and the safety line failing simultaneously. If the working line and the safety line are some distance apart, an anchor line protector should be used for each anchor line.

2.11.3.2.14 In mid-anchor line situations, attachment of an anchor line protector to the structure or natural feature rather than to the anchor line is preferable, as anchor line elongation could result in poor protection or no protection at all if the anchor line protector is fastened to the anchor line. If exit is to be from the bottom of the anchor lines but retrieval of the anchor lines is to be from the top, the anchor line protector should be fastened to the anchor line.

2.11.3.2.15 It is essential that edge protectors and anchor line protectors maintain their intended position. Care is necessary to ensure the edge protector or anchor line protector remains in the correct place when the anchor line is loaded, or that it is repositioned correctly when more than one person uses the anchor line. This may be particularly relevant if users are of different weights (masses). The consequences of a failure of the working line and the subsequent elongation of the safety line should be taken into account, which may prompt the use of several edge protectors or anchor line protectors.

2.11.3.2.16 Edge protectors and anchor line protectors of a type that can be located on the anchor lines anywhere along them (e.g. without having to thread the end of an anchor line through the edge protector or anchor line protector) are generally recommended. Anchor line protectors that have a touch-and-close system of fastening are useful when attaching to an anchor line part way down a drop. They are usually provided with a thin cord so that they can be fixed to the structure, natural feature or anchor line. One design of anchor line protector simply grips the anchor line by friction to keep it in place.

2.11.4 Additional safety measures

Rope access systems should be configured and used in such a way to prevent falls. Nevertheless, consideration should be given to the unlikely event of a fall, e.g. in the case of incorrect use or failure of a piece of equipment. Some of the points below are made in other sections of this code of practice but are repeated here for reinforcement. Rope access systems should be configured to ensure:

a) any potential fall distance is minimized, e.g. slack in the anchor lines is avoided or minimized (for information on fall factors, fall distances and associated risks, see **Part 3, Annex Q**);

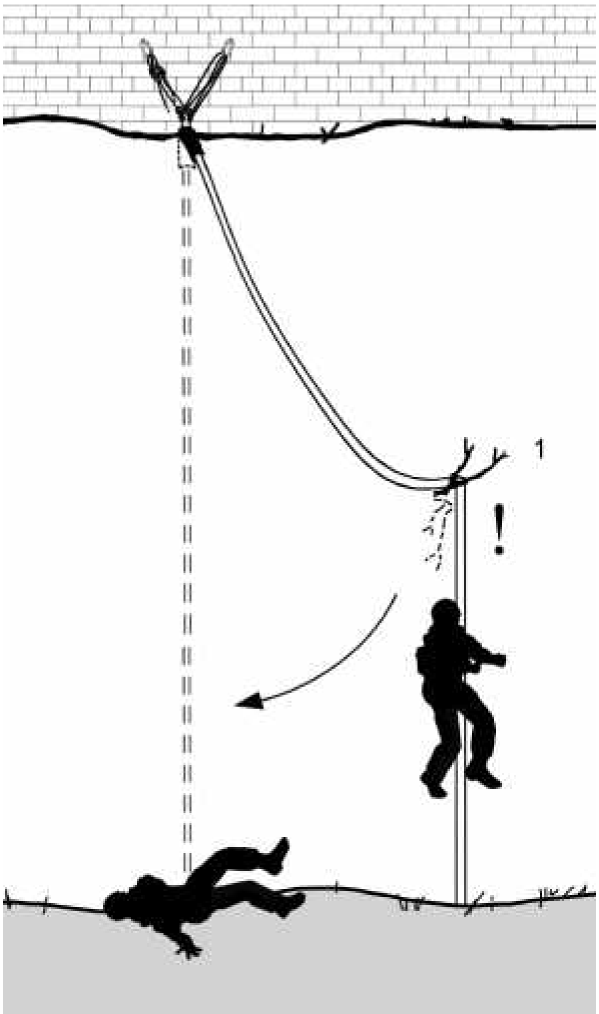
b) adequate clearance distance is provided, so that the rope access technician is prevented from impacting with the ground or obstacle in the path of a fall (e.g. allow for the extension of an energy absorber during deployment or elongation of the safety line);

c) any swing fall (pendulum) is kept to an acceptable minimum;

d) the maximum impact load a rope access technician could experience is as low as possible and never any greater than 6 kN;

e) adequate protection is provided for anchor lines and other equipment in the system to prevent them from failure during use and during a fall, its arrest or post-fall suspension;

f) following an incident, rope access technicians are likely to be in a position to rescue themselves;



Key

1 Anchor lines inadvertently snagged on a protuberance (could be natural or structural)

Figure 2.10 — Example of the potential danger of snagged anchor lines

g) anchor lines are configured so that if workmate retrieval becomes necessary, it can be readily carried out in a timely fashion;

h) rope access technicians are never left working on their own, so that, in the event of an incident, the workmate retrieval procedure can begin without delay;

i) there are plans in place to cater for potential incidents, which include:

(i) methods of communication;

(ii) appropriate equipment, which may include, depending upon the risk assessment, a pre-rigged rescue system;

(iii) methods of contacting rescue services that may be required and how they will be guided to the correct position on site;

(iv) for all team members, the means to travel up and down the anchor lines and to be able to carry out a rapid workmate retrieval.

2.11.5 The use of knots

2.11.5.1 Knots are used typically to form terminations in textile anchor lines and there are many that are suitable for use in rope access. Although knots reduce the overall strength of a rope (which should be taken into consideration when choosing a rope), one benefit is that they absorb energy. Some knots absorb more energy than others. An example of a knot that is particularly good at absorbing energy is the scaffold knot, which is often used to terminate an anchor lanyard.

2.11.5.2 It is essential that rope access technicians should be able to tie, dress and set appropriately a range of the most commonly used knots and to be confident that they will be able to tie them when in difficult circumstances. In the workplace, knots should only be tied by persons with a thorough knowledge of knots and knot-tying techniques.

2.11.5.3 When choosing a suitable knot, rope access technicians should take into account the following:

a) their own skill in tying that particular knot;

b) the suitability of the knot for the task and the anticipated way in which it may be loaded, including the potential forces envisaged;

c) the reduction of strength in the anchor line, device lanyard or anchor lanyard that the knot creates;

d) the ease with which the knot may be tied and untied;

e) where required, the ability of the knot to pass through or over potential obstructions, e.g. pulleys.

2.11.5.4 The tails of all knots should be at least 100 mm long, once the knot has been set. Knots should never be tied in anchor lines made from wire rope.

2.11.5.5 The reduction in the strength of the rope caused by the knot varies, dependent upon the type of knot and the accuracy and neatness with which it is tied. Neatening a knot, e.g. making sure the ropes in the knot are parallel and tightened equally, is known as *dressing*. Typical strength losses, showing the lower and upper values between a well-dressed knot and a poorly-dressed knot, are:

a) scaffold knot: 23 % to 33 %;

b) figure-of-eight on a bight: 23 % to 34 %;

c) figure-of-nine on a bight: 16 % to 32 %;

d) figure-of-ten on a bight: 13 % to 27 %;

e) overhand on the bight: 32 % to 42 %:

f) double figure-of-eight on the bight (bunny knot): 23 % to 39 %;

g) alpine butterfly: 28 % to 39 %;

h) bowline: 26 % to 45 %.

2.11.6 Work teams

2.11.6.1 A work team comprises a rope access team, i.e. the rope access technicians participating in the rope access work, and any supporting personnel. Because of the locations and the specialized nature of the work, all work teams should be properly supervised and be self-supportive, e.g. with respect to rescue.

2.11.6.2 IRATA International requires that a rope access team consists of at least two rope access technicians. However, there are many situations that require more than a two-person rope access team, depending, for example, on the nature of the work; site conditions; competency of the work team; potential rescue scenarios.

2.11.6.3 A rope access team size of two should only be considered in circumstances where retrieval and rescue by either rope access technician of his/her workmate could be achieved rapidly and unaided by third parties, e.g. where any potential rescue would be a direct lower of the casualty to a safe place. Wherever a potential rescue of the casualty could be other than such a direct lower, a team of three rope access technicians should be regarded as the normal minimum team size, unless other specific arrangements are in place that have been tried and tested by the rope access technicians.

2.11.6.4 One member of the work team has to be qualified as an IRATA International Level 3 rope access technician and be competent to supervise rope access safety (the *rope access safety supervisor* – see **2.5.2** and **2.6**).

2.11.6.5 Adequate supervision should be provided for each worksite. It may be appropriate to employ more than one Level 3 rope access safety supervisor, depending on the circumstances. Examples are:

a) the number of rope access technicians working on the site;

b) complex work situations;

c) arduous environmental conditions;

d) when operating on a work site with more than one discrete working area.

2.11.6.6 Both the Level 3 rope access safety supervisor and their company should ensure before work commences that the rescue procedures are adequate for that situation and that all members of the team have been suitably briefed. Sufficient personnel and resources should be readily available to carry out those procedures, in case the need arises.

2.11.6.7 Where the work takes place in a particularly hazardous or restricted area, e.g. one which could give rise to poisoning or asphyxiation, 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.

2.11.6.8 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.

2.11.7 Pre-work checking

2.11.7.1 If a permit to work is required, this should already have been obtained and checked. Permits to work are an effective method of isolating a hazard before work starts and to ensure that it remains isolated while work is in progress and until everyone is clear of the danger area.

2.11.7.2 At the start of each day, and as determined by changing site conditions, the work team should review the risks that could affect the safe, efficient and effective outcome of the job. This pre-work briefing should refer to the safety method statement, the risk assessment and the rescue plan already prepared, as well as the rôle of each member of the team.

2.11.7.3 Any special precautions required should be put into effect (e.g. standby boat alerted; radio check; gas checks; noxious chemicals check; work on or near hot surfaces).

2.11.7.4 Rope access technicians should carefully examine their own equipment, e.g. harnesses; anchor line devices; device lanyards; connectors, before starting work, to ensure it is in good condition. This is known as *pre-use checking*. The rope access safety supervisor should ensure this occurs. This checking should continue during the course of the job. In addition, there should be a further check by another member of the team, known as *buddy checking,* to ensure, for example, that each other's harness buckles are correctly fastened and adjusted, that device lanyards and anchor lanyards are attached correctly and that connectors are fastened correctly. Buddy checking by team members is good practice and should be continued throughout the day, including:

a) after the rope access technician has put on his/her harness and assembled his/her equipment;

b) when the rope access technician has attached to the anchor lines;

c) at all times when the rope access technician is engaged in rope access manoeuvres.

2.11.7.5 At the beginning of each working day and at other times as appropriate, e.g. when the anchor lines are relocated during the day, the rope access safety supervisor should carry out a pre-use check to ensure that all the anchors and anchor lines (wire and textile), and the structure or natural feature to which they are attached, are satisfactory. This pre-use check should include any points on the anchor lines where abrasion or other damage, e.g. caused by hot surfaces, could occur. The rope access safety supervisor should also take responsibility for checking anchor lines for length and that, where appropriate, termination stopper knots are in place and secure.

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

2.11.8 Exclusion zones

2.11.8.1 General

2.11.8.1.1 Exclusion zones may need to be set up to protect people from falling or to protect people against falling objects from above the area of rope access operations, or anyone below. They may also be required for reasons other than fall protection, e.g. to protect against exposure to: radiation; radio waves such as those emitted by mobile phone antennae; areas of high temperature; chemical pollution. Exclusion zones may be necessary at several levels, e.g. above anchor level; at anchor level; at intermediate levels; at ground level. See **Figure 2.11** for different types of exclusion zones.

2.11.8.1.2 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 sentries need not be trained in rope access work, provided that they are not counted as being a member of the rope access team.

2.11.8.2 Protection of third parties

2.11.8.2.1 Where required, precautions appropriate to the situation should be provided to prevent equipment or materials falling in such a way that other people might be endangered.

2.11.8.2.2 Methods of providing precautions include securing all tools to either the rope access technician or to separate lines. Normally, items weighing over eight kilograms should be attached to a separate line, while those below this weight may be secured to the worker (For more information on the use of tools and other work equipment, see **Part 3, Annex M**.) In addition, an exclusion zone should be established beneath the rope access site. Scaffold fans, temporary roof structures or containment nets or sheets could be provided to contain falling materials into safe and confined areas. These should be strong enough to retain any equipment or debris that might fall.

2.11.8.2.3 Exclusion zones established to protect against falling objects should minimise the risk of being struck by those objects. Where reasonably practicable, the width of the exclusion zone 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, natural feature or the ground. People should be discouraged or prevented from entering the exclusion zone or interfering with the rigging by posting suitable notices, providing warning signs, erecting appropriate barriers or installing alarms. Access ways, passageways or doors leading into the zone should be suitably controlled. It should be noted that the control of fire escapes and disabled access points need to be agreed with the building/structure owner or managers.

2.11.8.2.4 When work is carried out over or near public places, legislation may apply and advice should be obtained from the appropriate local authority.

2.11.8.3 Anchor area exclusion zone

2.11.8.3.1 An anchor area exclusion zone (also known as a rope access controlled area) should be cordoned off at anchor level with suitable barriers and warning signs. The anchor area exclusion zone should usually be large enough to include anchor points and to provide safe access to the working edge.

2.11.8.3.2 Only members of the rope access team should be allowed in the anchor area exclusion zone, unless under close supervision.

2.11.8.4 Working edge hazard zone

2.11.8.4.1 Inside the anchor area exclusion zone, a further exclusion area, often known as the *working edge hazard zone*, may be required. This may be formed by suitable barriers or scaffolding surrounding the working edge and is intended to prevent anyone from reaching the edge of the drop. The working edge hazard zone can be defined as any location within the anchor area exclusion zone where a risk of falling from a height exists.

2.11.8.4.2 The provision of working edge hazard zone barriers should include areas such as openings where it is necessary to remove handrails or lift pieces of grating to access or exit them. When working on grated deck areas, measures should be taken to prevent items of equipment falling through the grating.

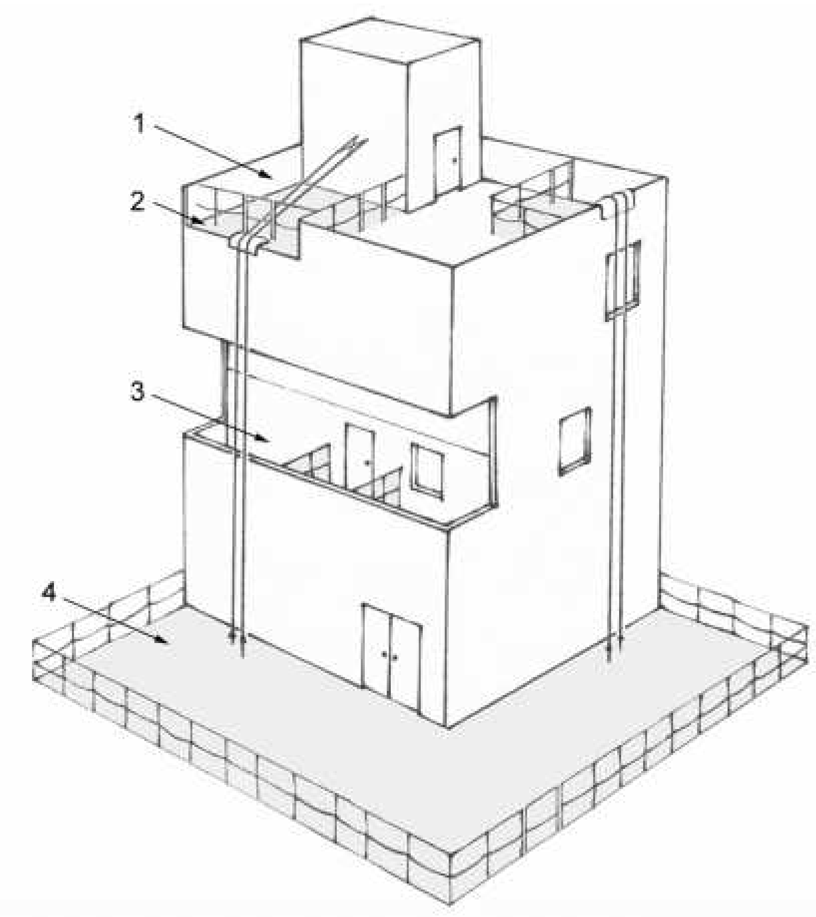
2.11.8.4.3 No one should be allowed to enter the working edge hazard zone for any purpose, unless they are wearing a harness and helmet and are attached to an anchored safety line.

2.11.9 Communication

2.11.9.1 An efficient communication system should be established between all rope access technicians and, where necessary, to third parties (e.g. sentries or the control room, if offshore). This should be agreed and set up before work starts and should remain effective for the whole of the time that people are at work.

2.11.9.2 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. The communication system should allow direct and uninterrupted communication between the rope access safety supervisor and the work team. Potential problems, e.g. noise; radio interference; other work teams' communication systems; weather, should be taken into account. It is preferable for the supervisor to have direct sight of the work team.

2.11.9.3 Hand or voice signals are liable to be misunderstood. Therefore, any special signals should be agreed and well-rehearsed before work begins. These should include a method, e.g. a sign or a signal, to enable the rope access technician to summon help, should other established methods of communication fail.



Key

1 Anchor area exclusion zone
2 Working edge hazard zone
3 Exclusion zone at intermediate level
4 Exclusion zone at bottom level

Figure 2.11 — Examples of different types of exclusion zone

2.11.10 Welfare

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

2.11.10.2 In calculating the length of shifts and rest periods for rope access technicians, consideration should be given to the effects of adverse climatic conditions and/or difficult or very exposed worksites, because these can affect efficiency and tiredness levels. Working in high and exposed places is likely to subject the rope access technician to factors such as wind chill or buffeting by the wind, which can have a significant effect on output at even quite moderate wind speeds. For more information on the effect of wind and height on working times, see **Part 3, Annex O**. Similarly, work in high temperatures can result in heat exhaustion or fainting. Carrying adequate drinking water in these circumstances is essential. Working short shifts minimizes risk to workers in such environments.

2.11.10.3 The nature of the work equipment to be used should also be taken into account when calculating the length of shifts and rest periods, to prevent unacceptable discomfort or tiredness of the rope access technician, which could affect his/her safety.

2.11.11 Emergency procedures

2.11.11.1 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 the 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; each change of job; changing environmental conditions, to assess all feasible emergency scenarios and to plan how any resulting rescues would be carried out.

2.11.11.2 Provisions should be made to ensure that help is provided promptly to any rope access technician who needs it. Rope access technicians should be skilled in appropriate rescue techniques, which should form part of their basic and on-going training.

2.11.11.3 Rescue equipment should always be present and ready for immediate deployment at the worksite. This equipment should be sufficient to carry out a rescue from any situation on the site. This could be the rope access technician's normal rope access equipment, preferably *rigged for rescue,* e.g. the working line and safety line established with releasable anchors to allow rapid implementation of lowering or hauling in an emergency.

2.11.11.4 Clear instructions should be given to rope access technicians on the procedures to be taken in site emergencies that could occur unexpectedly, e.g. on nuclear sites, offshore platforms, refineries.

2.11.11.5 The rope access team should have a planned method for rescue that includes the following:

a) a clearly defined leader;

b) adequate equipment;

c) competent rope access technicians;

d) practised techniques appropriate to the worksite;

e) an awareness of the higher loads involved in rescue;

f) an awareness of suspension intolerance (also known as suspension trauma, suspension syncope and harness induced pathology – see **Part 3, Annex G**), its symptoms and, in particular, how to manage someone suspected of suffering from the condition during the suspension and post-suspension phases of rescue;

g) the provision of medical aid if required.

2.11.11.6 There should be a first aid kit at each worksite and someone competent in first aid at all times.

2.11.12 Reporting of incidents and accidents

2.11.12.1 Reporting accidents and ill health at work is a legal requirement in some countries. Employers should check their own country's legislation.

2.11.12.2 In addition to any legal requirements, an accurate record of all accidents or near-misses should be kept, including measures to avoid a reoccurrence. All employees should be encouraged to report near-misses.

2.11.12.3 It is essential that the IRATA International work and safety statistics be completed for all hours worked on rope, accidents, incidents or near misses and returned promptly to IRATA International when requested. The statistics gathered from this information are used in the IRATA International *Work and Safety Analysis* to highlight the industry's safety record, in order to support the use of rope access methods. To assist with IRATA International's aim of continuous improvement of working methods, work and safety statistics are studied for trends so that any lessons may be learned.

2.11.13 End of shifts

At the end of each shift, equipment such as anchor lines, tools and components should be secured or stored safely (see **2.10.7**). While carrying out this procedure, care should be taken to avoid dropping equipment, which could cause injury. Personal equipment should only be removed when the rope access technician is in a safe place. A formal hand-over to the next shift should take place in accordance with local procedures and rules, at which time any relevant information should be passed on.

2.11.14 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.

2.11.15 Expanded techniques

Rope access is primarily concerned with movement up or down suspended ropes and working from them, and is considered to be primarily a technique for work positioning. However, the techniques and equipment used for this purpose are sometimes expanded to encompass traversing, aid climbing, lead climbing and other forms of access. The resulting system can range from a work positioning system to a fall arrest system, with hybrid systems somewhere in between. For more information, see **Part 3, Annex L**. In addition, non-harness-based height access methods and fall protection, e.g. scaffolding; nets, may sometimes be incorporated in the work plan.