BS 7985:2013

BSI Standards Publication

Code of practice for the use of rope access methods for industrial purposes – Recommendations and guidance supplementary to BS ISO 22846

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Publishing and copyright information

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Contents

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 54, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 September 2013. It was prepared by Technical Committee PH/5, *Personal fall protection.* A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 7985:2009, which is withdrawn.

Relationship with other publications

This new edition of BS 7985 has been prepared following the publication of BS ISO 22846-1 and BS ISO 22846-2. In the new edition of BS 7985 the general, widely applicable advice now given in BS ISO 22486-1 and BS ISO 22846-2 has been omitted and BS 7985 just provides details to supplement the two BSI ISO standards

This British Standard is intended to be used in conjunction with BS ISO 22846-1:2003 and BS ISO 22846-2:2012.

Information about this document

This new edition of BS 7985 incorporates only changes made necessary by the publication of BS ISO 22846-1 and BS ISO 22846-2. It does not represent a full review or revision of the standard, which will be undertaken in due course.

It is anticipated that a future revision of BS 7883 will include updated recommendations on the use of anchor devices.

This standard, when read in conjunction with BS ISO 22846-1 and BS ISO 22846-2, gives practical advice on the duties placed on employers, employees and self-employed people who use specialist rope access methods for work at height, and gives recommendations for good practice. The first edition of BS 7985, published in 2002, was based on the Industrial Rope Access Trade Association (IRATA) *Guidelines on the use of rope access methods for industrial purposes* [1], which represented a number of years of close co-operation with the Health and Safety Executive (HSE). It included contributions from the Federation of Master Steeplejacks and Lightning Conductor Engineers (since renamed the Association of Technical Lightning and Access Specialists).

The standard applies to industrial rope access work only, where the prime activity is the work itself. It is not intended to cover, for example, leisure activities or emergency evacuation systems and their procedures. Nevertheless, those engaged in other similar activities would probably benefit from the advice given in this standard, as many of the principles do apply and offer good practice. In addition to onshore work, the advice in this document is relevant to work carried out on all offshore installations where that installation is subject to the relevant sections of the Health and Safety at Work etc. Act 1974.

NOTE Copyright is claimed in Figure 4 and Figure 5. The copyright holder is Lyon Equipment Ltd., Unit 3-6, Clock Garage Industrial Estate, Old Tebay, Cumbria CA10 3SS, UK.

Use of this document

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

In particular, attention is drawn to the statutory regulations listed in Clause **4**.

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1 Scope

This British Standard gives recommendations and guidance on the use of rope access methods for work at height. It is intended for use by employers, employees and self-employed persons who use rope access methods, and those who commission rope access work, e.g. building owners and contractors, and also by national enforcement agencies and safety officers. This British Standard is applicable to the use of rope access methods for access to buildings, other structures (on or offshore) or natural features (such as cliff faces), in which the ropes are suspended from, or connected to, the structure or natural feature. It is applicable to situations where ropes are used as the primary means of access, egress or support and as the primary means of protection against a fall.

This standard is not intended to apply to the use of rope access methods for leisure activities, arboriculture, general steeplejack methods or emergency personal evacuation systems, or to the use of rope access (line rescue) techniques by the fire brigade and other emergency services for rescue work or for training.

*NOTE 1 For building owners and contractors, the information and guidance given in Clause **4** and Clause **5** and in **12.1** is of particular relevance.*

NOTE 2 A typical method of descending and ascending using rope access techniques is given in Annex A, an equipment inspection checklist in Annex B, a harness comfort and adjustability test in Annex C and information on the effect of wind speed and working height on available working times in Annex D. A list of useful addresses is given in Annex E.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 7883, *Code of practice for the design, selection, installation, use and maintenance of anchor devices conforming to BS EN 795*

BS EN 136, *Respiratory protective devices – Full face masks – Requirements, testing, marking*

BS EN 140, *Respiratory protective devices – Half masks and quarter masks – Requirements, testing, marking*

BS EN 143, *Respiratory protective devices – Particle filters – Requirements, testing, marking*

BS EN 149, *Respiratory protective devices – Filtering half masks to protect against particles – Requirements, testing, marking*

BS EN 166, *Personal eye-protection – Specifications*

BS EN 352 (all parts), *Hearing protectors – Safety requirements and testing*

BS EN 355, *Personal protective equipment against falls from a height – Energy absorbers*

BS EN 361, *Personal protective equipment against falls from a height – Full body harnesses*

BS EN 362, *Personal protective equipment against falls from a height – Connectors*

BS EN 374-1, *Protective gloves against chemicals and micro-organisms – Part 1: Terminology and performance requirements*

BS EN 388, *Protective gloves against mechanical risks*

BS EN 407, *Protective gloves against thermal risks (heat and/or fire)*

BS EN 420, *Protective gloves – General requirements and test methods*

BS EN 795:2012, *Personal fall protection equipment – Anchor devices*

BS EN 813, *Personal fall protection equipment – Sit harnesses*

BS EN 892, *Mountaineering equipment – Dynamic mountaineering ropes – Safety requirements and test methods*

BS EN 1263-1, *Safety nets – Part 1: Safety requirements, test methods*

BS EN 1263-2, *Safety nets – Part 2: Safety requirements for the positioning limits*

BS EN 1891:1998, *Personal protective equipment for the prevention of falls from a height – Low stretch kernmantel ropes*

BS EN 14387, *Respiratory protective devices – Gas filter(s) and combined filter(s) – Requirements, testing, marking*

BS ISO 22846-1:2003, *Personal equipment for protection against falls – Rope access systems – Part 1: Fundamental principles for a system of work*

BS ISO 22846-2:2012, *Personal equipment for protection against falls – Rope access systems – Part 2: Code of practice*

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS ISO 22846-1:2003 and BS ISO 22846-2:2012 and the following apply.

3.1 anchor line
flexible line connected at least at one end to a reliable anchor to provide a means of support, restraint or other safeguard for a person wearing a harness in combination with other devices

NOTE An anchor line may be a working line or a safety line.

3.2 supervisor
person responsible for all aspects of the rope access site

4 Legislation

4.1 Attention is drawn to the following acts and regulations, and HSE approved codes of practice (ACoP) and Guidance.

Confined Spaces Regulations 1997 SI 1997/1713 and ACoP and Guidance *Safe work in confined spaces* (HSE L101).

Construction (Design and Management) Regulations 2007 (CDM Regulations) SI 2007/320 and ACoP *Managing health and safety in construction* (HSE L144).

Control of Asbestos Regulations 2012 SI 2012/632 and ACoP *Work with materials containing asbestos* (HSE L143).

Control of Noise at Work Regulations 2005 SI 2005/1643 and Guidance (HSE L108).

Control of Substances Hazardous to Health Regulations 2002 (COSHH) SI 2002/2677 (as amended) and ACoP and Guidance *Control of substances hazardous to health* (fifth edition) (HSE L5) and Guidance *Working with substances hazardous to health. A brief guide to COSHH* (HSE INDG136 REV 5), *A step by step guide to COSHH assessment* (HSG97) and *Fumigation* (HSG251).

Control of Vibration at Work Regulations 2005 SI 2005/1093 and Guidance *Hand-arm vibration* (HSE L140).

Electricity at Work Regulations 1989 SI 1989/635.

Health and Safety at Work etc. Act 1974.

Health and Safety (First Aid) Regulations 1981 SI 1981/917 and ACoP *First aid at work. The Health and Safety (First Aid) Regulations 1981* (HSE L74).

NOTE 1 At the time of publication these regulations are under review.

Health and Safety (Safety Signs and Signals) Regulations 1996 SI 1996/341 and Guidance *Safety signs and signals* (HSE L64).

Highways Act 1980.

Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) SI 1998/2307 and ACoP and Guidance *Safe use of lifting equipment. The Lifting Operations and Lifting Equipment Regulations 1998* (HSE L113).

Management of Health and Safety at Work Regulations 1999 (MHSW Regulations) (as amended) SI 1999/3242.

Manual Handling Operations Regulations 1992 SI 1992/2793 (as amended) and Guidance *Manual handling* (HSE L23 3rd edition).

Mineral Workings (Offshore Installations) Act 1971.

NOTE 2 Parts of this Act have been repealed. Sections 1, 4 and 5 have been repealed by SI 1995/738 Regulation 22(1). Schedule 1, Part 1, sections 2 and 6 have been repealed by SI 1993/1823, Regulation 3(1) (a) and Regulation 6. Section 3 has been repealed by SI 1996/913, Regulation 25.

Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995 (MAR) SI 1995/738 and Guidance (HSE L70, 2nd edition).

Offshore Installations and Wells (Design and Construction) Regulations 1996 (DCR) SI 1996/913 and Guidance (HSE L84 and L85).

Offshore Installations (Prevention of Fire and Explosion and Emergency Response) Regulations 1995 (PFEER) SI 1995/743 and ACoP and Guidance *Prevention of fire and explosion, and emergency response on offshore installations* (HSE L65).

Offshore Installations (Safety Case) Regulations 2005 (SCR) SI 2005/3117 and Guidance (HSE L30).

Personal Protective Equipment Regulations 2002 SI 2002/1144.

Personal Protective Equipment at Work Regulations 1992 (PPE) SI 1992/2966 and Guidance (HSE L25 2nd edition 2005).

Provision and Use of Work Equipment Regulations 1998 (PUWER) SI 1998/2306 and ACoP *Safe use of work equipment* (HSE L22).

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR) SI 2013/1471.

Work at Height Regulations 2005 SI 2005/735 (WAHR), as amended by the Work at Height (Amendment) Regulations 2007 SI 2007/114, and Guidance (HSE INDG401 REV 1).

Workplace (Health, Safety and Welfare) Regulations 1992 SI 1992/3004 (as amended by the Quarries Regulations 1999 SI 1999/2024) and ACoP and Guidance *Workplace health, safety and welfare* (HSE L24).

4.2 The Health and Safety at Work etc. Act 1974 and the Mineral Workings (Offshore Installations) Act 1971 place general duties on employers, clients, contractors, owners, the self-employed and employees. Many regulations have

been made under these acts, which expand on these duties, some dealing specifically with particular issues such as first aid and protection of eyes. Other regulations have been made under the acts, which bring into force the requirements of EC directives. These regulations, for example the Management of Health and Safety at Work Regulations 1999 (MHSW), require a risk assessment (see HSE document *Five steps to risk assessment* [2]). They highlight the duties of clients, owners and designers of structures to ensure that, so far as is reasonably practicable, any work to be carried out in the workplace can be performed safely. It is the duty of every employer to ensure that they comply with all legal safety requirements relating to the type of work being undertaken and to work in the particular location concerned.

4.3 Where work is classed as construction work, for example under the Construction (Design and Management) Regulations 2007 (CDM Regulations), then other regulations also apply, such as the Provision and Use of Work Equipment Regulations 1998 (PUWER) and the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) (see HSE document ACOLAR LOLER [3]). Even where these regulations do not apply, it is possible that their requirements could be regarded as "being a reasonably practicable safe system of work" under the Health and Safety at Work etc. Act 1974. Employers and those commissioning rope access work are therefore advised to consider the requirements of these regulations.

4.4 The CDM Regulations impose some legal responsibility on the client to ensure that those they employ have an appropriate level of experience in the work being undertaken and are able to meet the requirements to work safely.

4.5 The Work at Height Regulations 2005, as amended, (Regulation 4) require that work at height be properly planned, appropriately supervised and carried out in a manner which is safe. This includes planning for emergencies and rescue. In addition, employers have a duty to ensure that work at height is carried out only when the weather conditions do not jeopardize the health and safety of persons involved in the work.

4.6 The Work at Height Regulations 2005, as amended, (Regulation 6) require every employer to take account of a risk assessment under the MHSW Regulations (Regulation 3). There is a hierarchy of protection measures. For more details see BS 8437:2005+A1, Table 1.

4.7 The Work at Height Regulations 2005, as amended, (Regulation 7) require collective protection measures to be given priority over personal protection measures. When selecting work equipment for use in work at height, the following have to be taken into account:

- the working conditions and the risks to the safety of persons at the place where the work equipment is to be used;
- in the case of work equipment for access and egress, the distance to be negotiated;
- the distance and consequences of a potential fall;
- the duration and frequency of use;
- the need for easy and timely evacuation and rescue in an emergency;
- any additional risk posed by the use, installation or removal of that work equipment or by evacuation and rescue from it.

4.8 The Work at Height Regulations 2005, as amended, (Regulation 9) require that that no person at work passes across or near (or works on, from or near) a fragile surface where it is reasonably practicable to carry out work safely, and under appropriate ergonomic conditions, without their doing so.

4.9 The Work at Height Regulations 2005, as amended, (Regulation 12) require that work equipment exposed to conditions causing deterioration which is liable to result in dangerous situations is inspected:

a) at suitable intervals;

b) each time that exceptional circumstances which are liable to jeopardise the safety of the work equipment have occurred.

For recommendations on inspection of equipment see Clause **11**.

4.10 Where the work is offshore, several additional regulations apply. In general, the principles are similar to those of the construction regulations but there are certain conditions that have to be followed by those working or intending to work offshore. Attention is drawn to the Offshore Installations and Wells (Design and Construction) Regulations 1996 (DCR), the Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995 (MAR) and the Offshore Installations (Prevention of Fire and Explosion and Emergency Response) Regulations, 1995 (PFEER). These regulations apply both generally to work offshore (survival certificates, proper work clothes, etc.) and specifically to worksites and the management of work.

4.11 Some regulations deal with specific types of hazard such as the Control of Substances Hazardous to Health Regulations 2002 (as amended) and the Control of Asbestos Regulations 2012. See also the HSE approved code of practice (ACoP) *Work with materials containing asbestos* [HSE L143]. It is essential that employers fully understand the requirements of such regulations when they propose to undertake work that might involve their operatives coming into contact with hazardous materials. This applies equally to onshore and offshore working.

4.12 Two documents in the HSE's revised series of health and safety guidance for the construction industry, *Health and safety in construction* [4] and *Health and safety in roof work* [5], provide valuable information in a simple but comprehensive form. The guidance covers such topics as organizing the site, the essentials of health and safety, and health and safety management and the law. Following the guidance is not a statutory requirement. However, the guidance provides sufficient information to enable the user to ensure that they comply with the law.

4.13 Where the CDM Regulations apply, there is a requirement for a health and safety plan. This is required to contain information concerning the safety aspects of the construction work, and some or all of the plan should be made available to those planning rope access work. When construction work has been completed, there is a requirement for a health and safety file. The file is required to contain information about the completed construction work which could be relevant to health and safety associated with cleaning and maintenance and any future construction work including alteration, refurbishment and demolition. The file should be made available to those planning rope access work. When subsequent alterations are made there might be a need to update the health and safety file. Similar requirements apply offshore, under the Offshore Installations (Safety Case) Regulations 2005 (SCR).

4.14 Reporting accidents and ill health at work is a legal requirement under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR). The regulations require employers, and other people who are in charge of work premises, to report and keep records of work-related deaths, certain serious injuries (reportable injuries), diagnosed cases of certain industrial diseases and certain "dangerous occurrences" (near-miss incidents).

5 Principles for a safe and effective system of work using rope access methods

The primary objective is to so organize, plan and manage the work that there will be an adequate margin of safety to minimize risk, with a goal of no accidents (zero targeting). See Clause **12** for further advice.

The Management of Health and Safety at Work Regulations 1999 require that, before rope access techniques are adopted for a particular job, employers carry out a risk assessment (see **12.1**) and set out clear requirements for all aspects of the work. In addition, the work should be carefully assessed to ensure that the method of access is appropriate to the quality of the work required.

In planning the work, the following statutory requirements apply.

a) The Work at Height Regulations 2005, as amended, and the Construction (Design and Management) Regulations 2007 require a safe place of work.

b) The Lifting Operations and Lifting Equipment Regulations 1998 require that rope access be properly planned, appropriately supervised and carried out in a safe manner (see Clause **12**).

c) The Personal Protective Equipment at Work Regulations 1992 require employers to provide suitable personal protective equipment, which includes some protective clothing (see Clause **8**).

d) The Personal Protective Equipment at Work Regulations 1992 require operatives to have suitable personal protective equipment (see Clause **8**).

e) The Work at Height Regulations 2005, as amended, require personal suspension equipment to be suitable and of sufficient strength (see Clause **8**).

f) The Work at Height Regulations 2005, as amended, require operatives to have training, knowledge or experience in safe rope access methods (see Clause **12**).

g) The Management of Health and Safety at Work Regulations 1999 require employers, in entrusting tasks to employees, to take into account their capabilities as regards health and safety (see Clause **12**).

h) The Work at Height Regulations 2005, as amended, require that the planning of work includes planning for emergencies and rescue (see Clause **12**).

In addition, it is necessary to ensure that:

1) the operatives chosen to carry out the work have a suitable attitude for working at height (see Clause **6**);

2) any tools and equipment used in the work do not endanger the operatives' health and safety (see **12.4**).

6 Selection of operatives

6.1 General

Candidates should be physically fit and free from any disability that might prevent them from working safely at height.

Contra-indications include:

- heart disease/chest pain;
- high or low blood pressure;
- epilepsy, fits, blackouts;

- fear of heights/vertigo;
- giddiness/difficulty with balance;
- impaired limb function;
- alcohol or drug dependence;
- psychiatric illness;
- obesity;
- diabetes.

It is the responsibility of operatives and their employers to establish that the operatives are physically and medically fit to undertake rope access work.

6.2 Aptitude and experience

6.2.1 Assessing a person's suitability for rope access work requires detailed consideration of their previous experience. Where candidates claim to have experience in rope access work, prospective employers should check their personal records and other references. Employers should also consider relevant trade experience and skills to ensure safe use of tools and equipment.

6.2.2 Other suitable experience could include caving, mountaineering and working at height using other means of access. Service with the fire brigade and possibly the armed forces might also be relevant, if a person has been regularly engaged in the use of methods that involve being exposed at a height.

6.2.3 An assessment of the candidate's aptitude should be carried out before they are given training or offered rope access work. Unless the employer has the relevant expertise to do this, assistance from a competent outside organization should be sought (e.g. a recognized provider of training in rope access work).

7 Welfare of operatives and access by non-rope access personnel

7.1 Welfare

Periodic health checks or medical examinations are recommended for all operatives (see **6.1**).

7.2 Access by non-rope access personnel

Occasions can arise where non-rope access personnel need to inspect the work (e.g. a client's representative). A system should be arranged to ensure that such persons are able to do this safely. This could be done, for example, by providing additional top-rope protection. In addition, it would be necessary for the supervisor to check personally that all items of such a person's suspension equipment were correctly secured and of a suitable standard and condition. They should then supervise them throughout the ascent or descent as though they were new trainees.

8 Selection of equipment

8.1 General

8.1.1 Risk assessment

Regulation 3 of the Management of Health and Safety at Work Regulations 1999 requires that before equipment is selected or used a risk assessment is carried out for each job for which that equipment is to be used. The risk assessment should pay specific attention to the probability and consequences of misuse.

8.1.2 CE marking

8.1.2.1 Under the Personal Protective Equipment Regulations 2002, which are based on the Personal Protective Equipment Directive (89/686/EEC) [6], equipment used in rope access work that is classified under the Directive as PPE is required to carry CE marking. This applies to most equipment used in rope access work.

8.1.2.2 If it is planned to use CE marking as a criterion for purchasing, it is essential to ensure that the marking is for goods appropriate to the intended use. CE marking is mandatory on many different types of product, not just personal protective equipment (PPE). For PPE, there are three different categories, ranging from simple items like protective work gloves (category I) to category III equipment for protection against mortal danger (e.g. harnesses). Most rope access equipment is category III.

8.1.2.3 For PPE category III, CE marking indicates that the product has been independently type tested and meets the basic health and safety requirements of the Personal Protective Equipment Directive (89/686/EEC) [6] and the Personal Protective Equipment Regulations 2002. A booklet entitled *Personal protective equipment: Guidance notes on UK Personal Protective Equipment Regulations* [7], provides all the details.

8.1.2.4 The prime function of CE marking is to protect against barriers to trade within the European Union. It is not meant to be taken as a mark of quality, although PPE category III is subject to such rigorous controls that this point could be argued otherwise.

8.1.3 Standards

8.1.3.1 Equipment should be selected that conforms to standards relevant to the intended use. Wherever possible, these should be appropriate BS EN standards. In the absence of these, equipment conforming to other standards, e.g. international (ISO), national or International Federation of Climbing and Mountaineering Associations (UIAA), may be chosen.

8.1.3.2 Manufacturers should not claim product conformity to draft standards. However, 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.

8.1.3.3 If there is doubt about whether or not a particular standard is relevant to the intended use, it is advisable to discuss it with the manufacturer of the equipment.

8.1.4 Compatibility

When selecting equipment, purchasers should ensure that components in any system are compatible and that the safe function of any one component is not adversely affected by, and does not interfere with, the safe function of another. Sometimes this is not obvious so it is important to check with the supplier or the manufacturer.

8.1.5 Knowledge of equipment

Under the Personal Protective Equipment at Work Regulations 1992, the manufacturer of the 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 and other technical brochures and catalogues.

8.2 Clothing and protective equipment

8.2.1 Operatives need to be appropriately dressed and equipped for the work situation and conditions. Attention is drawn to the Personal Protective Equipment at Work Regulations 1992 and other regulations covering equipment and health and safety of operatives as listed in **4.1**.

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

8.2.3 A useful guidance document on the Personal Protective Equipment at Work Regulations 1992, which includes the regulations themselves, is the HSE guidance document *Personal protective equipment at work* (HSE L25), published by the HSE. It should be noted that some equipment (e.g. ladders, lifting slings, drills, scaffolding, hoists) is subject to other regulations, such as the Provision and Use of Work Equipment Regulations 1998 (PUWER).

8.2.4 Operatives should wear protective helmets that are suitable for the type of work being undertaken. Helmets that conform to standards for either mountaineering (BS EN 12492) or industrial use (BS EN 14052 or BS EN 397:2012+A1) might be suitable. Users should check carefully the performance specification of industrial helmets conforming to BS EN 397:2012+A1 as they might not always be suitable, because some of the performance requirements considered necessary for the safety of rope access operatives are:

a) not specified in BS EN 397:2012+A1, e.g. front, side and rear energy absorption capacity;

b) not mandatory in BS EN 397:2012+A1 (i.e. they are optional) e.g. the provision of a chinstrap and fastening arrangement, low temperature performance and ventilation.

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

8.2.6 Chinstraps on helmets used in rope access work should be of a design such that when the strap is properly fastened, it prevents the helmet from coming off the head. This is typically achieved by the use of "Y" shaped straps where the

two top points of the "Y" are attached to the shell of the helmet. Helmets should always be used with the chinstrap fastened. In some work situations, it might be desirable for helmets to be compatible with complementary personal protective equipment such as visors or ear defenders.

8.2.7 Operatives should wear the following:

a) protective clothing (e.g. overalls) that have no loose flaps or attachments which might be 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 for work in wet and/or windy conditions;

b) suitable footwear, which fits well, provides a good grip and gives an adequate level of protection for the task being undertaken.

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

8.2.9 The following protective items might also be required. The HSE guidance document referred to in **8.2.3** gives advice on the selection, use and maintenance of most of these.

a) Gloves, to protect against cold weather or where the equipment or materials used might cause injury to, or have harmful effects on, the skin. Gloves conforming to BS EN 420 and to BS EN 374-1, BS EN 388 or BS EN 407 should be used as appropriate.

b) Eye protection, where debris is being cleared or material is being chipped away, or where drilling, blasting or percussion operations are being undertaken. Eye protection is usually also required if chemicals are being sprayed or painted which could cause irritation or damage to the eyes. Eye protection conforming to BS EN 166 should be used.

c) Respiratory protective equipment, where there is a risk of inhalation of harmful chemicals or dusts. Many building chemicals are liable to be harmful, particularly in a situation where an operative is unable to get quickly to a source of fresh water to dilute or wash the chemical away. Respiratory protective equipment conforming to BS EN 136, BS EN 140, BS EN 143, BS EN 149, or BS EN 14387 should be used as appropriate. Guidance on use of respiratory protective equipment is given in BS EN 529.

d) Hearing protectors, when the noise levels in the vicinity could cause a risk of hearing loss to operatives. The Control of Noise at Work Regulations 2005 require employers to provide operatives with hearing protectors. Hearing protectors conforming to BS EN 352 should be used.

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 rope ascent/descent devices.

f) Protection against sunburn, for example, by the use of a sunscreen.

8.2.10 Any intention to depart from the worksite "standard" PPE (e.g. lifejackets, eye protection, safety footwear, helmet), for whatever reason, should first be cleared with the site management.

8.3 Equipment used in the rope access system and for personal protection against falls from a height

8.3.1 General

8.3.1.1 All equipment used in the access system requires adequate static and dynamic strength to withstand any loads or forces that might be imposed on it, with an adequate safety margin in addition. Such equipment should only be loaded in accordance with the manufacturer's user instructions. Most personal protective equipment used in rope access work, such as low-stretch ropes, harnesses and ascenders, is tested using the minimum breaking loads specified in the relevant standards. Some equipment is supplied with a safe working load (SWL), a working load limit (WLL) or a rated load, which can be a minimum rated load (RL_{MIN}) or a maximum rated load (RL_{MAX}). These are sometimes in addition to the minimum breaking load and sometimes in place of it. Dynamic rope is supplied with a statement of the number of dynamic falls held during type testing.

8.3.1.2 There is irrefutable evidence that ultraviolet light (UV) weakens many man-made fibres. Purchasers and users are recommended to check with equipment suppliers that equipment made from textiles, e.g. polyamide, polyester, polyethylene, polypropylene, aramid, is protected from the adverse effects of UV. UV is emitted not only in sunlight, but also in fluorescent light and by 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 selection of a suitable type and colour of any dye used or the use of a protective covering.

NOTE European Standards for personal fall protection equipment do not address explicitly the potential for degradation by UV and 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 adequate protection against UV and abrasion.

8.3.1.3 The behaviour under load of components in the system, such as dynamic cow's tails, load-limiting back-up devices and the extension of the low-stretch rope, can help to absorb any forces generated, should there be a limited fall. However, the system generally should be designed to avoid this, i.e. it should be a work positioning system. Normally, low-stretch equipment is used because it is the most effective in use. Where rope access is extended to climbing and traversing, limited falls can be possible and appropriate equipment should be chosen and precautions taken (see **12.3.1.5**). When choosing equipment for a particular application, account should be taken of weakening factors, such as the loss of strength at knots.

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

8.3.1.5 All equipment should carry marking to allow traceability to, for example, a test, inspection, thorough examination or certificate of conformity. If the manufacturer or supplier has not already provided such marking, care should be taken not to mark the equipment in a manner that impairs its integrity (see **9.4**).

8.3.2 Work positioning equipment

If the planned method of work is for the operative 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 [see Figure 1c)]. 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 does not conform to the other essential requirements for a fall arrest system, unless combined with appropriate additional components. Work positioning body supports for rope access work may be a sit harness or full body harness, depending upon the precise nature of the work to be carried out. A sit harness is normally used, which may be coupled with a chest harness.

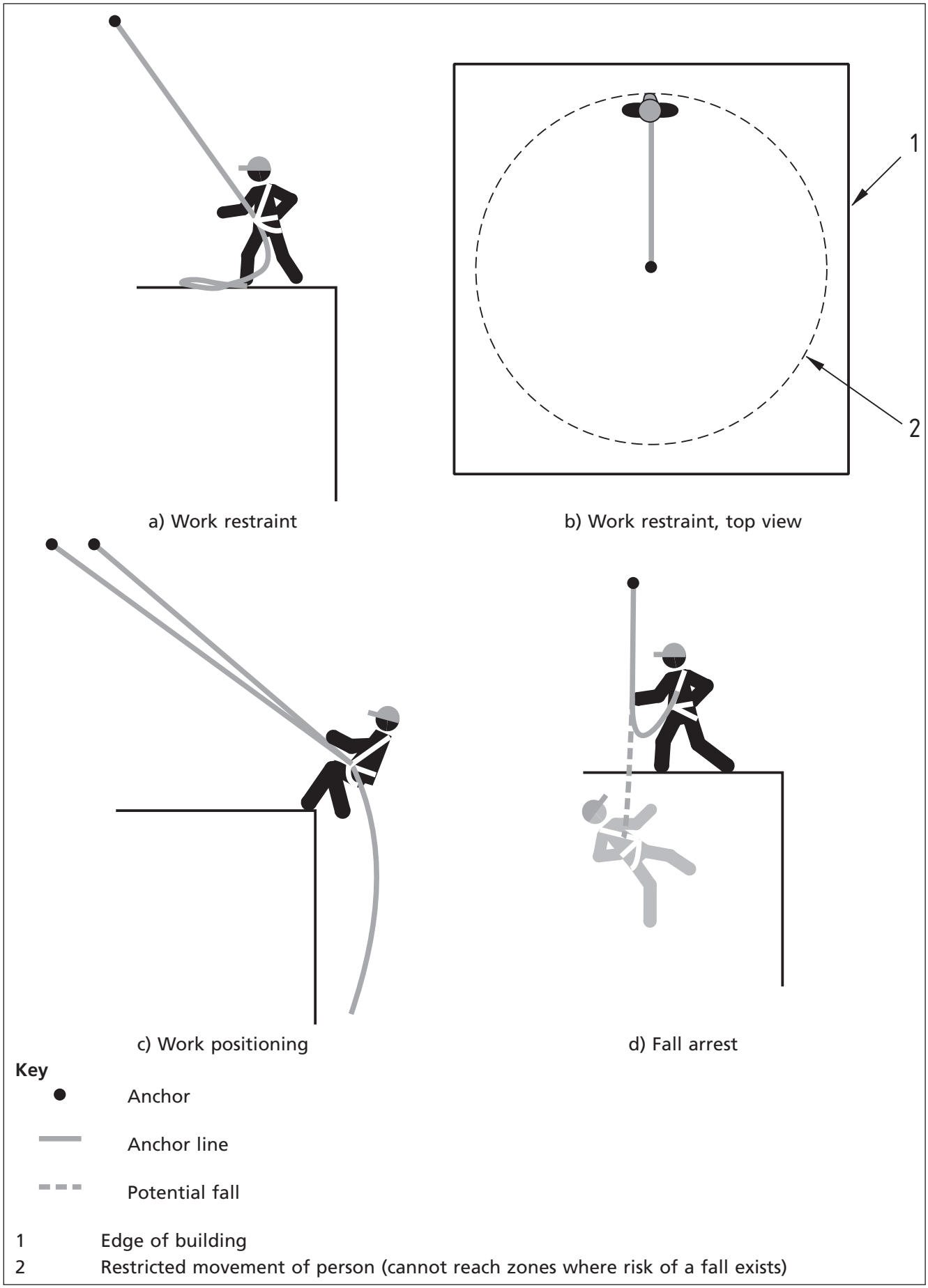
8.3.3 Fall arrest system

If the planned method of work is such that if the user loses controlled physical contact with the working surface there will be a free fall, it is necessary to choose a fall arrest system [see Figure 1d)]. This should include a full body harness conforming to BS EN 361, an energy absorber or a system that limits the impact force in the event of a fall to a maximum of 6 kN (e.g. a dynamic rope conforming to BS EN 892, together with an appropriate belaying device) and other equipment selected for its suitability for the type of work intended (see **12.3.1.5**).

8.3.4 Travel restriction using work restraint equipment

If the objective is to restrict the operative'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 [see Figure 1a) and Figure 1b)]. This may be fall arrest equipment, work positioning equipment, or a simple belt coupled with a lanyard of limited length.

Figure 1 **Illustration of work restraint, work positioning and fall arrest situations**



8.3.5 Limits of equipment use

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 for 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 (see **8.3.6.1**).

8.3.6 Harnesses

8.3.6.1 All harnesses used should be designed to support the wearer in a comfortable working position while allowing unhindered operation of other devices in the system. Harnesses should be appropriate for the application and should conform to relevant standards, for example, sit harnesses should conform to BS EN 813, and full body harnesses should conform to BS EN 361. Sit harnesses should only be used on their own for work positioning (which includes descending and ascending), and work restraint (i.e. travel restriction). In a fall arrest situation, a full body harness should be worn. Some sit harnesses can be converted to a full body harness conforming to BS EN 361 by the addition of a chest harness, where the manufacturer has verified that this is acceptable. An appropriate chest harness is one that conforms to BS EN 12277.

8.3.6.2 Many types of harnesses are available. Before using a harness for the first time, the operative should carry out a suspension test in a safe place to ensure that the harness is the correct size, has sufficient adjustment and is of an acceptable comfort level for the intended use. An example of a harness comfort and adjustability test is given in Annex C.

8.3.7 Workseats

When there is a need for operatives 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 a simple workseat can enhance the comfort, and health and safety of a rope access operative, possibly including a reduction in the risk of suspension intolerance. If the support takes the form of a workseat incorporated into a harness system, the workseat should be fitted in such a way that the harness remains the primary means of attachment to the anchor lines.

8.3.8 Connectors (karabiners, safety hooks, screwlink connectors, etc.)

8.3.8.1 Connectors with a closure that provides protection against inadvertent opening of the gate, for example, by a screwed sleeve or an automatic locking device, are the only types that can provide the required level of security for rope access work. 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 (e.g. a hanger, eyebolt or shackle) should be of such a design and size that they are able to rotate freely in the anchor and sit correctly without hindrance and without loosening the anchor. Connectors conforming to BS EN 362 should be used. In addition, connectors conforming to certain classes of connector in BS EN 12275 also meet the requirements of BS EN 362, and these connectors are also suitable. In the case of such connectors, conformity to BS EN 362 should be confirmed before use. Both standards include screwlink connectors, which might be more appropriate than karabiners for infrequently operated connections or where there might be a loading against the gate. The gate on most connectors is usually the weakest part and loading against it should be avoided. In use, unintentional loading against the gate of many connectors is not uncommon and is usually caused by the migration of straps or

other connecting components from their intended position during an unloaded period. Where appropriate, connectors with a captive eye, where a lanyard or other component is maintained in the intended position, are recommended.

8.3.8.2 When selecting a connector, users should take note of the type of gate locking system employed and should consider how and where the connector will be used in the rope access system. This is with a view to protecting against the possibility of roll-out. Roll-out is the result of pressure on the gate by a connecting component, such as an anchor, a harness attachment point (especially if made from metal), webbing, rope or another connector. If the safety catch mechanism on the locking gate is tripped during the time that this pressure is applied, it can cause the accidental opening of the gate and the release (roll-out) of the connecting component from the connector. The safety catch mechanism can be accidentally tripped typically in one of two ways, depending upon the type of locking gate. These are as follows:

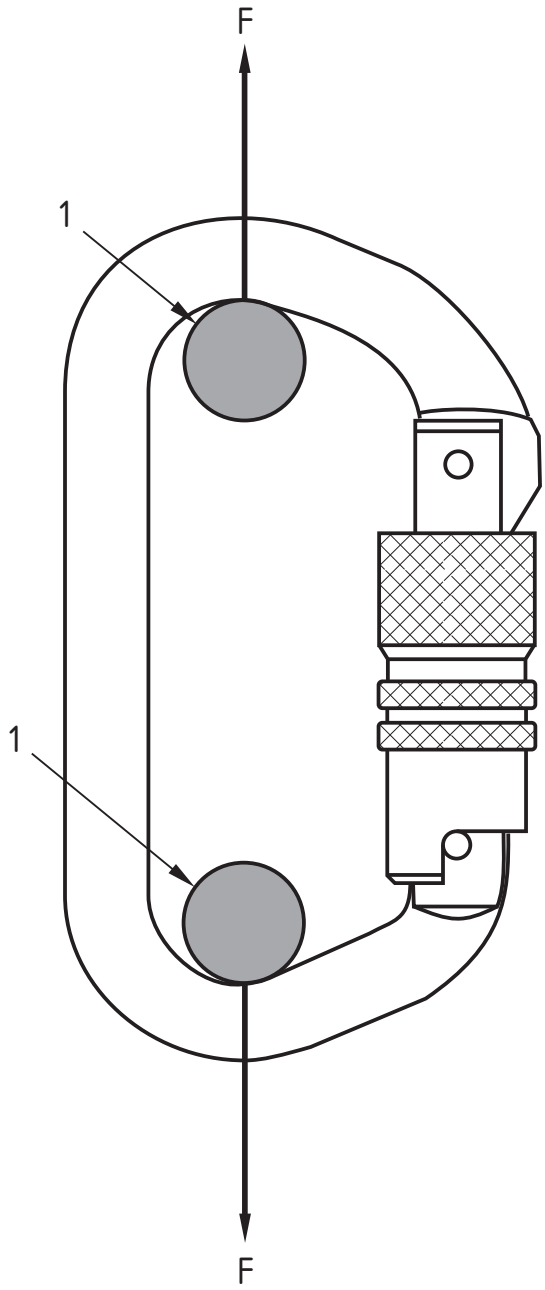
a) the action of rope or webbing running over the top of some types of gate which incorporate a twist-action safety catch;

b) the unintentional pressing of a safety catch on so-called double-action safety hooks against the operative's body or the structure.

8.3.8.3 The potential problems of loading against the gate and roll-out can be largely avoided by consideration of how loads could be inadvertently applied to the connector during use, and then choosing the correct connector for the particular application.

8.3.8.4 The strength of a connector specified in BS EN 362 is determined by pulling between 12 mm bars. If the connector is an asymmetrical shape, the test load is normally applied parallel to, and close to, the spine. If the load in use is not so positioned, 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 breaking load might be less than specified. Therefore, care should be taken when using asymmetrical connectors to ensure that they are loaded as in the standard test (see Figure 2). It should also be noted that high side-loadings on connectors can lead to cross-gate failure and should be avoided.

Figure 2 **Loading of a connector during static testing**



Key
1 12 mm diameter bar
F Force

8.3.9 Descenders

8.3.9.1 Descenders are used to attach the operative to the working line and to control the descent. They should be chosen bearing in mind their suitability for use in the prevailing environmental conditions, for example wet, muddy, icy, abrasive, or corrosive conditions.

8.3.9.2 Descenders should give the operative suitable control over the speed of descent, should not cause undue shock loads to the working line when braking and be such that, if the operative loses control, they will stop (noting that it is common and acceptable for some minor creep of the descender along the anchor line to occur), or allow only a slow, automatically controlled descent in

the hands-off position. In addition, they should not cause significant abrasion, plucking or stripping of the sheath when suddenly clamped onto the working line. They should be of a type that cannot be accidentally detached from the working line or become detached under any circumstances while carrying a person's weight. If a connector is used to attach the descender to the operative, only an appropriate locking connector should be used. For long descents, preferred descenders are those with good heat dissipating properties to prevent burning of the hands and melting of the working line, and those that minimize twisting of the rope.

NOTE Appropriate standards for descenders for rope access work are BS EN 12841 and ISO 22159. BS EN 341 specifies descenders only for use in rescue systems. Descenders conforming only to BS EN 341, therefore, might not be suitable for all aspects of rope access.

8.3.10 Back-up devices

8.3.10.1 Back-up devices are used to attach the operative to the safety line. Back-up devices should be used which are capable of withstanding any foreseeable forces resulting from the rope access activity that could be placed on them, without catastrophic damage to the safety line or to the device itself. They should be chosen bearing in mind their suitability for use in the prevailing environmental conditions, for example wet, muddy, icy, abrasive or corrosive conditions.

8.3.10.2 In the event of a failure of the working line or loss of control by the operative, back-up devices are intended to lock on to the safety line without causing catastrophic damage to the line and also to absorb the limited shock load that might occur. Back-up devices should always be positioned on the safety line so that, in the event of a failure in the working line system, the load will be taken on the back-up device in such a way that a fall is prevented or minimized. There is an advantage in using back-up devices that can be released by the operative without de-weighting first. However, correct functioning of this type of back-up device critically relies on the loading being applied via the cam and not the body (i.e. grabbing the body of the device could cause it to slide down the rope and prevent it from functioning properly). Devices requiring minimal operator manipulation should be used. Back-up devices should preferably fail to safe in all modes of operation, e.g. prevent or arrest a fall even when gripped in panic.

NOTE An appropriate standard for back-up devices is BS EN 12841. Some types of fall arrest device which conform to BS EN 353-2 might also be appropriate, provided that they can be positioned on the safety line by the user.

8.3.11 Ascenders

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

8.3.11.2 Ascenders should be of a type that cannot be accidentally detached from the line and should be chosen so that the risk of damage to the line is minimized when in use. Any dynamic loading should be avoided, as damage could result to either the ascender or the line.

NOTE An appropriate standard for ascenders for rope access work is BS EN 12841.

8.3.12 Ropes

8.3.12.1 In the present state of materials science, only ropes made from polyamide or polyester are normally suitable as working lines or safety lines. Ropes of other man-made materials might be useful in specific situations. Before such ropes are used, care should be taken to verify their suitability for the work intended.

8.3.12.2 Ropes made from high modulus polyethylene, high tenacity polypropylene and aramid may be considered for use in exceptional circumstances, and if appropriate rope adjustment devices (e.g. descenders) 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 descenders. 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 (including sunlight) and repeated bending.

8.3.12.3 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.

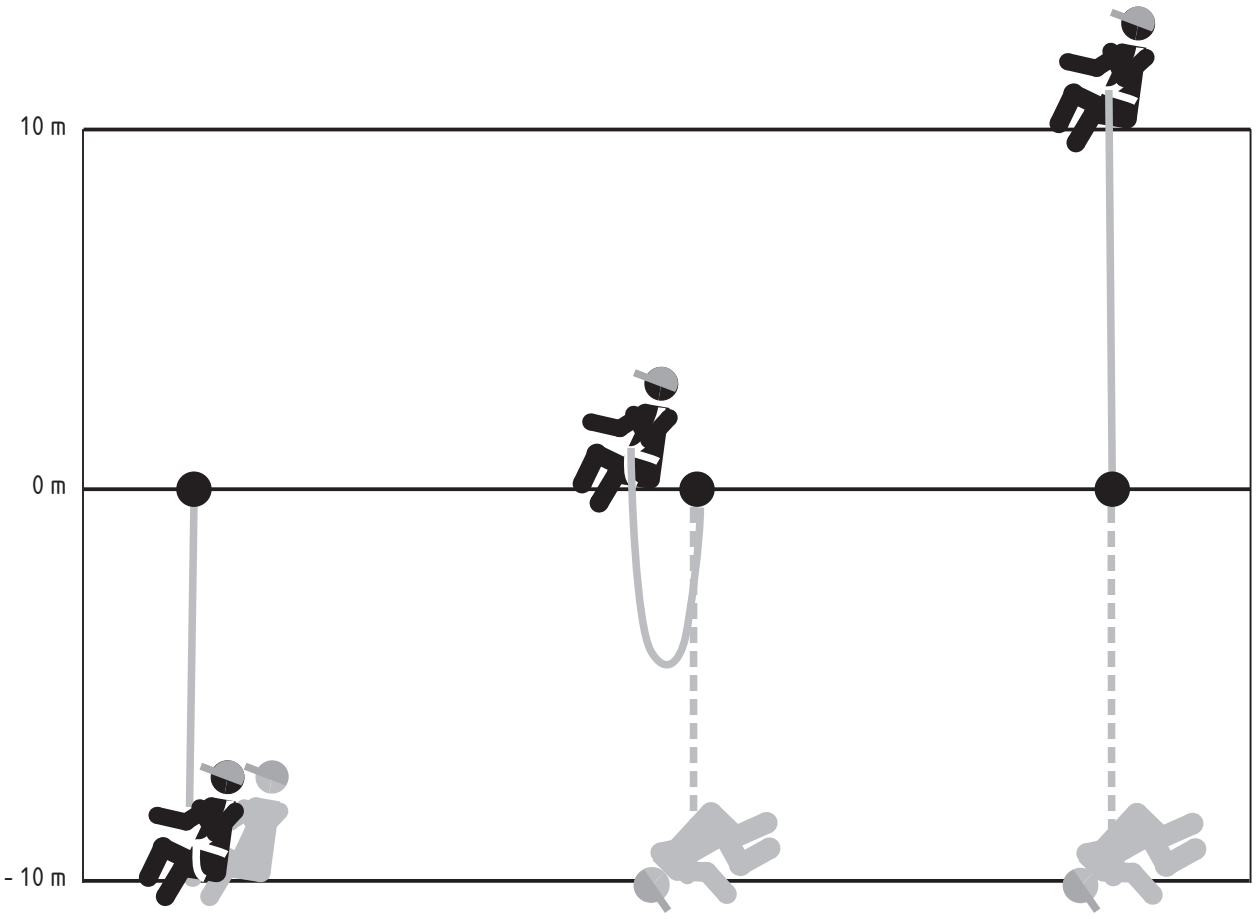
8.3.12.4 Textile ropes constructed with a load-bearing core and an outer protective sheath are recommended (e.g. kernmantel ropes). The sheath should be resistant to wear from the descent/ascent devices and tight enough to resist the ingress of dirt and grit. Ropes with other types of construction may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

8.3.12.5 Efficiency in descending, ascending and, to some extent, working in one place for any length of time, depends on the elongation characteristics of the working line. Therefore, in most cases, the working line (and normally also the safety line) should be a low-stretch kernmantel rope conforming to BS EN 1891:1998, type A.

8.3.12.6 When new type A rope is dynamically tested in accordance with BS EN 1891:1998 using a 100 kg mass, in order to be deemed to conform to the standard it is required to not exceed an impact force of 6 kN at fall factor 0.3 and is then required to hold a minimum of five falls at fall factor 1. An illustration of how fall factors are calculated is given in Figure 3. While appropriate for normal rope access techniques, i.e. descending, ascending and working from ropes, such ropes are not designed to sustain major dynamic loads, particularly because of the undesirable impact forces that could be generated. Therefore, in situations where the possibility of a substantial dynamic load exists, for example, when using lead-climbing techniques, a dynamic rope conforming to BS EN 892 should be used. BS EN 892 specifies three categories of rope: single, half and twin. For rope access, the use of "single" rope with a nominal diameter of 11 mm is recommended. The static strength of each anchor line [including terminations (all types, e.g. sewn and knotted)] should be a minimum of 15 kN.

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 operative striking the ground or structure, or ending up fully immersed in water or other liquid.

Figure 3 **Illustration of how fall factors are calculated**



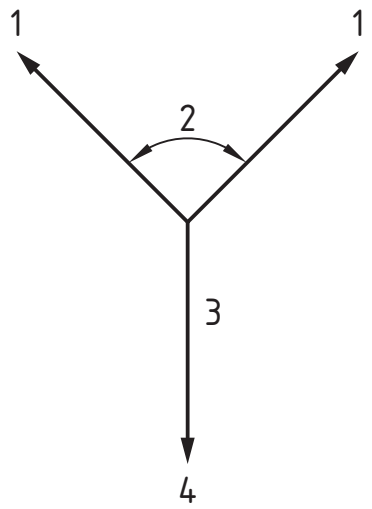
8.3.13 Webbing

Webbing used in personal protective equipment, which includes slings, lanyards and harnesses, 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. Webbing and stitching should be of a type that is protected against the effects of UV, e.g. by the use of inhibitors and/or by a protective covering.

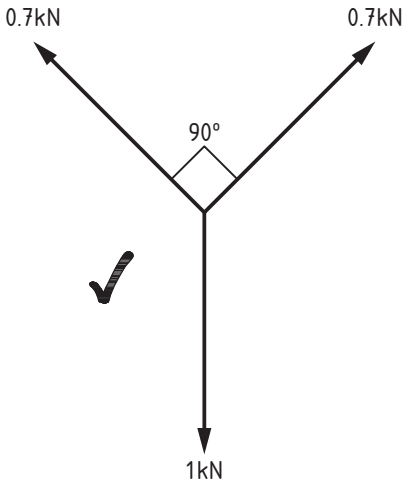
8.3.14 Anchor slings

Anchor slings may be used where there are no suitable anchors to which the anchor lines can be attached directly. They should be made from textiles, wire rope or chain. If made from textiles, they should have sewn joints and have a minimum rated static strength of 22 kN. Appropriate standards for anchor slings are BS EN 354 and BS EN 795:2012, type B. In use, great care should be taken to protect the sling from abrasion, or cutting by sharp edges, for example by the use of suitable padding. Where the included angle (the Y angle) at the anchor point is high and produces a multiplier effect (i.e. it increases the loading on the anchor sling), such as when an anchor sling is wrapped around a lift-shaft housing, the extra forces that are produced need to be taken into account. See Figure 4.

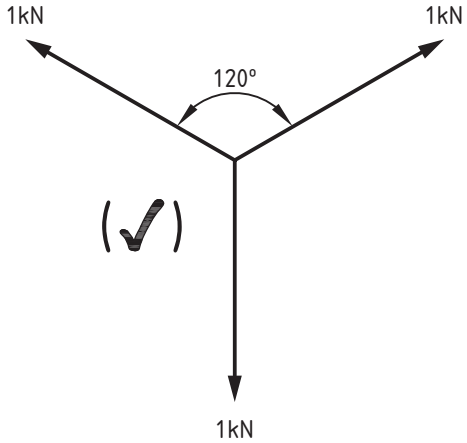
Figure 4 **Examples of the increase in loading on anchors and anchor lines (and anchor slings) caused by an increase in Y angle**



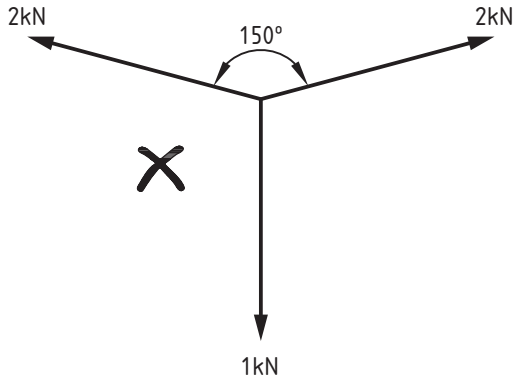
a) General arrangement



b) Preferred angle (the smaller the better)



c) Recommended absolute maximum angle



d) Angle to be avoided

Key

1 Anchor
2 Y angle
3 Anchor line
4 Load

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8.3.15 Lanyards (including cow's tails)

8.3.15.1 Some lanyards are used to provide a link between the user's harness and the rope adjustment devices, i.e. the foot ascender and the back-up device. Such lanyards are generally made from dynamic mountaineering rope and fitted with knotted terminations.

8.3.15.2 Another type of lanyard, generally made from dynamic mountaineering rope and fitted with knotted terminations, is used to connect the rope access technician directly to an anchor via a connector. This is known as a "cow's tail". Cow's tails are normally used in two lengths, primarily at a re-anchor when changing from one anchor line to another during descent and ascent. The short cow's tail is used during a change-over in descent and the long one is used during a change-over in ascent. Both may also be used to connect to other types of anchors.

8.3.15.3 The lanyards described in **8.3.15.1** and **8.3.15.2** should be able to withstand any dynamic forces that might be imposed upon them in times of emergency. Lanyards made of rope should have a quality and performance at least equal to that of a "single" dynamic rope conforming to BS EN 892, which requires 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. 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.

8.3.15.4 Other types of lanyard might be appropriate for use in rope access, e.g. lanyards conforming to BS EN 354, where the minimum static strength requirement is 22 kN and energy absorption is not considered.

NOTE For proprietary lanyards the manufacturer's instructions should be consulted.

8.3.15.5 If an energy absorber is incorporated into the system (other than that provided by the energy absorbing qualities of the material and knots used in the construction of the lanyard), it should conform to BS EN 355.

8.3.15.6 In normal use, the length of the lanyard should be as short as possible and limited to the operative's reach, which will vary from operative to operative.

9 Certification, marking and traceability of equipment

9.1 CE marking of PPE category III requires independent type testing of the product to a standard and either the implementation by the manufacturer of a quality management and quality assurance standard such as BS EN ISO 9001:2008, which is monitored by an "approved body" (i.e. an independent auditor), or by regular batch testing by an approved test house. It is recommended that a certificate of conformity or other written evidence, which states that the product meets the requirements of the Personal Protective Equipment Directive (89/686/EEC) [6] and conforms to any standard it claims to meet, should be obtained by the purchaser from the manufacturer or supplier.

9.2 If the product is not classified as PPE and, therefore, is not required to be CE marked as such, yet is considered to be within the realms of safety equipment, it

is recommended that suitable certificates of conformity or other written evidence, which give confidence in its quality and suitability, should be obtained.

9.3 Where the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) or the Provision and Use of Work Equipment Regulations 1998 (PUWER) apply, lifting equipment is required to be clearly marked to indicate the safe working load (SWL). See HSE document ACOLAR LOLER [3]. All components of a rope access system should be identifiable in such a way that they can be easily associated with their respective documentation (see HSE document ACOLAR LOLER [3]), for example, by the tagging of ropes by the user. PPE should not be proof loaded by the user to determine a safe working load.

9.4 Equipment should be traceable to the relevant test certificates or certificates of conformity, and matched to the record of its use in order to facilitate its proper care. Karabiners and other metal items should be indelibly marked in a manner that does not affect their integrity. Metal items should not be marked by stamping, unless by agreement with the manufacturer. Ropes and harnesses etc. can be indelibly marked by various methods, for example, by marking their identification on a tape, which is then fixed in place by a heat-shrunk, clear plastics cover. Lengths cut off a main rope should have the identification transferred to them sequentially, for example, lengths cut off a main rope with the number A1 should be numbered A1/1, A1/2, etc.

10 Procedures for inspection of equipment

10.1 It is essential that all load-bearing equipment is given a visual and tactile inspection before each use to ensure that it is in a safe condition and operates correctly. Advice should be obtained from the manufacturer on how to do this, and this advice should be strictly followed. Any item showing any defect should be withdrawn from service, immediately if possible. For an equipment inspection checklist see Annex B. Also see HSE guidance document INDG 367 *Inspecting fall arrest equipment made from webbing or rope* [8].

10.2 The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) require lifting equipment to be "thoroughly examined" by a competent person before first use and at intervals not exceeding 6 months, or in accordance with a written "examination scheme". In addition to these examinations, LOLER require additional thorough examinations to be carried out where circumstances liable to jeopardize safety have occurred. Thorough examinations are required to be recorded in a report. Unless this has been done, it is not legal for the lifting equipment to be used. Detailed information regarding LOLER is given in HSE document ACOLAR LOLER [3]. It is recommended that PPE is not subjected to proof load testing by the user (see **9.3**).

10.3 It is recommended that inspections of lifting equipment are carried out over and above the pre-use checks and the thorough examinations required under LOLER. These should be at intervals determined by the risk assessment carried out under the MHSW Regulations. In determining what is a suitable interval, factors such as whether items are subject to high levels of wear and tear or contamination should be considered.

10.4 Procedures should be established for the inspection and maintenance of equipment and how this is to be recorded. Records listing all the items of equipment issued should be kept. These should refer to the safe working load (SWL), working load limit (WLL), declaration of conformity (see HSE document ACOLAR LOLER [3]), etc. and should be kept up to date. It could be helpful to include relevant comments noting where the equipment was used, its storage

conditions, and any incidents that could affect its life (e.g. unusual loadings, use in chemical or gritty atmospheres). Such information could help to determine when to take an item out of service.

11 Inspection, care and maintenance of equipment

11.1 General

Information on inspection, care and maintenance of equipment should be obtained from the manufacturer and this should be strictly followed. The additional general advice given in **11.2** to **11.6** should also be followed. For an equipment inspection checklist see Annex B.

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

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

11.2.2 Textiles 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 textile equipment is through abrasion (either by grit working into the strands or by chafing against sharp or rough edges) or by other damage such as cuts. In order to minimize grit content, or simply to keep the product clean, soiled textile items should be washed in clean water (maximum temperature 40 °C) 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.

11.2.3 Equipment made from man-made fibres, e.g. harnesses, lanyards and anchor lines, is susceptible to degradation by ultraviolet light (see **8.3.1.2**). It is difficult to inspect for UV degradation but tell-tale indicators are fading of colours and any powdering of the surface of the materials. However, these indicators also apply to degradation by chemicals. Any textile equipment showing these signs should be taken out of service.

11.2.4 Users of textile equipment should also carefully and regularly inspect their equipment for signs of abrasion. This applies to both external abrasion and internal abrasion. External abrasion is easy to spot 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 textile equipment: the greater the abrasion the greater is the loss of strength.

11.2.5 The effects of UV degradation and abrasion combined weaken the materials even further.

11.2.6 Textiles that have been in contact with rust should be washed. Textiles with permanent rust marks should be regarded as suspect and scrapped. Tests have indicated that rust can have a weakening effect on polyamides.

11.2.7 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.

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

11.2.9 Ropes, webbing or harnesses which have glazed or fused areas could have suffered excessively high temperatures and are suspect. If the fibres appear powdery or if there are changes in colour in a dyed rope, this can indicate severe internal wear or contact with acids or other damaging chemicals. Swellings or distortion in a rope can be a sign of damage to the core fibres or of movement of the core relative to 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 rope it should be scrapped.

11.2.10 Most man-made textiles 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.)

11.2.11 Textile equipment that has suffered a high shock load (impact force), or has had a load dropped on to it, should be scrapped.

11.2.12 Textile equipment 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 textile, which could cause strength losses of up to 15%.

11.2.13 Since textile equipment can deteriorate with age, e.g. by ultraviolet degradation, employers are advised to set a period after which such equipment should no longer be used. Employers should refer to the information supplied by the manufacturer for the product when deciding on the length of this period. Additional information on the effects of physical, external and chemical causes of damage to man-made textiles is given in BS EN 1891:1998, Annex A.

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

Metal items such as rings, buckles on harnesses, karabiners and descenders 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.

11.4 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.

11.5 Equipment exposed to a marine environment

Equipment that has been used in a marine environment should be cleaned by prolonged immersion in clean, cold freshwater, then dried naturally in a warm room away from direct heat and inspected before storage.

11.6 Storage

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

12 Methods of work

12.1 Suitability of rope access versus other means of access

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

12.1.2 Before adopting rope access techniques for a particular job, the owners of buildings, the main contractors and others responsible for commissioning the work are required to carry out a risk assessment, in accordance with the Management of Health and Safety at Work Regulations 1999 and Approved Code of Practice (ACoP). The risk assessment has to include consideration of whether or not the use of rope access techniques would be appropriate, in view of the hierarchy of protective measures laid down in the Work at Height Regulations 2005 (as amended) (see **4.6**).

12.1.3 When planning rope access work particular attention should be paid to the selection of unquestionably reliable anchors.

12.2 Safe working methods

12.2.1 General

Under the Management of Health and Safety at Work Regulations 1999, employers are required to review carefully the procedures to be followed in carrying out rope access work, examining how they can reduce the risks involved to an acceptable level. They are then required to set down suitable working procedures in a safety policy, written in the clearest manner possible, which will control these risks. The policy has to identify all the foreseeable risks that might arise from the work, including those to people other than their employees, and set out the steps to be taken to minimize these. It may also include reference to the standards of training, competence of the operatives, organization of work teams and rescue procedures.

12.2.2 Site survey

A site survey may be required to determine the means of access and egress, risks to people other than the employees and the nature of the working environment. Consideration should be given to how any workmate rescue could be safely and efficiently carried out.

12.2.3 Permits to work

In addition to the documents referred to in **12.2.1** and **12.2.2**, permits to work might be necessary, (for example, from the client or contractor) particularly where hazards such as live electrical conductors, hot metal ducts or vents for steam or gases are present. The objective of such a permit to work system is to confirm that any hazard has been isolated before work starts and to ensure that it remains isolated while work is in progress. Almost all rope access work offshore is controlled by permits to work.

12.2.4 Documentation to be kept on site

It is recommended that the following documentation should be kept on site:

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

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

c) an equipment log (or other suitable record) which lists all the equipment on site and which gives equipment identification numbers with cross reference to batch or individual test certificates, or certificates of conformity, and safe working load,where appropriate;

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

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

f) personal records, or similar evidence of competence, to be carried by all persons who are working using rope access techniques.

Where the Construction (Design and Management) Regulations 2007 apply, a construction phase health and safety plan, including the project notification, is required to be kept on site.

12.2.5 Working in confined spaces

Working in confined spaces is subject to the requirements of the Confined Spaces Regulations 1997. These are contained in the HSE ACoP and Guidance, *Safe work in confined spaces*.

12.3 Working practices

12.3.1 Work principles

12.3.1.1 All operatives using full rope access methods (i.e. where an anchor line is used as a primary support or for positioning) should use two completely independent anchor lines arranged so that, in the event of a failure of one, the operative cannot suffer a fall. This is the principle of double protection.

12.3.1.2 The principle of double protection also applies to the attachment of operatives to the working line and safety line, for example, descenders and back-up devices should be fixed separately to the operative's harness. Operatives normally descend down the working line by means of the descender with the

back-up device trailing closely by, along the safety line. However, this can be modified to become a top rope protection, where particular supervision or care of the operative is required.

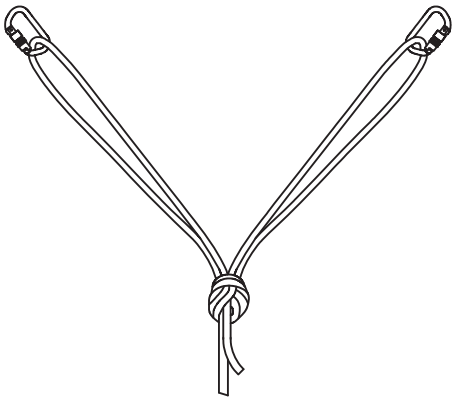
NOTE Sometimes, rope access methods are used in conjunction with conventional suspended access equipment. In such cases, the principle of double protection still applies to the rope access work. The anchors for rope access should be independent of the anchors for the conventional suspended access equipment. For the safety requirements for work on conventional suspended access equipment, reference should be made to the appropriate standards, such as BS 6037, BS 5974 and BS EN 1808.

12.3.1.3 To meet the recommendations given in **12.3.1.1** and **12.3.1.2**, operatives need a separate working line and safety line. Each line should be attached to its own anchor point. These may be connected to each other for added security. 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 safety line. This should be verified by a competent person. Supervisors are responsible for checking that the anchor lines are correctly rigged so that if one should fail, a shock load would not be passed on through the system. (See Figure 5.)

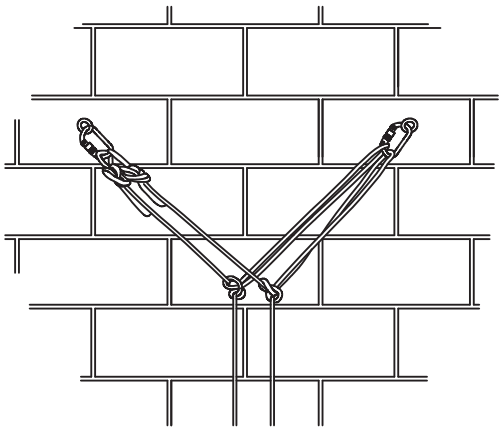
12.3.1.4 Appropriate measures should be taken to avoid the possibility of the operative being able to descend inadvertently off the end of the working line or safety line. This can be achieved, for example, by the use of a suitable stopper knot (e.g. a figure-of-eight knot, see Figure 6) tied at an appropriate point in each of the lines. The knot should be hand-tightened, and the tail, after the knot has been tightened, should be at least 300 mm long.

Figure 5 **Examples of typical anchor arrangements for rope access**

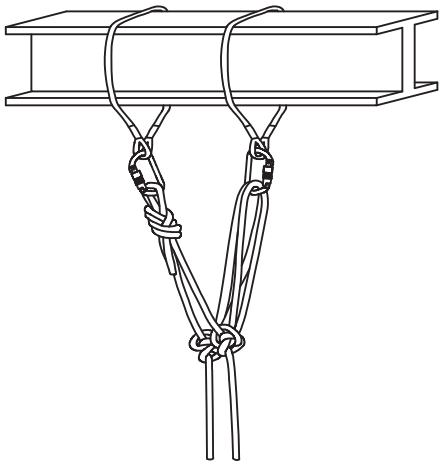
NOTE Reproduced with permission from Lyon Equipment Ltd.



a) Example of two equally loaded anchors linked by means of a figure-of-eight knot on the bight.

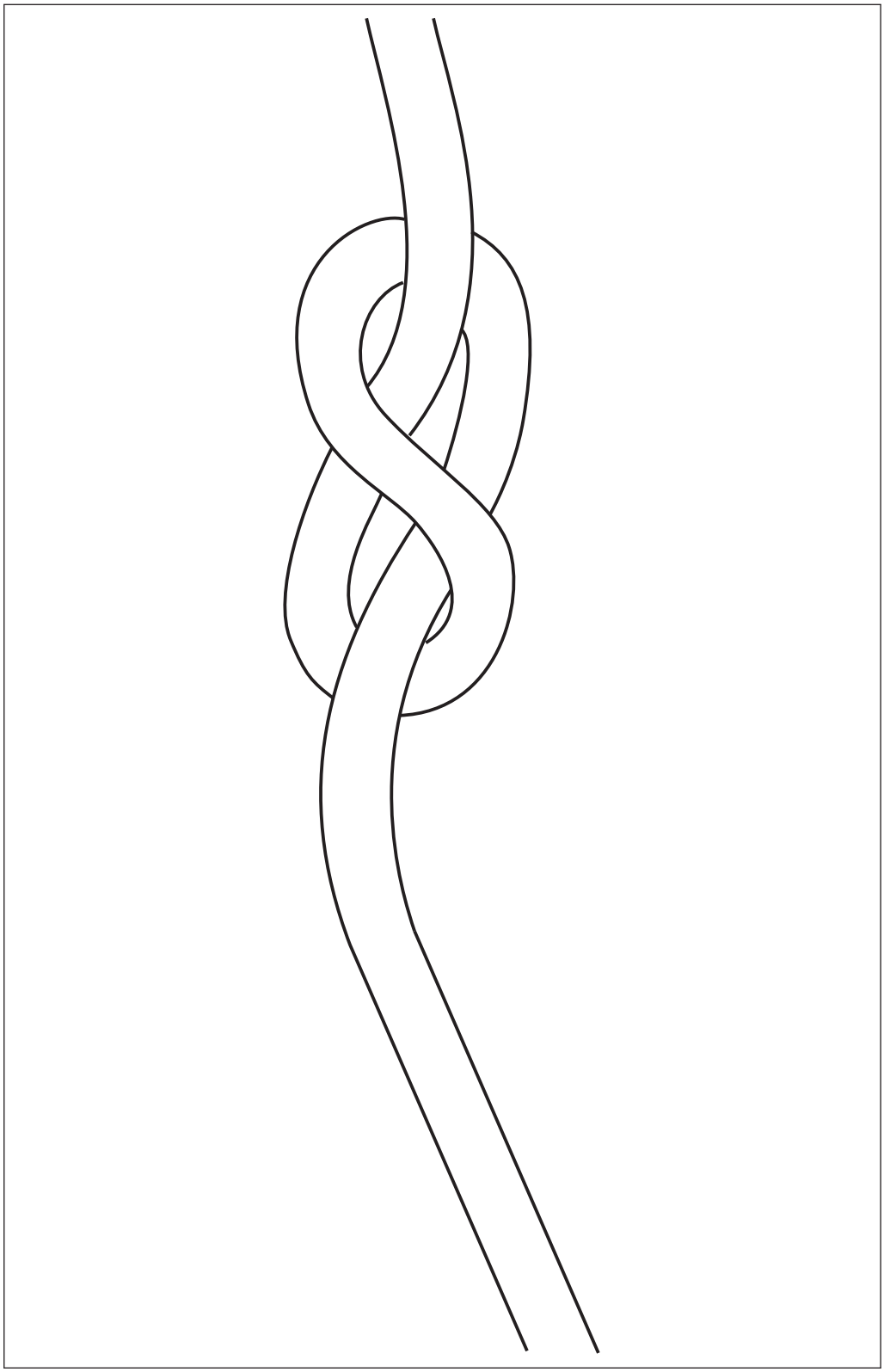


b) Example of the use of eyebolts to provide double protection.



c) Example of the use of anchor slings to provide double protection.

Figure 6 **Example of a figure-of-eight knot for use as a stopper knot at the end of the working line and safety line**



12.3.1.5 Rope access is primarily concerned with movement up or down, and work from, suspended ropes and is considered to be primarily a technique for work positioning. However, the techniques and equipment used for this purpose may be extended to encompass traversing, aid climbing, and lead climbing. The system used can range from a work positioning system to a fall arrest system, with hybrid systems somewhere in between. The fall arrest systems (i.e. those used for lead climbing and some traversing techniques) are different from those used for traditional fall arrest work techniques, which, for example, may allow factor 2 falls of up to 4 m before the arrest of the fall commences. Techniques that could result in a fall should be used only after a specific assessment of the risk and the appropriate choice of equipment (see **4.5**, **4.6**, **8.1.1** and **12.1.2**). The choice of techniques and equipment may vary, according to the job, but the principles for a safe and effective system of work should always be considered as part of the risk assessment.

12.3.2 Work teams

12.3.2.1 Because of the locations and the specialized nature of rope access work, all work teams should be properly supervised and be self-supporting. A work team should, therefore, consist of at least two members. One member of the work team should be a supervisor. The supervisor, together with their employer, should ensure before work commences that workmate rescue procedures have been agreed upon that are adequate for the particular situation, and that sufficient resources are readily available to enable those procedures to be carried out should the necessity arise. When operating on a worksite with more than one discrete working area, adequate supervision should be provided for each of those discrete areas.

12.3.2.2 Where the work is to take place in a particularly hazardous or restricted area, such as one that 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.

12.3.2.3 In some circumstances, the work team may require additional support members for safety reasons, for example, 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 (see **12.6**). The additional persons required to act as sentries need not be trained in rope access work, provided that they are not counted as being members of the rope access team. They should, nevertheless, be regarded as full members of the work team.

12.3.2.4 Where work is carried out offshore, regulations such as the Offshore Installations (Prevention of Fire and Explosion and Emergency Response) Regulations 1995 (PFEER) apply. Under PFEER, suitable rescue equipment has to be provided and measures adopted to arrange for prompt rescue of anyone entering the water (Regulations 4 and 17).

12.3.3 Pre-work checking and checks at the start of each day

12.3.3.1 If a permit to work is required (see **12.2.3**), this should already have been obtained and checked. Any special precautions required should be put into effect (e.g. standby boat alerted, radio check, gas checks). At the start of each day, the work team should review the risks that could affect the safe, efficient and effective outcome of the job. This review should include referring to risk assessment already prepared (see **12.1.2**).

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

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

12.3.4 Work procedure

12.3.4.1 The Work at Height Regulations 2005 (as amended) and the Construction (Design and Management) Regulations 2007 require a safe place of work. Therefore, work should start from properly protected safe areas or areas made safe by the installation of temporary guarding or scaffolding. Such areas are also required to have a safe means of access.

12.3.4.2 Appropriate precautions need to be taken to prevent damage to the suspension equipment, when in use. Wherever possible, ropes should be rigged so as to avoid running over sharp edges, particularly of steelwork, stone, concrete or masonry, or over hot surfaces. Where this cannot be done, it is essential that the rope is suitably protected, for example, by the use of rollers or other types of rope protector. Tests have shown that rollers offer the best protection. However, if these are not used, rope protectors made from heavy canvas can offer excellent protection. Rope protectors made from PVC-coated textiles should be avoided. The rope protection used should ensure that the radius of any bend is at least twice the diameter of the rope.

12.3.4.3 Operatives should normally descend vertically with the minimum amount of penduluming to minimize the risk of chafing the rope or overloading the rope or anchors. On long drops, running belays or intermediate deviation anchors (deviations) should be fitted on the ropes to enable the operatives to maintain their position without being buffeted too much by the wind. The effects of wind on the free end of ropes should be taken into account. Also, care should be taken to ensure that the tail end of ropes cannot snag on dangerous objects, for example, a moving vehicle. Running belays or deviations can also prevent ropes from becoming entangled, as can the placing of any excess rope (in the drop) in a bag and suspending it beneath the operative.

12.3.5 Anchors

12.3.5.1 Anchors are used as the main attachment point(s) of the working line and the safety line to the structure and also for other purposes, e.g. to reposition the lines to avoid abrasion or other hazards (called re-anchors, also known as re-belays), to alter the direction of the lines (intermediate deviation anchors), or simply to maintain the lines in their intended position. Examples of anchors are eyebolts (which should conform to BS EN 795:2012, type A), lift-shaft housings on tower blocks, structural steelwork, sound concrete and natural geological features. Anchors should be unquestionably reliable.

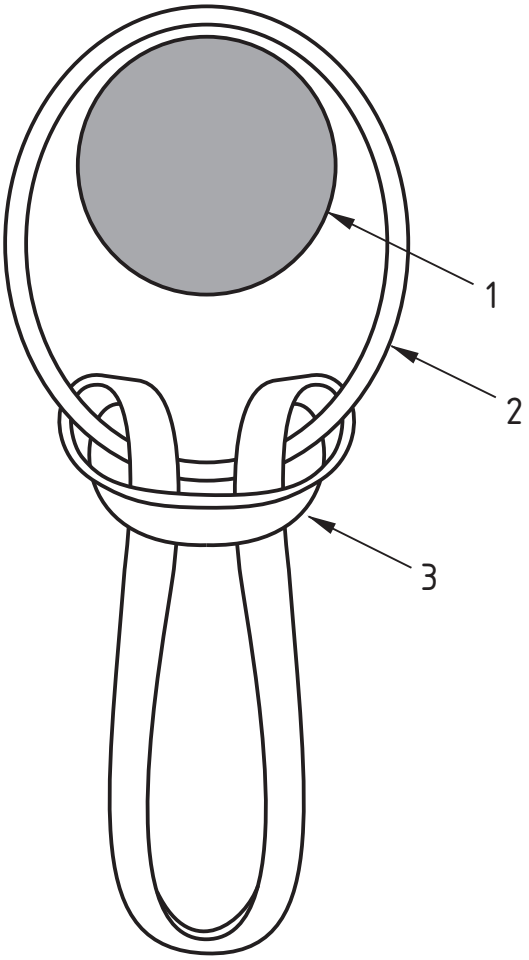
12.3.5.2 The maximum permissible impact force on the user in the event of a fall should not exceed 6 kN. This British Standard has used a safety factor of 2.5 to determine the anchor strength requirement. Therefore the static strength of all anchors, except deviation anchors and anchors placed simply to maintain the position of the anchor lines, should be at least 15 kN. Deviation anchors and anchors placed simply to maintain the position of the anchor lines may have a lower static strength than this but should be sufficient for the load that could be applied (see Figure 8). 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. These values have been determined assuming a total mass of the operative plus their equipment of 100 kg, which is the standard test mass used in European Standards for personal fall protection equipment. The mass of the user might be greater than this, especially in the case of rescue, where there could be more than one person

attached to the anchor system. (During rescue, rope access operatives are required to follow procedures which restrict the potential for dynamic loading of the anchor system.)

NOTE Work commissioned by the Health and Safety Executive gives a typical loading on the anchor system (see HSE Contract Research Report 364/2001: Industrial rope access – Investigation into items of personal protective equipment *[9].*

12.3.5.3 Anchor slings made from textiles should have a minimum breaking strength of 22 kN. Because of the weakening effect, the looping of anchor slings or other slings, strops or lanyards through themselves (known as lark's footing or choking) should be avoided, unless they are specifically designed to allow this. See Figure 7.

Figure 7 **Diagram of a lark's footed sling (generally not recommended)**



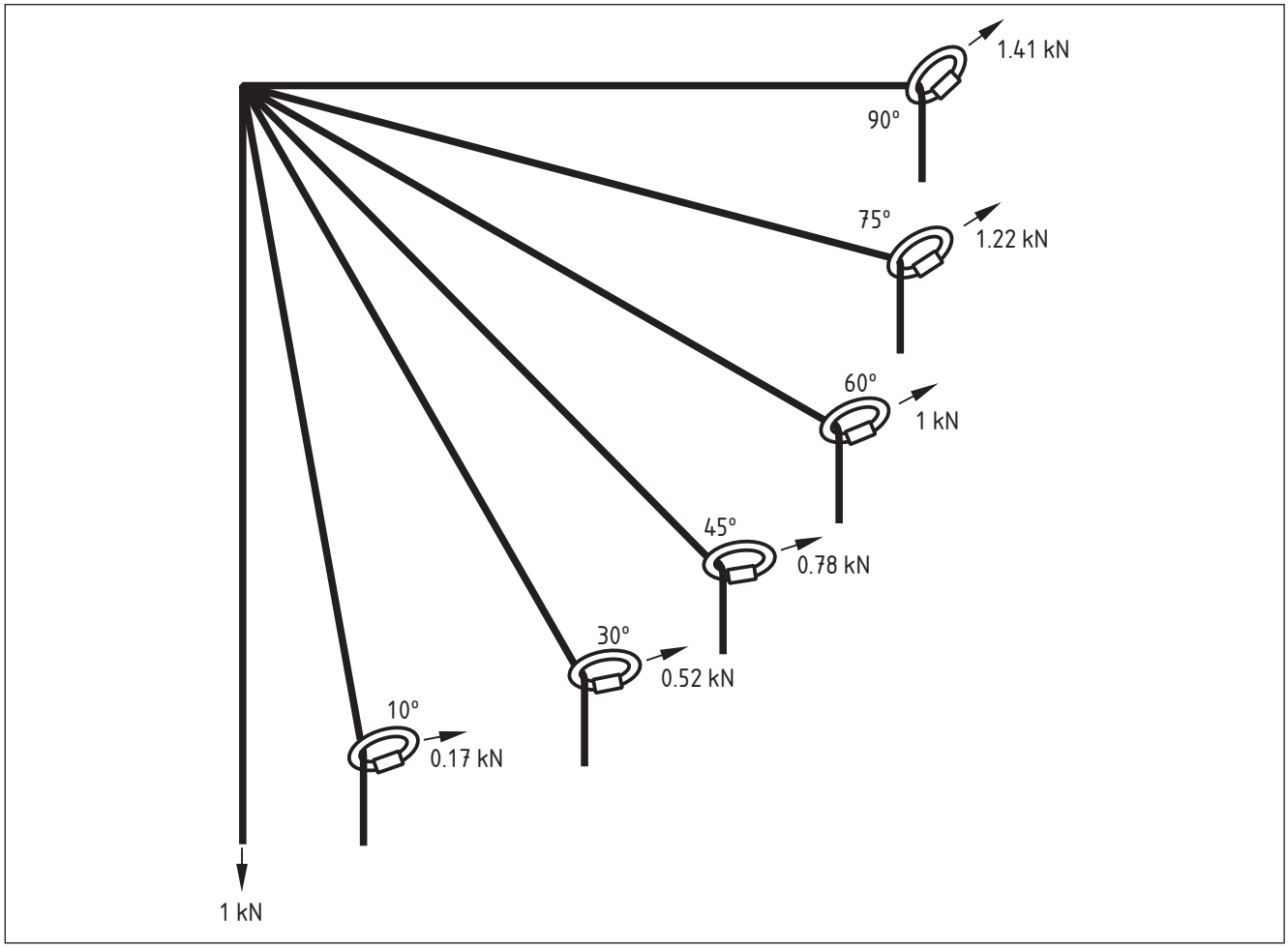
Key
1 Anchor point
2 Anchor sling
3 Lark's foot

12.3.5.4 Anchor devices, such as eyebolts, should conform to BS EN 795:2012 and should be used in accordance with BS 7883. BS EN 795:1997 required anchor devices to have a static strength of 10 kN. BS EN 795:2012 requires anchor devices to have a static strength of 12 kN. To achieve the 15 kN minimum strength of an anchor as recommended in **12.3.5.2**, it might be necessary to use

such anchor devices in pairs. Information on stability calculations for davits, parapet clamps etc. is given in BS EN 1808.

12.3.5.5 Where ropes are redirected, the angle and loading at any intermediate deviation anchor used, and the strength of other equipment in the system, for example, connectors and lanyards, should be taken into account before use, along with the consequences of failure. An example of the effect of the angle on the loading is given in Figure 8, based on a mass of 100 kg (which equates to a load of approximately 1 kN). Masses smaller or larger than this would give different loadings to those shown in the example.

Figure 8 **Example of how the angle at an intermediate deviation anchor affects the loading**



12.3.6 Rest periods

In calculating rest periods for operatives, consideration should be given to the effects of adverse climatic conditions.

12.3.7 Workmate rescue

Even though great care and attention has been given to safe working, incidents 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 worksite at appropriate times, for example, each day or at each change of job, to assess all possible emergency scenarios, and to plan how any resulting rescues would be carried out. Provisions should be made to ensure that help is provided promptly to any operative who needs it or who is unable to communicate and might be in danger, for example, from suspension intolerance.

12.4 Use of tools and other work equipment

12.4.1 Small tools

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

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

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

12.4.2 Power leads and power supply

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

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

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

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

12.4.2.5 All electrically operated hand tools, other than cordless ones, should be supplied from a 110 V centre-tapped-to-earth system. See the HSE publications *Electrical safety and you* (INDG231) [10] and *Electricity at work. Safe working practices* (HSG85) [11].

12.4.2.6 Where, owing to the tool design, a supply voltage of 240 V a.c. is needed, the supply to each tool should be controlled at source by a residual current device with a rated tripping current not exceeding 30 mA. Where such devices are used, they should be tested for electro-mechanical operation, by means of the test button, each day before use.

12.4.3 Large power tools

12.4.3.1 Equipment weighing more than 8 kg should be fitted with a separate suspension system secured to an independent anchor. Anchors and suspension ropes used for equipment should be clearly identified to avoid confusion with those used to support operatives.

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

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

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

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

12.5 Communications systems

12.5.1 An efficient communications system should be established between all operatives and, where necessary, between the operatives and third parties (e.g. the control room staff, if offshore). It is essential that this is agreed and set up before work starts and that it remains in effect for the entire time that operatives are at work.

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

12.5.3 Hand or voice signals are liable to be misunderstood. Therefore, any special signals should be agreed and well rehearsed before work begins. These should include a signal that would enable the operative to communicate the need for help, in case any other adopted method of communication fails.

12.6 Protection of other people

12.6.1 Precautions should be taken to prevent equipment or materials falling in such a way that they could be a danger to other people. These should be

appropriate to the particular situation. Advice is given in HSE guidance document *Protecting the public – Your next move* [12].

12.6.2 Precautions include securing all tools to either the operative or to separate lines (see **12.4.1**, **12.4.2** and **12.4.3**) or establishing an exclusion zone at ground level. Alternatively, scaffold fans, temporary roof structures or containment nets or sheets should be provided to contain falling materials, etc. in safe and confined areas. These should be strong enough to retain any equipment or debris that might fall. Safety nets should conform to BS EN 1263-1 and should be erected in accordance with BS EN 1263-2.

12.6.3 When work is carried out over or near public places, the provisions of the Highways Act 1980 could apply, and advice should be obtained from the appropriate local authority.

12.6.4 Usually, it is necessary to establish an exclusion zone at the base of the rope access work area. An exclusion zone should be big enough to keep people clear of any risk from falling objects. In ideal circumstances, the width of the exclusion zone should be at least equal to the height of the work position. However, this is often impossible to achieve owing to the proximity of other buildings, so the width of the zone should be the maximum appropriate to the work situation. Account should be taken of the possibility of material deviating from a straight fall as a result of wind or after bouncing off the structure or the ground. People should be discouraged or prevented from entering the exclusion zone by posting notices, providing warning signs (see Note), erecting barriers, installing alarms or posting sentries (see **12.3.2.3**). Access ways, passageways or doors leading into the zone should be locked or closed off by a barrier.

NOTE Attention is drawn to the Health and Safety (Safety Signs and Signals) Regulations 1996.

12.7 Termination of a job

Where the CDM Regulations 2007 apply, contractors are required to pass the appropriate information to the CDM co-ordinator for inclusion in the health and safety file.

Annex A (informative) Typical method of descending and ascending using rope access techniques

A.1 Pre-use equipment check

All equipment should be submitted to a pre-use check to ensure that it is in good condition and functions correctly. Suspect items should not be used and should be taken out of service. In addition, before approaching the point of descent or ascent or commencing the descent or ascent, checks should be made to ensure that:

- harness(es) are fastened properly;
- lanyards and connectors are fastened properly;
- anchors are secure;
- ropes (working lines and safety lines) are anchored properly and free from damage;
- stopper knots are tied at the lower end of both the anchor line and the safety line at an appropriate position, with an allowance for stretch;
- tools or other objects are secured so they cannot fall.

When the point of descent/ascent is reached, further checks should be made to ensure that:

- ropes are rigged so as to avoid damage during the work operation;
- rope adjustment devices are attached properly and securely (e.g. descenders, ascenders, back-up device).

A.2 Use of the back-up device

The back-up device should be used to protect against falls before, during and after attachment to the suspension rope. It should be the first item to be attached, before descender/ascenders, and the last item to be removed at the point of egress, after removing the descender or ascenders. In order to keep potential falls to a minimum, the back-up device should be operated so that slack does not develop in the connecting lanyard. It is essential that the back-up device is never positioned below the level of the operative.

A.3 Descending and ascending

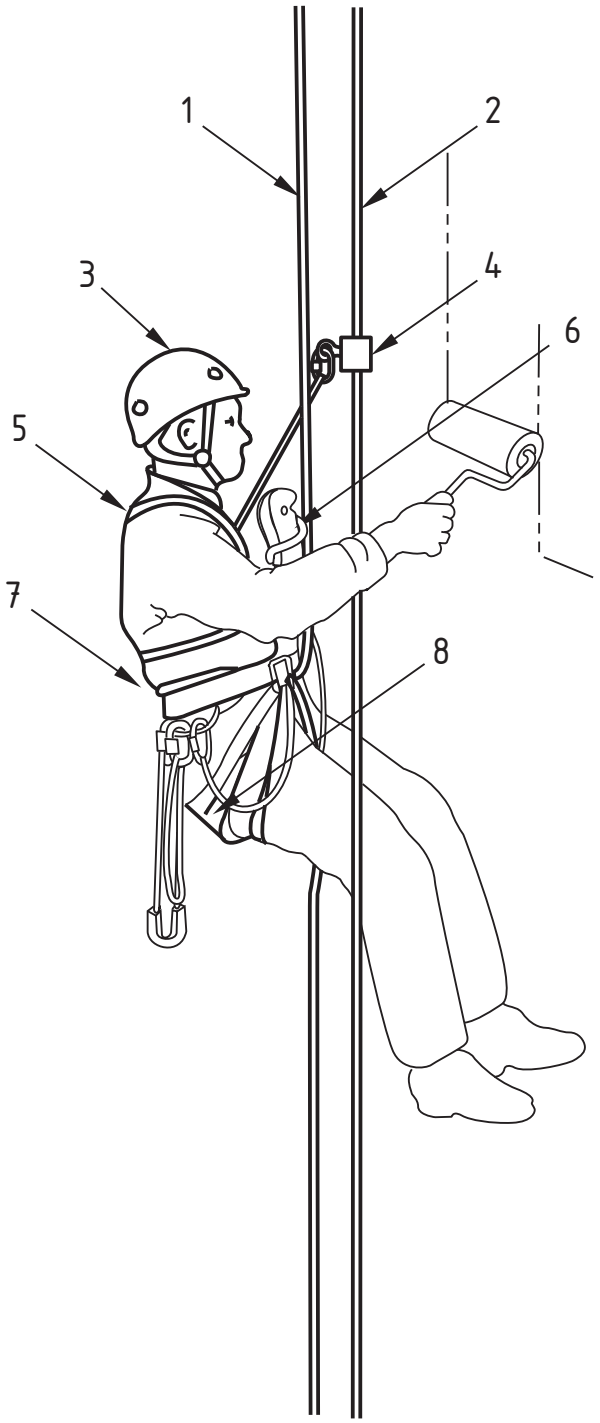
NOTE When an operative is preparing to load the suspension rope, either for descent or ascent, care should be taken to eliminate slack rope. Slack can occur if the anchor is positioned some distance from the point of loading, or when an operative unloads the rope halfway down a descent.

A.3.1 Method for descending (see Figure A.1)

Approach the area of descent safely, using an additional fall protection system if necessary. Place the back-up device on the chosen safety line and position it to minimize any potential fall. Disconnect from the additional safety system (if appropriate) and move to a position adjacent to the point of descent. Thread the descender onto the working line, check security and operation and lock the descender. Position for descent and move the back-up device to a position where it can be operated conveniently. Control the "tail" rope leaving the descender and remove the lock on the descender. Descend carefully and slowly, controlling the speed of descent by means of the descender, the precise method depending on the type of descender used. Never lose control of the "tail" rope leaving the descender. Always lock off the descender during stops in the descent. Ensure the back-up device is operated with minimum slack in the connecting lanyard.

When the working position is reached, lock off the descender and position the back-up device as high as possible.

Figure A.1 **Example of working in descent mode (with descender locked off) in a rope access system**



Key

1	Working line	5	Chest harness
2	Safety line	6	Descender
3	Helmet	7	Work positioning harness
4	Back-up device	8	Workseat

A.3.2 Method for ascending (see Figure A.2)

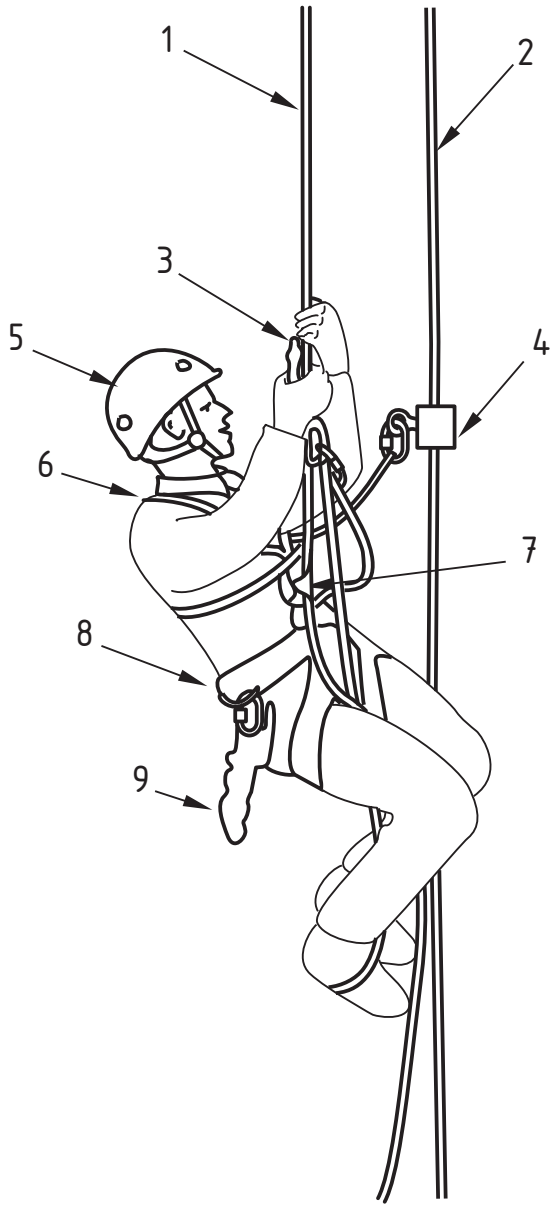
Approach the point of ascent safely, using an additional fall protection system if necessary, taking the precautions detailed in **A.1**, **A.2** and the Note to **A.3**. Check all rope adjustment devices and connectors for security. Place the back-up device on the selected rope (the safety line) at shoulder height. Fit the other rope (the working line) to the chest ascender, and take the initial stretch out of it by pulling it down through the chest ascender. Fit the foot ascender above the chest ascender (also on the working line) and, by standing in the foot loop, pull through any further slack, passing the slack also through the chest ascender until the line is as taut as possible.

To begin the ascent, sit down on the chest ascender and lift the foot ascender to approximately helmet height. Stand up in the foot loop and pull the resulting slack through the chest ascender as before. Sit down, so the load is again taken on the chest ascender, and repeat this process until the ascent is completed.

Move the back-up device up the safety line during the ascent, taking care to avoid slack in the connecting lanyard. On reaching the top of the climb, attach to a secure anchor or safety system. Remove the chest ascender from the rope first, then the foot ascender. When a position of safety has been reached, remove the back-up device.

NOTE It is essential that ascenders are only used in tension on the rope and that they are never used in such a way that they could be subjected to a dynamic load (the force of a fall).

Figure A.2 **Example of a typical method of ascending in a rope access system**



Key

1	Working line	6	Chest harness
2	Safety line	7	Chest ascender
3	Ascender	8	Work positioning harness
4	Back-up device	9	Descender
5	Helmet		

Annex B (informative) Equipment inspection checklist

An equipment inspection checklist is given in Table B.1.

Table B.1 **Equipment inspection checklist**

Component	Inspection procedure
All textile equipment	*General checking procedure for all textile equipment*
	☐ Have you read the information supplied by the manufacturer? ☐ Is the product within the manufacturer's recommended lifespan? Visual – Check for: ☐ Excessive wear to any part ☐ Abrasion, particularly to load-bearing parts ☐ Furry webbing or rope (this indicates abrasion) ☐ Stitching cut, broken or abraded ☐ Cuts, particularly to load-bearing parts ☐ Dirty webbing or rope (dirt accelerates abrasion, both externally and internally) ☐ Product markings still present and legible (e.g. serial numbers, CE markings) Visual and tactile – Check for: ☐ Damage by chemicals. Powdery surface ☐ and/or discolouration ☐ and/or hardened areas ☐ (these often signify chemical contamination and/or ultraviolet degradation) ☐ Damage by heat, e.g. glazed areas Action: ☐ Product beyond recommended lifespan: remove from service ☐ Excessive wear to any part: remove from service ☐ Abrasion: a small amount is permissible. Remove from service if excessive ☐ Cuts: remove from service ☐ Dirty: clean according to manufacturer's instructions ☐ Chemical contamination: remove from service ☐ Heat damage: remove from service ☐ Stitching cut, broken or abraded: remove from service ☐ Product markings insufficiently legible to allow traceability (e.g. to company records): remove from service If in doubt on any point, remove from service

Table B.1 **Equipment inspection checklist**

Component	Inspection procedure
Working lines and safety lines	*Checks in addition to the general checking procedure for all textile equipment*
	Visual – Check: ☐ Ends of rope for excessive wear Visual and tactile – Check for: ☐ Internal damage. On cable-laid ropes, open up the lay and inspect as above. On kernmantel ropes, feel for unusually soft or hard areas, on sheath and core. (This signifies damage.) Particularly check ends of ropes ☐ All knots for security ☐ That knot overlaps are sufficient Action: ☐ Excessive internal grit: clean according to manufacturer's instructions. If it is not possible to remove the grit, inspect the rope for damage by abrasion more frequently than normal ☐ Unusually soft or hard areas: remove from service. (Sometimes, the damage is only local, so damaged areas can be cut out.) ☐ Knots: if in doubt, remove from service. Knots may be retied by a competent person. Tension knot with body weight and ensure that there is sufficient overlap (minimum 100 mm). If the knots in an anchor line appear to be very tight, either retie the knots or replace the anchor line If in doubt on any point, remove from service

Table B.1 **Equipment inspection checklist**

Component	Inspection procedure
Harnesses	*Checks in addition to the general checking procedure for all textile equipment*
	Visual and tactile – Check: ☐ Inside and outside any textile attachment point loops for all the features listed under the general checking procedure ☐ Fastening and adjustment buckles for: ☐ correct assembly, ☐ correct functioning, ☐ excessive wear, ☐ corrosion, ☐ cracks, ☐ other damage ☐ Other safety critical metal or plastics components for: ☐ correct functioning, ☐ corrosion, ☐ cracks, ☐ other damage Action: ☐ Textile attachment point loops: treat in accordance with general checking procedure ☐ Fastening and adjustment buckles, other safety critical metal or plastics components: ☐ Excessive wear: remove from service ☐ Corrosion: remove from service ☐ Cracks: remove from service ☐ Other damage: remove from service ☐ Incorrect functioning: remove from service If in doubt on any point, remove from service
Cow's tails, lanyards, strops, slings	*Checks in addition to general checking procedure for all textile equipment*
	Visual and tactile – Check: ☐ Inside and outside any attachment point loops for all the features listed under the general checking procedure ☐ All knots for security ☐ That knot overlaps are sufficient ☐ That knots in cow's tails are not too tight (i.e. that they would still provide some energy absorption) Action: ☐ Attachment point loops: treat in accordance with general checking procedure ☐ Knots: if in doubt, remove from service. Knots may be retied by a competent person. Tension knot with body weight and ensure that there is sufficient overlap (minimum 100 mm). If the knots in a cow's tail appear to be very tight, either retie the knots or replace the cow's tail. If in doubt on any point, remove from service

Table B.1 **Equipment inspection checklist**

Component	Inspection procedure
Metal components	*Checking procedures for metal components*
Descenders	☐ Have you read the information supplied by the manufacturer? Visual – Check for: ☐ Wear, particularly on bobbins ☐ Deformation ☐ Cuts ☐ Cracks ☐ Heavy marking or scoring ☐ Burring ☐ Corrosion ☐ Contamination by chemicals, e.g. pitting, flaking of aluminium products (usually due to salt water) ☐ Build-up of foreign matter, e.g. grit, grease, paint ☐ Product markings still present and legible (e.g. serial numbers, CE markings) Visual and tactile – Check that: ☐ Moving parts function correctly, e.g. handles, locking devices ☐ Threaded assemblies are fully tightened and correctly secured ☐ There is no deformation of any parts, e.g. handles Action: ☐ Remove any foreign matter ☐ Some wear is permissible: refer to manufacturer's information ☐ Deformation: remove from service ☐ Cuts, heavy burring, marking or scoring: remove from service ☐ Cracks: remove from service ☐ Contamination by chemicals: remove from service ☐ Incorrect functioning: remove from service ☐ Threaded assemblies not properly tightened: remove from service ☐ Product markings insufficiently legible to allow traceability (e.g. to company records): remove from service If in doubt on any point, remove from service

Table B.1 **Equipment inspection checklist**

Component	Inspection procedure
Ascenders/Back-up devices	☐ Have you read the information supplied by the manufacturer? Visual – Check for: ☐ Wear, particularly on cam teeth or face, rope channel ☐ Deformation ☐ Cuts ☐ Cracks ☐ Heavy marking or scoring ☐ Burring ☐ Corrosion ☐ Contamination by chemicals e.g. pitting, flaking of aluminium products (usually due to salt water) ☐ Build-up of foreign matter, e.g. grit, grease, paint ☐ Product markings still present and legible (e.g. serial numbers, CE markings) Visual and tactile – Check that: ☐ Moving parts function correctly, e.g. cam, springs, locking catch ☐ Hinge pin is in good condition ☐ Threaded assemblies are fully tightened and correctly secured ☐ There is no deformation of any parts Action: ☐ Remove any foreign matter ☐ Wear: some wear is permissible; refer to manufacturer's information ☐ Moving parts: if any do not function correctly, remove from service ☐ Hinge pin not in good condition: remove from service ☐ Deformation: remove from service ☐ Cuts, heavy burring, marking or scoring: remove from service ☐ Cracks: remove from service ☐ Contamination by chemicals: remove from service ☐ Incorrect functioning: remove from service ☐ Threaded assemblies not properly tightened: remove from service ☐ Product markings insufficiently legible to allow traceability (e.g. to company records): remove from service If in doubt on any point, remove from service

Table B.1 **Equipment inspection checklist**

Component	Inspection procedure
Connectors	☐ Have you read the information supplied by the manufacturer? Visual – Check for: ☐ Wear, particularly where the rope or webbing normally lies ☐ Deformation ☐ Cuts ☐ Cracks ☐ Heavy marking or scoring ☐ Burring ☐ Corrosion ☐ Contamination by chemicals, e.g. pitting, flaking of aluminium products (usually due to salt water) ☐ Build-up of foreign matter, e.g. grit, grease, paint ☐ Product markings still present and legible (e.g. serial numbers, CE markings) Visual and tactile – Check that: ☐ Moving parts function correctly, e.g. keeper locates in body correctly, spring returns keeper correctly, keeper locking mechanism operates correctly (screw gate, twist-lock), any threaded parts run correctly ☐ Hinge pin is in good condition ☐ Catch pin is not bent ☐ There is no deformation of any parts Action: ☐ Remove any foreign matter ☐ Wear: Some wear is permissible; refer to manufacturer's information ☐ Moving parts: if any do not function correctly, remove from service ☐ Hinge pin not in good condition: remove from service ☐ Catch pin bent: remove from service ☐ Deformation: remove from service ☐ Cuts, heavy burring, marking or scoring: remove from service ☐ Cracks: remove from service ☐ Contamination by chemicals: remove from service ☐ Incorrect functioning: remove from service ☐ Threaded assemblies not properly tightened: remove from service ☐ Product markings insufficiently legible to allow traceability (e.g. to company records): remove from service If in doubt on any point, remove from service

Table B.1 **Equipment inspection checklist**

Component	Inspection procedure
Helmets	☐ Have you read the information supplied by the manufacturer? ☐ Is the helmet within the manufacturer's recommended lifespan? Visual and tactile Check for: ☐ Cracks, deformation or other damage to the shell ☐ Damage to the cradle/chinstrap assembly ☐ Excessive wear to any part Check that: ☐ Chin strap adjusts easily ☐ Product markings still present and legible (e.g. serial numbers, CE markings) Action: ☐ Helmet beyond recommended lifespan: remove from service ☐ Any cracks, deformation or other damage, including scoring or cuts to the shell: remove from service ☐ Damage to the cradle/chinstrap assembly: remove from service ☐ No chin strap, or chin strap does not adjust easily: remove from service ☐ Product markings insufficiently legible to allow traceability (e.g. to company records): remove from service If in doubt on any point, remove from service

Annex C (informative) Harness comfort and adjustability test

C.1 General

This annex gives a test procedure for assessing the comfort of a harness when worn by the intended user while suspended, as they might be during normal work activity or following a fall. The adjustability of the harness when worn by the intended user is also assessed. The test is suitable for belts with sub-pelvic support, sit harnesses and full body harnesses. It should not be used for belts without sub-pelvic support or for chest harnesses.

C.2 Safety precautions

C.2.1 Part of the test procedure involves the user being suspended clear of the ground while wearing the harness. The test should be carried out in a safe place, with at least one other person present, preferably someone who is appropriately qualified in first aid for dealing with emergencies involving persons working at height. The test should be arranged so that when the user is suspended, there is only a small clearance between the user's feet and the ground, e.g. 100 mm. A means of support should be provided, e.g. a wooden box, of a height slightly greater than the clearance between the user's feet and the ground so that if the user finds the harness too painful, or experiences any other discomfort, they can immediately put their feet on it to support their weight.

C.2.2 If the user experiences any unacceptable pain, or any of the following symptoms, at any time during the test procedure, the test should be stopped immediately and the user removed from suspension:

- faintness or dizziness;
- breathlessness;
- sweating or hot flushes;
- nausea;
- loss or greying of vision;
- an increase in pulse rate.

C.2.3 The test involves testing in turn each of the attachment points on the harness that is intended to be used in practice. The test of each attachment point should have a maximum duration of 4 min, and the user should have a break of at least 5 min between tests. While in suspension the user should move their legs regularly to maintain circulation, and during the breaks they should exercise their legs, for example by walking about.

C.3 Procedure

C.3.1 The procedure detailed in **C.3.2** to **C.3.7** should be carried out for each of the harness attachment points designated by the manufacturer that are intended to be used by the user. If the harness has side waist attachment points these should always be tested in pairs. The user should be directly supervised throughout the procedure.

C.3.2 The user should don the harness in accordance with the manufacturer's instructions and adjust it to ensure a snug fit.

C.3.3 A lanyard and a connector suitable for fall arrest purposes should be used. One end of the lanyard should be attached to the attachment point, or points, under test using the connector. The other end of the lanyard should be attached to an anchor that is sufficiently strong to support the user's mass with a safety

factor of at least 10. This anchor should be positioned such that the user can be suspended with their feet just clear of the ground. One way to do this is to raise the user by means of a winch.

C.3.4 The duration of the test should be timed with a stop-watch. Subject to the safety precautions given in **C.2**, after a minimum of 3 min 45 s and a maximum of 4 min the test should be stopped and the user lowered to the ground.

C.3.5 One minute after the start of the test, the harness should be checked to determine whether it is still properly adjusted to fit the user snugly. After the first minute, adjustment of the harness while the user is in suspension may be made at any time during the test. If necessary, the test may be temporarily stopped and the harness readjusted in accordance with the manufacturer's instructions. The time taken to adjust the harness while the user is not in suspension should be added to the suspension time given in **C.3.4**.

C.3.6 During the test, while the user's feet are off the ground, the harness should be examined to determine whether:

a) any metal fitting is in contact with the groin, the inside of the thighs, the armpits or the small of the back;

b) any part of the harness is exerting direct pressure on the genitals, head or neck.

In addition, the user should note whether they experience any of the following:

1) any loss of feeling (numbness) or tingling ("pins and needles") in any part of the body;

2) any restriction of normal breathing.

In addition to the safety precautions detailed in **C.2**, if the harness is in contact or causing pressure as detailed in item a) or b), or if the user experiences any of the symptoms listed in items 1) and 2) the test should be stopped immediately.

C.3.7 During the test, while their feet are clear of the ground, the user should carry out the following movements to determine whether the harness allows adequate freedom of movement:

a) hold the left foot with the right hand, then release;

b) hold the right foot with the left hand, then release;

c) hold both hands together at full stretch above the head, then release;

d) hold both hands together behind the waist and then release.

C.3.8 After the suspension test is completed, and with the user standing on the ground, the amount of adjustment in each adjustment element of the harness, e.g. the length of strap ends, including any length required for locking the adjusters, should be checked to ensure there is sufficient adjustment to allow for less or additional clothing to be worn for the expected conditions of work, for example, in hot or cold weather.

C.4 Evaluation of results

The harness can be judged as suitable if all the following conditions are met.

a) It was not necessary to stop the test for any of the reasons given in **C.2** or **C.3.6**.

b) The user was able to carry out the movements listed in **C.3.7** a) to d) with relative ease.

c) The harness was considered to be sufficiently adjustable for the user in the expected conditions of work, when assessed in accordance with **C.3.8**.

Annex D (informative)

The effect of wind speed and working height on available working times

The information given in Table D.1 is based on work presented in the Toronto University Wind Study Report on the Hong Kong and Shanghai Bank headquarters and in a survey of factors affecting working periods at various heights in windy and inclement conditions.

Table D.1 **Available working time in an 8 h shift at different wind speeds**

Wind speed	Available working time		
	Unprotected	With containment netting	With containment sheeting
m/s	h	h	h
2	8	8	8
5	5	7	8
7	4	6	7
9	3	5	6
11	2	4	5
14	1.5	3	4
28	0.5 [A)]	0.5 [A)]	0.5 [A), B)]

[A)] Emergency work only.
[B)] Sheeting could be in danger of blowing away.

Table D.1 is intended only to be an example, as the actual height where work is being done and the temperature of the surrounding air have a major affect on available working time.

The values in Table D.1 give an indication of what might be a reasonable length of shift at different wind speeds when the work situation, a platform in this case, is unprotected and an indication of the benefits that might be obtained from the use of containment netting or containment sheeting as a protection.

Others sources of information on recommended working practices in relation to wind speed include the following:

- BS 5975:2008+A1, **17.5.1.9**, in relation to falsework, refers to the maximum wind speed during which working operations can take place as being normally limited to that of a wind force, on the Beaufort Scale, of Force 6, which corresponds to a design wind speed of 18 m/s;
- Construction Industry Research and Information Association (CIRIA) publication C703, *Crane stability on site*, Second edition, [13] gives a "...typical maximum in-service wind speed..." for a tower crane of 20 m/s (45 m.p.h.).
- Prefabricated Access Suppliers' and Manufacturers' Association (PASMA) Operator's code of practice [14] Chapter 5.4 states that "...if the wind speed should exceed 17 m.p.h. you should cease to work upon the tower…".

Annex E (informative)

Useful addresses

For HSE priced and free publications (not national regulations or standards):

HSE Books
PO Box 1999
Sudbury
Suffolk
CO10 2WA

Tel: 01787 881165 Fax: 01787 313995

For copies of national regulations:

www.tsoshop.co.uk

Tel: 0870 600 5522

Or:

http://www.legislation.gov.uk

For publications on PPE by the Department for Business, Innovation and Skills (formerly the Department of Trade and Industry and then the Department of Business, Enterprise and Regulatory Reform):

Department for Business, Innovation and Skills
1 Victoria Street
London
SW1H 0ET

Tel: 020 7215 5000

https://www.gov.uk/government/organisations/department-for-business-innovation-skills

For information on The Association of Technical Lightning and Access Specialists:

The Association of Technical Lightning and Access Specialists
6-8 Bonhill Street
London
EC2A 4BX

Tel: 0844 249 0026 Fax: 0844 249 0027

Email: info@atlas.org.uk

http://www.atlas.org.uk/contact.asp

For Industrial Rope Access Trade Association (IRATA) publications and enquiries:

IRATA International
Kingsley House, Ganders Business Park
Kingsley
Bordon
Hampshire
GU35 9LU

Tel: 01420 471619 Fax: 01420 471611

Email: info@irata.org

http://www.irata.org

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BS 5975:2008+A1:2011, *Code of practice for temporary works procedures and the permissible stress design of falsework*

BS 6037-1, *Code of practice for the planning, design, installation and use of permanently installed access equipment – Part 1: Suspended access equipment*

BS 6037-2, *Code of practice for the planning, design, installation and use of permanently installed access equipment – Part 2: Travelling ladders and gantries*

BS 8437:2005+A1:2012, *Code of practice for the selection, use and maintenance of personal fall protection systems and equipment for use in the workplace*

BS EN 341, *Personal fall protection equipment – Descender devices for rescue*

BS EN 353-2, *Personal protective equipment against falls from a height – Part 2: Guided type fall arresters including a flexible anchor line*

BS EN 354, *Personal fall protection equipment – Lanyards*

BS EN 397:2012+A1:2012, *Industrial safety helmets*

BS EN 529, *Respiratory protective devices – Recommendations for selection, use, care and maintenance – Guidance document*

BS EN 1808, *Safety requirements on suspended access equipment – Design calculations, stability criteria, construction – Tests*

BS EN 12275, *Mountaineering equipment – Connectors – Safety requirements and test methods*

BS EN 12277, *Mountaineering equipment – Harnesses – Safety requirements and test methods*

BS EN 12492, *Mountaineering equipment – Helmets for mountaineers – Safety requirements and test methods*

BS EN 12841, *Personal fall protection equipment – Rope access systems – Rope adjustment devices*

BS EN 14052, *High performance industrial helmets*

BS EN ISO 9001:2008, *Quality management systems – Requirements*

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