BS 7985

Code of practice for the use of rope access methods for industrial purposes

Content

1 Scope

This British Standard gives recommendations and guidance on the use of rope access methods for work at a 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. 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.

For building owners and NOTE contractors, the information and guidance given in Clause **4** and Clause **5** and in **7.4** and **12.1** is of particular relevance.

2 Normative references

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

BS 2830, *Specification for suspended access equipment (suspended chairs, traditional steeplejack's seats, work cages, cradles and platforms) for use in the building, engineering construction, steeplejack and cleaning industries*

BS 5974, *Code of practice for the planning, design, setting up and use of temporarily installed suspended access equipment*

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 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 795:1997, *Protection against falls from a height — Anchor devices — Requirements and testing*

BS EN 813, *Personal protective equipment for the prevention of falls from a height — Sit harnesses*

BS EN 892:2004, *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 1808, *Safety requirements on suspended access equipment — Design calculations, stability criteria, construction — Tests*

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

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

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1 work types

3.1.1 Rope access

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

3.1.2 Work positioning

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

3.1.3 Work restraint

Technique whereby a person is prevented by means of personal protective equipment from reaching zones where the risk of a fall from a height exists

3.1.4 Aid climbing

Method of progression in suspension, either by moving from one fixed anchor to another or by the use of moveable anchors or anchor points

3.1.5 Lead climbing

Method of progression, not in suspension, in which the operative is supported by the structure and is protected by a safety line, which is passed through intermediate anchors

3.1.6 Traversing

Broadly horizontal progression, generally using lead climbing or aid climbing techniques or transverse ropes or pulley systems

3.1.7 Workmate rescue

care and removal by one or more operatives of an incapacitated member of their rope access work team from a place of danger to a place of safety

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)

Construction (Head Protection) Regulations 1989 SI 1989/2209 and Guidance (HSE L102)

Control of Asbestos at Work Regulations 2006 SI 2006/2739 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 *COSHH A brief guide to the regulations* (HSE INDG 136 REV 3) *A step by step guide to COSHH assessment* (HSG 97) and *Fumigation* (HSG 251)

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 and Guidance *First aid at work* 1997 (HSE L74)

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* 1998 (HSE L113)

Management of Health and Safety at Work Regulations 1999 (MHSW Regulations) SI 1999/3242 and ACoP and Guidance *Management of health and safety at work* (HSE L21)

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

Mineral Workings (Offshore Installations) Act 1971

Parts of this Act have been NOTE repealed. Sections 1, 4 and 5 have been repealed by SI1995/738 Regulation 22(1). Schedule 1, Part 1, ss 2 and 6 have been repealed by SI 1993/1823, Regulation 3(1) (a) and Regulation 6. Section 3 has been repealed by SI1996/913, 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 L83, 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 1995 (RIDDOR) SI 1995/3163 and Guidance [HSE L73 and HSE33 REV 1 (*RIDDOR Offshore*)]

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, 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 at Work Regulations 2006. 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 on 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 file. This is required to contain information concerning the safety aspects of the construction work, and some or all of the file should be made available to those planning rope access work. When construction work has been completed, there could 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, 1995 (RIDDOR). The regulations require any accident where the time lost by the injured person is over three days, or where a serious incident (dangerous occurrence) has occurred, to be recorded and information included on the time lost by the injured person and others in the work team. A free leaflet, RIDDOR Offshore (HSE 33 REV 1) [6], explains what incidents are reportable, and by whom and to whom they have to be reported and HSE guidance document A guide to the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 [7] gives details of what is required.

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

5.1 General and legal

5.1.1

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.

5.1.2

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 5.2.1 and 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 **7** and 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 **7** and 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 **7** and 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, is necessary to ensure that:

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

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

5.2 Summary of principles for a safe and effective system

The principles listed should not NOTE 1 be taken to be exhaustive.

For details of a typical method NOTE 2 of descending and ascending using rope access techniques, see Annex A.

5.2.1

Before rope access work commences, a hazard identification and risk assessment has to be carried out to establish the appropriateness of using rope access techniques and to address any hazard issues. See 5.1.2 and 12.1.

5.2.2

Of primary importance is the principle of double protection. It is essential to include the provision of at least one alternative means of support to prevent an operative falling, for example, a working line plus a safety line. This means that, should any one item fail within the suspension system, there is an adequate back-up to prevent an accident. When an operative is to be in tension or suspension, there should be at least two independent anchor lines, one primarily as a means of access, egress and support (the working line) and the other as additional back-up security (the safety line). See 12.3.1.

5.2.3

Connection of an operative to the rope access system should be made in an area where there is no risk of a fall from a height, unless there is protection by other means. See 12.3.4.1 and 12.3.4.2.

5.2.4

Exclusion zones should be established as appropriate. This might necessitate establishing exclusion zones at locations other than the top and bottom of the rope access work site. See 12.3.4.1, 12.3.4.2, 12.6 and also 12.3.2.3.

5.2.5

The operative should be connected to both the working line and the safety line via an appropriate harness. The two lines may be connected to the same harness. See also 5.2.25 and 5.2.26.

5.2.6

The harness should be an appropriate sit harness or an appropriate full body harness. See 8.3.6.

5.2.7

The primary connection to the operative of both the working line and the safety line should always be via the harness, even if a work seat is being used. See 8.3.7.

5.2.8

The back-up device (on the safety line) should be capable of withstanding any foreseeable forces resulting from the rope access activity, without catastrophic damage to the safety line or the device. See 8.3.10.

These forces can be minimized by NOTE keeping the back-up device high to prevent or limit a fall.

5.2.9

Descender devices or systems (on the working line) should be of a type such that if the operative loses control they will stop or only allow a slow automatically controlled descent in the hands-off position. See 8.3.9.

5.2.10

Measures should be taken to avoid the operative being able to descend inadvertently off the end of the working line or safety line. See 12.3.1.4.

5.2.11

All equipment should be appropriate to its application. It should be inspected before each use (pre-use inspection) and more thoroughly at regular intervals. Details of all thorough inspections should be recorded. See Clause 10, Clause 11, 12.3.3, Annex B and HSE document ACOLAR LOLER [3].

5.2.12

Equipment should be properly maintained and stored, and should be traceable back to the manufacturer or supplier. See Clause 9 and Clause 11.

5.2.13

Operatives should be sufficiently physically capable and free from any impairment that might prevent them from working safely. See 6.1.

5.2.14

Operatives should work in teams of not less than two, one of whom is competent to supervise. See 12.3.2.

5.2.15

Operatives should be trained and competent to carry out any rope access tasks that they are to undertake, including workmate rescue. Operatives should only be allocated tasks appropriate to their level of training. See 7.1, 7.2, 12.3.7 and 12.4.1.1.

5.2.16

Operatives should be competent in the pre-use inspection of their equipment, including an understanding of when equipment should be withdrawn from service. See Clause 10 and 12.3.3.4.

5.2.17

Operatives should have clothing and equipment appropriate to the work situation and conditions. See 8.2.

5.2.18

There should be a specific workmate rescue plan in place for each worksite. See 12.3.7.

5.2.19

An operative should always be in a position to recover him/herself, or to be recovered quickly and efficiently as part of the normal work technique by the immediate work team or by a dedicated on-site rescue team. See 7.2.4, 12.3.2.1, 12.3.2.2 and 12.3.7.

5.2.20

An efficient team communication system should be established. See 12.5.

5.2.21

There should be proper supervision of the workplace. See 7.4.1, 7.4.2 and 12.3.2.1.

5.2.22

Supervisors should be competent in all rope access techniques appropriate to the workplace and should know and understand the limitations of those techniques. They should be competent in advanced workmate rescue techniques and to organize or effect a workmate rescue appropriate to the worksite. See 7.2, 7.4.1, and 7.4.2.

5.2.23

The impact force on an operative in any potential fall should never be greater than 6 kN. See 8.3.3 and 8.3.10.

5.2.24

No potential fall should cause the operative to impact with the ground. All practicable measures should be taken to avoid injurious impact with the structure or obstructions. See Note to 8.3.12.6.

5.2.25

Rope access techniques can be extended from activities in tension or suspension to include traversing, aid climbing and lead climbing. As some of these techniques could result in a fall, they should be used only after a specific hazard identification and risk assessment, and the appropriate choice of fall protection/access equipment. Only specifically trained and qualified operatives should engage in these types of rope access work. See 12.3.1.5.

5.2.26

There should always be at least two attachments to the structure when aid climbing.

6 Selection of operatives

6.1 General

6.1.1

The modern industrial environment requires that, to work at a height safely, competently and productively, those engaged in such work have an appropriate attitude, aptitude, physical capability and training.

6.1.2

These operatives frequently work in remote places or are out of sight of their supervisors. It is, therefore, especially important that the operatives can be always relied upon to behave in a sensible and responsible manner.

6.1.3

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.

Employers should ensure that employees are in possession of an appropriate medical certificate before starting this kind of work.

7 Training, welfare and supervision of operatives

7.1 General

Rope access work can only be carried out in a reliably safe manner when operatives are competent. Different organizations and countries have their own requirements for the assessment of competence. In order to be considered competent, an operative needs to have sufficient professional or technical training, knowledge and actual experience to enable them to:

- carry out their assigned duties at the level of responsibility allocated to them, including inspection of their own equipment;
- understand potential hazards related to the work under consideration, and be able to carry out appropriate workmate rescue procedures;
- detect technical defects or omissions in their work, recognize implications for health and safety caused by such defects or omissions, and be able to specify a remedial action.

The person responsible for the site should ensure appropriate levels of supervision and only allow rope access work to be carried out by competent operatives. Exceptions may be made in the case of inspection of the work, in which case additional precautions are essential. (See **7.5**.)

7.2 Training

7.2.1

Training should be provided or monitored by a competent outside organization or person, to ensure that the standard is to an externally certificated level. All candidates should be trained to a formal programme, formalized in both time and performance, and be assessed independently. Training routes should be clearly defined.

7.2.2

In addition to rope access techniques, training should include general and job-specific health and safety issues, the safe use of tools and other work equipment during rope access activities, and the handling of materials.

7.2.3

All operatives are in the learning process for some time after completing their basic training. The newly qualified operative should at first be under the direct supervision of the supervisor and then gradually be allowed to progress to working under the close supervision of an experienced operative, at the supervisor's discretion. At this stage, the experienced operative should be required to check that all items of the inexperienced operative's suspension equipment are correctly secured before they are allowed to start work. They should, thus, be continuously monitored and not allowed to work without close supervision until the supervisor is satisfied that the operative has achieved a suitable level of competence. This should be when they have demonstrated suitable knowledge and experience to carry out the full range of jobs that they are likely to encounter, in a safe and effective manner, and are capable of acting properly within the limits of their level of competence and in any emergency that might conceivably arise.

7.2.4

It is essential that operatives are skilled in workmate rescue techniques and emergency procedures, and these should form part of their basic and ongoing training. In addition to this, workmate rescue techniques should be practised at regular intervals and before the start of any work in a situation that is unfamiliar to any of the work team (see 12.3.7).

7.2.5

Operatives should have a personal record showing the training received and describing their work experience. This is to assist employers in the verification and monitoring of an operative's experience. Employers taking on new operatives should assess these records. (See 6.2.)

7.2.6

It is essential that employers maintain their employees' level of ability. This requires a re-assessment at regular defined intervals and further training where necessary. Retraining is appropriate for operatives who have had a significant break from rope access work (e.g. 6 months or more). This could be either a refresher course or a full course at the appropriate level. All refresher courses should include all the techniques covered at the basic level. For experienced operatives and supervisors, the refresher course should concentrate on rigging and workmate rescue procedures.

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

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) [8], 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) [8] and the Personal Protective Equipment Regulations 2002. A booklet entitled Personal Protective Equipment: guidance notes on UK Personal Protective Equipment Regulations [9], 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.

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 9001:2000, which is monitored by an "approved body" (i.e. an independent auditor), or by regular batch testing by an approved test house. In both circumstances, a certificate of conformity, which states that the product meets the requirements of the Personal Protective Equipment Directive (89/686/EEC) [8] 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, suitable certificates of conformity, 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 INDG367 Inspecting fall arrest equipment made from webbing or rope [10].

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 six 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 gfor 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, working load limit, 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 **11.10** should also be followed. For an equipment inspection checklist see Annex B.

11.2 Lifespan

Some equipment is given a lifespan or obsolescence date by the manufacturer. Equipment that has reached such a limit, which has not already been rejected for other reasons, should be withdrawn from service and not used again, unless or until confirmed by a competent person, in writing, that it is acceptable to do so.

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

11.3.1

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.

11.3.2

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.

Equipment made from man-made fibres, e.g. harnesses, lanyards and anchor lines, is susceptible to degradation by ultra-violet 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.

11.3.4

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.

11.3.5

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

11.3.6

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.

11.3.7

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.

11.3.8

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.

11.3.9

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.

11.3.10

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.)

11.3.11

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

11.3.12

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%.

11.3.13

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.

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

11.4.1

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.

11.4.2

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

11.4.3

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

11.5 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.

11.6 Disinfection of equipment

It may be considered necessary to disinfect equipment, for example after working in a sewer, although normally cleaning as described in **11.3** or **11.4** is sufficient. There are two things to consider when choosing a disinfectant: its effectiveness in combating disease and whether or not there will be any adverse effect on the equipment after one or several disinfections. Advice should be sought on these two points from the manufacturer or supplier of the equipment before carrying out any disinfection. After disinfection, the equipment should be rinsed thoroughly in clean, cold water and then dried naturally in a warm room away from direct heat.

11.7 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.

If you would like to make a comment on this section of the draft, please use the comment

11.8 Storage

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

11.9 Equipment withdrawn from service

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

11.10 Alterations to equipment

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

12 Methods of work

12.1 Suitability of rope access versus other means of access

12.1.1

The advantage of rope access work lies chiefly in the speed 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

The following aspects also require particular attention when planning rope access work:

a) the selection of unquestionably reliable anchors;

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

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

d) whether the work at any one location will be so slow that the operatives could be at risk of unacceptable levels of exposure;

e) whether it would be possible to rescue the operatives quickly, using rope access techniques, from any potential position in which they might find themselves.

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 Safety method statement

From the risk assessment (see **12.1.2**), and based on the safety policy (see **12.2.1**), employers should then prepare a suitable work plan or "safety method statement". Where necessary, separate safety method statements should be prepared for each particular aspect of the job. In the safety method statement, the employer should set out the general principles and working procedures for the particular situation that are to be followed by their employees and by self-employed people contracted to work for them. In many cases, where types of jobs are similar, the safety method statements may be identical and may, therefore, be in the form of a general document. Where the work includes the use of tools such as welding torches, flame cutters and abrasive wheels which can constitute a potential hazard to the operative and his/her access equipment, a more detailed safety method statement needs to be prepared prior to the commencement of work.

12.2.4 Permits to work

In addition to the documents referred to in **12.2.1**, **12.2.2** and **12.2.3**, 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.

12.2.5 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 (see **12.2.3**);

f) personal records (see **7.2.5**), 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.

12.2.6 Emergency situations

In working environments where site emergencies could occur at any time (nuclear, offshore, refineries, etc.), clear instructions should be given to the operatives by the employer or site manager for dealing with emergency situations, should they occur while operatives are on ropes.

12.2.7 Health risks from gases

Attention is drawn to the Association of Technical Lightning and Access Specialists' code of practice *Working on tall structures – Health risks* [11], which provides information on the health risks from gases, and protective measures that can be taken.

12.2.8 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*. The Association of Technical Lightning and Access Specialists' code of practice *Working on tall structures – Health risks* [11] also provides information on the health risks when working 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 (see 5.2).

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.

Sometimes, rope access methods are NOTE 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, BS 2830 and BS EN 1808.

12.3.1.3

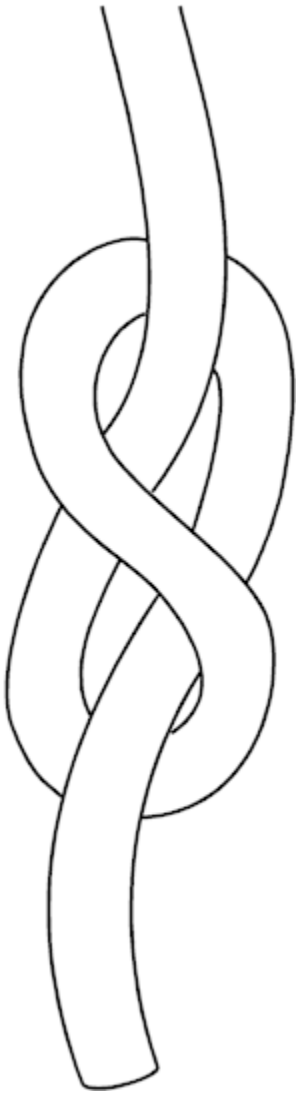
To meet the recommendations given in 12.3.1.1 and 12.3.1.2, operatives need a separate working line and safety line. Each line should be attached to its own anchor point. These may be connected to each other for added security. A single element of a structure, (e.g. structural steelwork), a natural geological 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 6.)

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) tied at an appropriate point in each of the lines. See Figure 5.

Figure 5 — Example of a stopper knot (in this example, a figure-of-eight knot) for use at the end of the working line and safety line

Figure 5 — Example of a stopper knot (in this example, a figure-of-eight knot) for use 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 summarized in 5.2, particularly those given in 5.2.19 and 5.2.23 to 5.2.26, 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 (see Clause 7). 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 12.3.3.5 and 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 12.2.4), 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 the safety method statement and risk assessment already prepared (see 12.1.2 and 12.2.3).

12.3.3.2

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

12.3.3.3

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.

12.3.3.4

The supervisor should ensure that operatives follow suitable pre-descent/ascent procedures. Operatives should carefully examine their own harness, descent and ascent devices and ropes to check that they are in good condition. The setting up of a system is recommended in which members of the work team check each other's equipment (known as a "buddy check") to ensure, for example, that harness fastening buckles and connectors are correctly fastened. Before each descent/ascent, visual checks should be made of the anchors and any points on the rope where chafing could occur.

12.3.3.5

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

12.3.3.6

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

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

12.3.4.3

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.

12.3.4.4

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 eye bolts (which should conform to BS EN 795:1997, Class 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 strength of all anchors (except intermediate deviation anchors and anchors placed simply to maintain the position of the anchor lines, which may be weaker) should be at least as great as that of the terminated ropes, i.e. the working line and the safety line, attached to them. This British Standard has used a safety factor of 2.5 to determine the anchor strength requirement. The maximum permissible impact force on the user in the event of a fall should not exceed 6 kN; therefore, the anchorage system should have a static strength of at least 15 kN. 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.)

Work commissioned by the Health NOTE 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 [12]: http://www.hse.gov.uk/research/crr_htm/2001/crr01364.htm).

12.3.5.3

In the case of eye bolts or other types of temporary anchors, the minimum strength may be obtained by linking and equally loading two anchors, for example by the use of a bowline knot on the bight, a figure-of-eight knot on the bight or an alpine butterfly knot. See Figure 6. Anchors of the type that are fixed in masonry should only be installed by competent persons, who are aware of the minimum distance required between the two fixed anchors. Guidance, modified from BS 7883:2005, Annex C, on the positioning of these anchors is given in Annex D. The angle formed by the ropes between the bight and the two anchors (the Y angle) should be as low as possible and should generally not be more than 90°. The greater the angle beyond this, the weaker the connection will be. See Figure 4. If circumstances dictate the need for an angle greater than 90°, account should be taken of the increased forces at the anchors, at the anchor line terminations and on other components in the system. The Y angle should never exceed 120°. See Figure 4.

12.3.5.4

Where there are no suitable anchors to which the ropes can be attached directly, anchor slings should be used (see 8.3.14). The advice regarding angles given in 12.3.5.4 also applies to anchor slings, i.e. the included angle formed between the two ends of the anchor sling and the point at which it is connected to the working line or safety line should be as low as possible, should generally not be more than 90° and should never exceed 120°. See Figure 4. See also Figure 6c for an example of the use of anchor slings.

12.3.5.5

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.

12.3.5.6

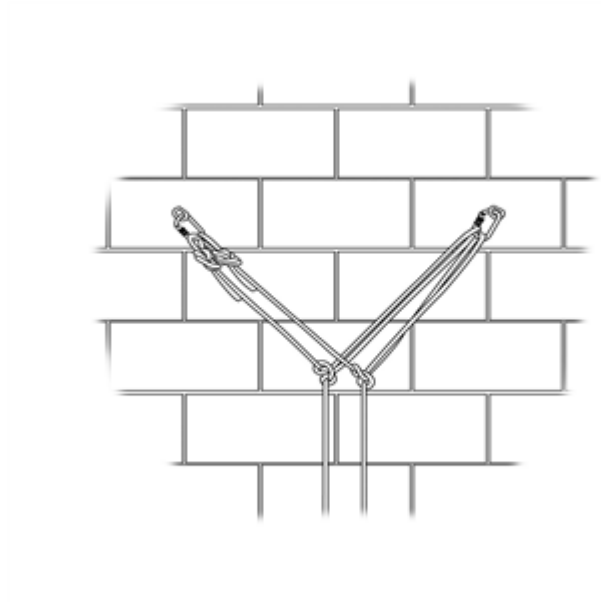
When anchor lines are tensioned, for example in the establishment of a cableway system or horizontal anchor line, the increase in the forces at the anchor, anchor line terminations and other components in the system should be taken into account. The potential forces in an incorrectly tensioned system can be catastrophic. The forces should be calculated by a competent person and steps taken to ensure that the system is safe before it is used.

Figure 6 – Examples of typical anchor arrangements for rope access

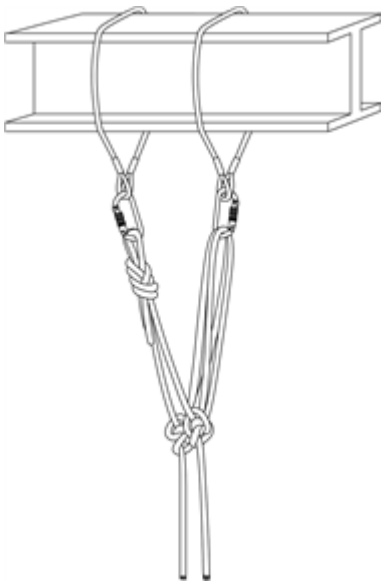
Figure 6 – Examples of typical anchor arrangements for rope access

Reproduced with the permission of NOTE Lyon Equipment Ltd.

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



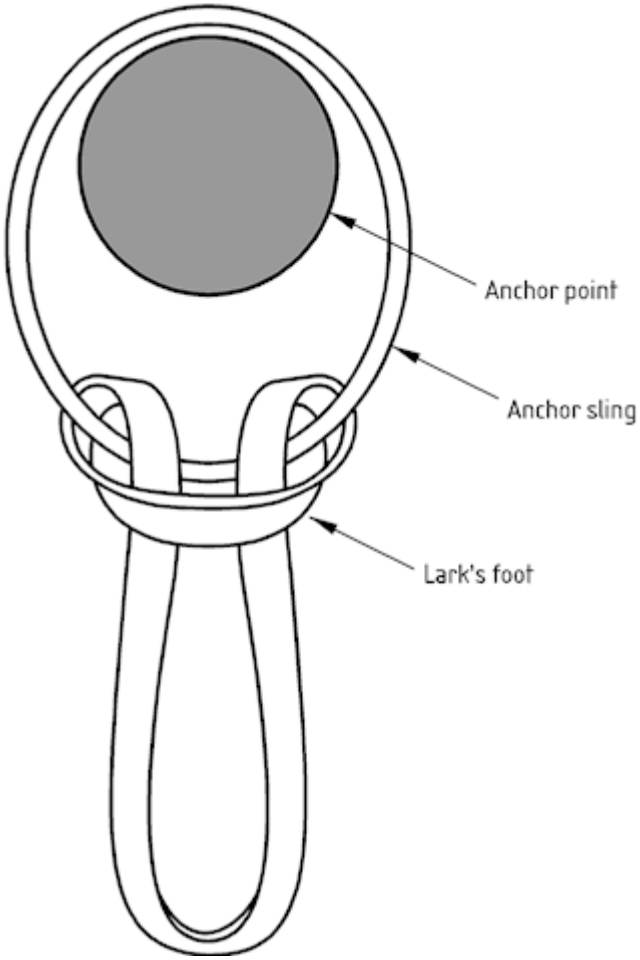
b) Example of the use of eyebolts to provide double protection



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

Figure 7 — Diagram of a lark’s footed sling (generally not recommended)

Figure 7 — Diagram of a lark’s footed sling (generally not recommended)



12.3.5.7

Anchor devices, such as eye bolts, should conform to BS EN 795:1997 and should be used in accordance with BS 7883. BS EN 795:1997 requires anchor devices to have a static strength of 10 kN, therefore, to achieve the 15 kN minimum strength of an anchor as recommended in 12.3.5.2, it may be necessary to use such anchor devices in pairs. Information on stability calculations for davits, parapet clamps etc. is given in BS EN 1808.

12.3.5.8

Where dead-weight anchor systems are used, particular account should be taken of cantilever or frictional effects. It is especially important to be aware that wet or icy conditions can significantly affect the frictional performance of anchor-weight systems. The frictional resistance of any anchor weight should be assured by checking that it does not move when subjected to a load of four times that which will be applied in a work positioning situation. A higher factor is required if a fall arrest situation is envisaged. Users should also consider the possibility of rescue, which might involve the weight of two persons.

12.3.5.9

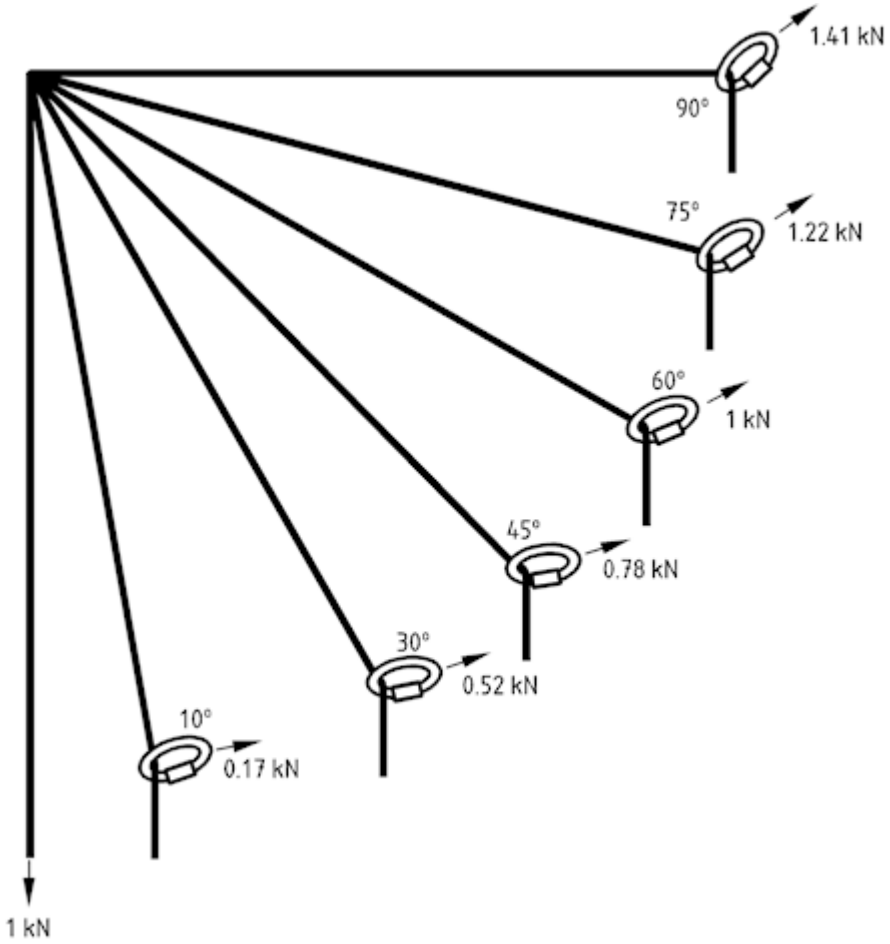
Where ropes are redirected, the angle and loading at any intermediate deviation anchor used, and the strength of other equipment in the system, for example, connectors and lanyards, should be taken into account before use, along with the consequences of failure. An example of the effect of the angle 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.

12.3.5.10

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

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

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 and/or difficult or very exposed worksites, because these can affect efficiency and tiredness levels. Working in high and exposed places is likely to subject the operative to factors such as wind chill or buffeting by the wind, which can have a significant effect on output, at even quite moderate wind speeds. Information regarding the effect of wind speed on available work time is given in Annex E.

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 trauma. Information on suspension trauma is given in Annex C. Operatives should be skilled in appropriate rescue techniques. Specific rescue equipment should always be present at the worksite. This equipment should be sufficient to carry out a workmate rescue from any situation on the site. There should be a first aid kit at each worksite and, at all times, a person with specific responsibilities for administering first aid.

Attention is drawn to the Health NOTE and Safety (First Aid) Regulations 1981

12.4 Use of tools and other work equipment

12.4.1 General

12.4.1.1

Operatives should be appropriately trained in the correct use of tools and other work equipment (see 7.2.2).

12.4.1.2

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

12.4.1.3

Where tools and equipment are carried by the operatives, appropriate steps should be taken to prevent them being dropped or falling on to people below (see 12.6).

12.4.1.4

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

Attention is drawn to the NOTE Electricity at Work Regulations 1989.

12.4.1.5

Special rules could apply to the use of power tools in offshore working and clearance should be obtained from the platform manager prior to such equipment being used.

12.4.2 Small tools

12.4.2.1

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.

12.4.2.2

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.

12.4.2.3

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

12.4.3 Power leads and power supply

12.4.3.1

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.

12.4.3.2

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.

12.4.3.3

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

12.4.3.4

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.

12.4.3.5

All electrically operated hand tools, other than cordless ones, should be supplied from a 110 V centre-tapped-to-earth system. See the HSE publication Electrical safety on construction sites [13].

12.4.3.6

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.

12.4.4 Large power tools

12.4.4.1

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.

12.4.4.2

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.

12.4.4.3

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.

12.4.4.4

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.

12.4.4.5

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, should any other adopted method of communication fail.

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 [14].

12.6.2

Precautions include securing all tools to either the operative or to separate lines (see 12.4.2, 12.4.3 and 12.4.4) 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.

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

12.7 Provision of facilities for operatives

Operatives require adequate facilities where they can rest in the dry, protected from the cold, and where they can obtain fresh water, store any additional clothing and be able to wash. They should also be provided with, or have access to, adequate toilet facilities. Under Schedule 2 of the Construction (Design and Management) Regulations 2007, the contractor is responsible for providing the level of accommodation and facilities appropriate to the number of operatives employed on site.

12.8 Completion of work

12.8.1 Ending of a shift

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

12.8.2 Termination of a job

At the termination of a job, care should be taken to clear the site properly, with a final inspection of the area before any permit to work is handed back. Where the CDM Regulations 2007 apply, contractors are required to pass the appropriate information to the planning supervisor 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 ascent or descent, 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 ascent/descent 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 ascenders/descender, 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 Ascending and descending

When an operative is preparing to NOTE 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.

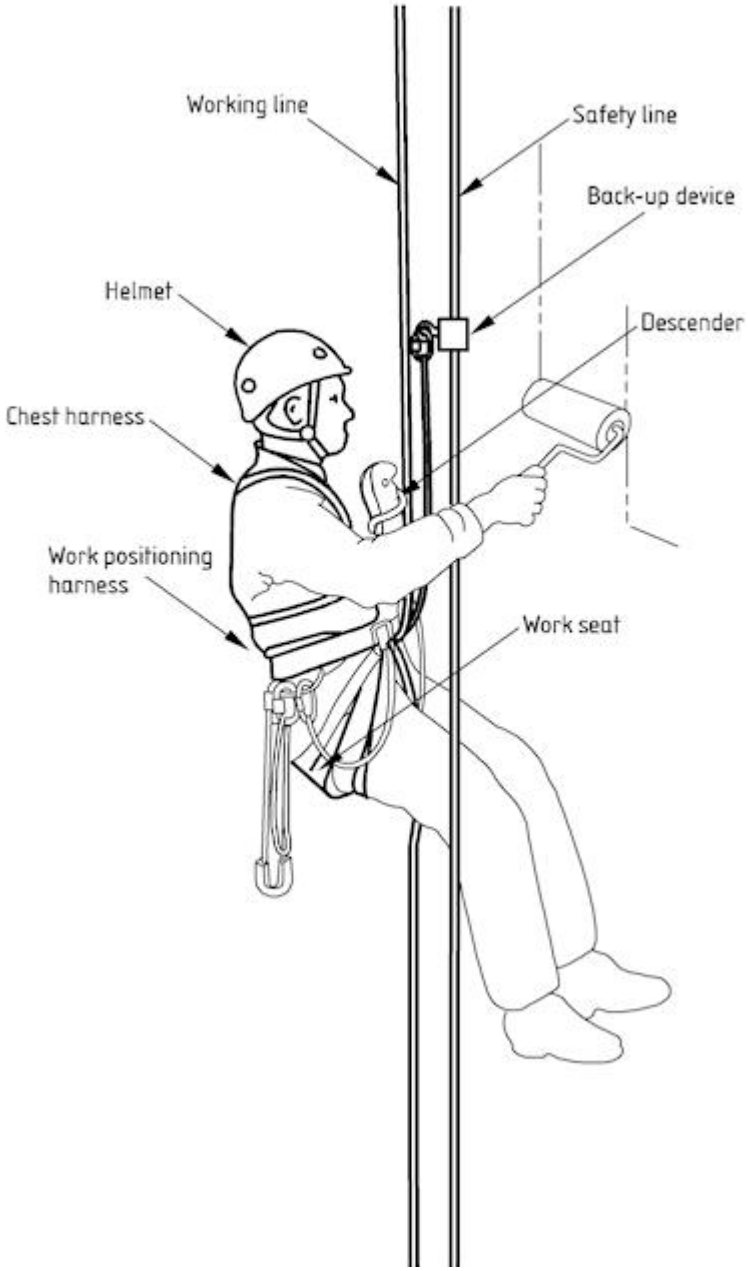
A.3.1 Method for descending (see Figure A.1)

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 the descent mode (with descender locked off) in a rope access system

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



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.

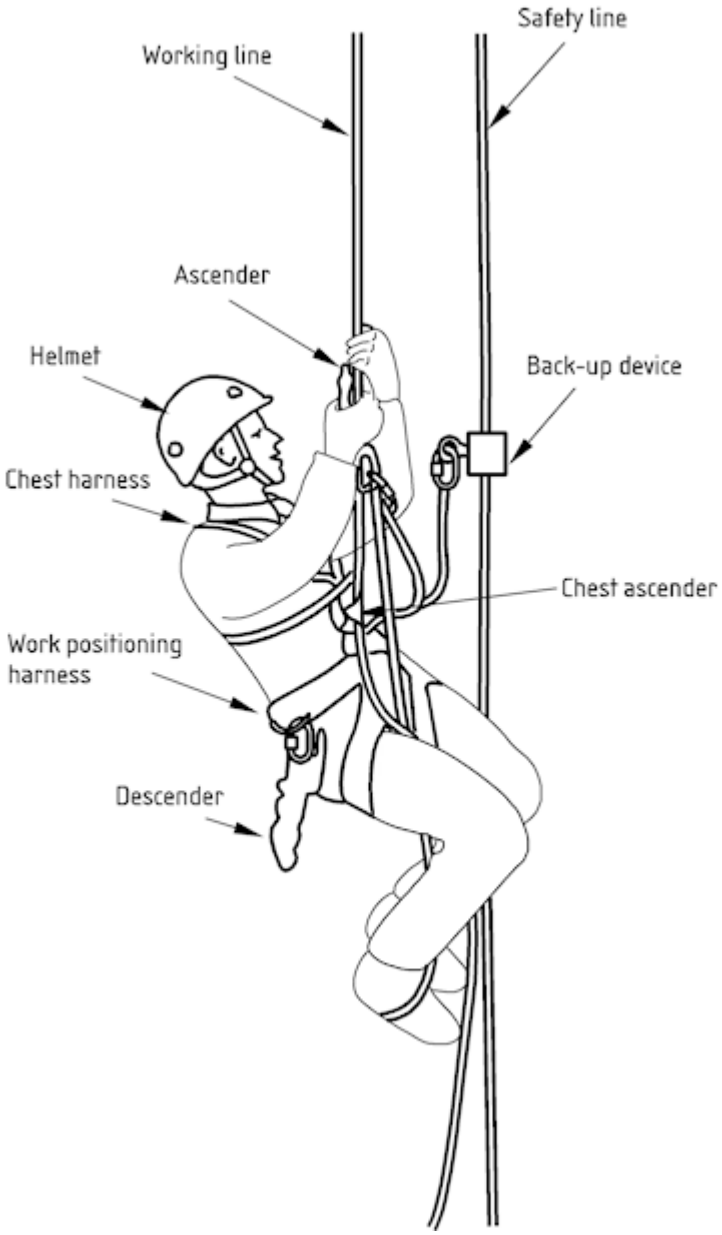
To begin the ascent, sit down on the chest ascender and lift the foot ascender to approximately helmet height. Stand up in the foot loop and pull the resulting slack through the chest ascender as before. Sit down, so the load is again taken on the chest ascender, and repeat this process until the ascent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

It is essential that ascenders are NOTE 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

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



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) Visual and tactile — Check for: ☐Damage by chemicals. Powdery surface ☐ and/or discolouration ☐and/or hardened areas ☐(these often signify chemical contamination) ☐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 If in doubt on any point, remove from service

Table B.1 — Equipment inspection checklist *(continued)*

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
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

Table B.1 — Equipment inspection checklist *(continued)*

Component	Inspection procedure
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 *(continued)*

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 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 ÿ Threaded assemblies not properly tightened: remove from service If in doubt on any point, remove from service

Table B.1 — Equipment inspection checklist *(continued)*

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 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 If in doubt on any point, remove from service

Table B.1 — Equipment inspection checklist *(continued)*

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 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 If in doubt on any point, remove from service

Table B.1 — Equipment inspection checklist *(continued)*

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 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 If in doubt on any point, remove from service

Annex C (informative) Suspension intolerance (formerly known as suspension trauma)

C.1

Suspension intolerance is a condition in which a person suspended in a harness can experience pallor, cold sweats, nausea, ringing in the ears, blurred vision, dizziness, feeling faint (these symptoms are known as pre-syncope), loss of consciousness (at which stage it is known as syncope) and eventually death. The condition appears mainly to affect persons who are suspended in a harness in a generally upright position and who are motionless, for example, when unconscious.

C.2

Muscular action in moving the limbs normally assists the return against gravity of blood in the veins back to the heart. If the legs are completely immobile, these "muscle pumps" do not operate and an excess of blood accumulates in the veins, which are capable of considerable expansion and, therefore, have considerable capacity. The excess of blood in the veins is known as venous pooling. The retention of blood in the venous system reduces the circulating blood volume available to the heart and, thus, the circulatory system is disturbed. This can lead to a critical reduction of blood supply to the brain and the symptoms described in C.1. Other organs critically dependent on a good blood supply, such as the kidneys, can also suffer serious damage, with fatal consequences.

C.3

In several clinical trials, where the test subjects were told not to move, most experienced many of the effects of suspension intolerance, some including loss of consciousness, in just a few minutes. Others managed for longer before reporting symptoms.

C.4

It seems that steps can be taken to minimize the risk of rope access operatives experiencing the condition. Movement of the legs will activate the muscles and should reduce the risk of venous pooling. Harness leg loops should be well-padded and as wide as possible to spread the load and reduce any possible restrictions of the arteries or veins in the legs. The use of a workseat might be advisable if work in one position is to be sustained for an extended period.

C.5

The number of incidents of suspension intolerance in rope access appears to be minimal, as there is little evidence of it occurring in such an environment. However, it is clear that an effective rescue plan is essential to ensure that, following an incident, the operative is removed from the suspended position and cared for in a proper manner. The longer the casualty is suspended without moving, the greater the chances there are of the effects of suspension intolerance developing and the more serious it is likely to be. Therefore, a casualty suspended in a harness awaiting rescue should be removed from upright suspension as quickly as possible. This is particularly important for a casualty who is motionless.

C.6

A person suspended motionless in a harness awaiting rescue might be better off in a substantially horizontal position or with the knees elevated. During rescue, elevation of the legs by the casualty or rescuer, where safely possible, may prolong tolerance of suspension.

C.7

Rope access workers should be able to recognize the symptoms of suspension pre-syncope. These include light headedness, nausea, sensations of flushing, tingling or numbness of the arms or legs, anxiety, visual disturbance, or a feeling that they are about to faint. (Motionless head-up suspension can lead to pre-syncope and sometimes syncope in most normal subjects within 1 h, and in 20% of subjects within 10 min.)

C.8

During rescue, standard first-aid guidance should be followed, with an emphasis on airway, breathing and circulation management (ABC). If appropriate, oxygen may be administered.

C.9

Following rescue, standard first-aid guidance should continue to be followed and treatment should take into account any contra-indications. The fully conscious casualty may be laid down and the semi-conscious or unconscious casualty should be placed in the recovery position. This differs from earlier advice and is the result of literature research and assessment carried out by the UK Health and Safety Laboratory (HSL) in 2008.

C.10

During and post-rescue, it is essential that any injuries from which the casualty might be suffering are assessed and treated, where appropriate.

C.11

All casualties who have been suspended motionless in a harness should be taken to hospital immediately for further professional medical care and observation.

C.12

Those preparing rescue plans should regularly review current best practice.

Annex D (informative) Additional information and guidance on the selection and use of anchor devices conforming to BS EN 795:1997, Class A1 for rope access

COMMENTARY ON ANNEX D

The information and guidance given in this annex has been modified from BS 7883:2005, Annex C, for the convenience of users of this standard.

D.1 Installation

D.1.1

Installation of anchor devices conforming to BS EN 795:1997, Class A1 to be used for rope access should always be planned in collaboration with a suitably qualified and competent person. Information on the design, selection, installation, use and maintenance of anchor devices is provided in BS 7883.

D.1.2

This British Standard recommends a static strength of at least 15 kN for the anchorage system (see 12.3.5.2) together with a system of double protection for both the anchor lines (see 5.2.2) and the anchorage (see 12.3.1.3). Where Class A1 anchor devices conforming to BS EN 795:1997 are considered for use in rope access, then a combination of two or more such anchor devices is deemed to satisfy the recommendations given in this British Standard (see Figure 6).

D.1.3

Class A1 anchor devices to be used for rope access purposes should be tested in accordance with BS 7883:2005, Clause 11.

D.1.4

The spacing between anchor devices fixed into substrates such as rock, masonry, brickwork and blockwork can be critical. Where Class A1 anchor devices conforming to BS EN 795:1997 are required to be used in pairs they should be installed at centres in accordance with the manufacturer's recommendations for the base material concerned. Factors to be taken into account in determining the spacing between structural anchors include:

a) the strength and nature of the base material;

b) the fact that in masonry, structural anchors should not be located in the same, or even in adjacent, masonry units (see Figure G.1). Ideally they should be located on a horizontal centreline;

c) the need, in solid materials such as concrete, to protect the cone of potential failure around each structural anchor. This may be typically regarded as a cone with a radius equal to the overall depth of the structural anchor (see Figure G.2);

d) the need to take account of the effect on loading of increased “Y” angles (see Figure 4), which may be caused by wide spacing between the anchors. This effect may be minimized by increasing the length of anchor lines.

D.1.5

The distance from the anchor device to the edge of the structural element (e.g. block work) to which it is attached is also critical, to avoid the possibility of failure of the substrate, known as “breakout”. The advice of the anchor device manufacturer should be followed for the type of structural material concerned.

Figure D.1 – Example of minimum spacing between anchor devices set in non-adjacent masonry units and on a horizontal centreline

MISSING PICTURE

Figure D.2 – Example of minimum spacing between anchor devices set in concrete to protect the cone of potential failure around each

MISSING PICTURE

Key

Upper drawing: Plan view

Lower drawing: Section through D-D

1 Areas of potential failure

2 Embedment depth

3 Anchor spacing $\geq$ 2 × embedment depth

MISSING PICTURE

Annex E (informative) The effect of wind speed and working height on available working times

The information given in Table E.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 E.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 E.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.

Table E.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.

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

- BS 5975:2008, **17.5.1.8**,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*, 2003 edition, [15] gives a "…typical maximum in-service wind speed…" for a tower crane of 20 m/s (45 m.p.h.).

- Prefabricated Aluminium Scaffolding Manufacturers Association (PASMA) *Operator's Code of Practice* [16] Chapter 5.4 states that "…if the wind speed should exceed 17 m.p.h. you should cease to work upon the tower…".

Annex F (informative) Useful addresses

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

HSE Books

PO Box 1999

Sudbury

Suffolk CO10 2WA

Tel: 01 787 881 165 Fax: 01 787 313 995

For health and safety enquiries:

HSE Infoline

Caerphilly Business Park

Caerphilly

South Wales

CF83 3GG

Tel: 0845 345 0055

For copies of national regulations:

The Stationery Office

TSO Orders/Post Cash Dept
PO Box 29
Norwich
NR3 1GN

Tel: 0870 600 5522

Fax: 0870 600 5533

For DBERR publications on PPE only (the Department of Trade and Industry changed its name in 2007 to Department for Business, Enterprise and Regulatory Reform):

New Approach Products Regulatory Department

Department for Business, Enterprise and Regulatory Reform

151 Buckingham Palace Road

London

SW1W 9SS

Tel: 0207 215 1438

Fax: 0207 215 1340

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

The Association of Technical Lightning and Access Specialists

4c St. Mary's Place

The Lace Market

Nottingham

NG1 1PH

Tel: 0115 955 8818

Fax: 0115 941 2238

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

Industrial Rope Access Trade Association

Tournai Hall

Evelyn Woods Road

Aldershot

Hampshire

GU11 2LL

Tel: 01252 357 839 Fax: 01252 357 831

Email: info@irata.org Web: http://www.irata.org

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 5975: 2008, Code of practice for the procedural control of temporary works and the permissible stress design of falsework

BS 8437:2005, *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 protective equipment against falls from a height — Descender devices*

BS EN 353-2:2002, *Personal protective equipment against falls from a height – Part 2: Guided type fall arresters including a flexible anchor line*

BS EN 354, *Personal protective equipment against falls from a height – Lanyards*

BS EN 397:1995, *Specification for industrial safety helmets*

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

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

BS EN ISO 9001:2000, *Quality management systems — Requirements*

ISO 22159, *Personal equipment for protection against falls – Descending devices*

Other publications

[1] INDUSTRIAL ROPE ACCESS TRADE ASSOCIATION. *Guidelines on the use of rope access methods for industrial purposes*. Edition 2.1, 2000.

[2] HEALTH AND SAFETY EXECUTIVE. *Five steps to risk assessment* (INDG163 REV 2) 2006.

[3] HEALTH AND SAFETY EXECUTIVE. ACOLAR LOLER *The Lifting Operations and Lifting Equipment Regulations 1998 ('LOLER') How they apply to rope-based access systems for work at height.* 20071).

[4] HEALTH AND SAFETY EXECUTIVE. *Health and safety in construction* (HS(G)150) 2006.

[5] HEALTH AND SAFETY EXECUTIVE. *Health and safety in roof work* (HS(G)33) 2008.

[6] HEALTH AND SAFETY EXECUTIVE. *RIDDOR Offshore* (HSE33 REV 1) 1999.

[7] HEALTH AND SAFETY EXECUTIVE. *A guide to the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995* (HSE L73 2nd edition) 1999.

[8] EUROPEAN COMMUNITIES 89/686/EEC Council Directive on the approximation of the laws of the member states relating to personal protective equipment, and amendments. Luxembourg: Office for the Official Publications of the European Communities. 1989

[9] DEPARTMENT BUSINESS, ENTERPRISE AND REGULATORY REFORM.. *Personal protective equipment: Guidance notes on UK Personal Protective Equipment Regulations* URN 02/1284. 2002

[10] HEALTH AND SAFETY EXECUTIVE. *Inspecting fall arrest equipment made from webbing or rope* (INDG 367) 2002.

[11] NATIONAL FEDERATION OF MASTER STEEPLEJACKS AND LIGHTNING CONDUCTOR ENGINEERS. Code of practice and recommended safe working methods for the steeplejack industry: Working on Tall Structures - Health Risks (revised 1998).

[12] HEALTH AND SAFETY EXECUTIVE. Contract Research Report 364/2001*: Industrial rope access – Investigation into items of personal protective equipment*2)

[13] HEALTH AND SAFETY EXECUTIVE. *Electrical safety on construction sites* (HS(G)141) 1995.

[14] HEALTH AND SAFETY EXECUTIVE. *Protecting the public – Your next move* (HS(G)151) 1997.

[15] CONSTRUCTION INDUSTRY RESEARCH AND INFORMATION ASSOCIATION (CIRIA). Special publication 131 *Crane stability on site* 20033).

[16] PREFABRICATED ALUMINIUM SCAFFOLDING MANUFACTURERS ASSOCIATION (PASMA). *Operator's code of practice*. 2006 (revision 12.3)4).

[17] HEALTH AND SAFETY EXECUTIVE. Simple Guide to the Lifting Operations and Lifting Equipment Regulations 1998 (INDG290).

[18] HEALTH AND SAFETY EXECUTIVE. Simple Guide to the Provision and Use of Work Equipment Regulations 1998 (INDG291)

[19] EUROPEAN COMMUNITIES. 89/391/EEC Council Directive on the introduction of measures to encourage improvements in the safety and health of workers at work. Luxembourg: Office for the Official Publications of the European Communities. 1989.

[20] EUROPEAN COMMUNITIES. 89/654/EEC Council Directive concerning the minimum safety and health requirements for the work place. Luxembourg: Office for the Official Publications of the European Communities. 1989.

[21] EUROPEAN COMMUNITIES. 89/656/EEC Council Directive on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace. Luxembourg: Office for the Official Publications of the European Communities. 1989.

[22] EUROPEAN COMMUNITIES. 92/57/EEC Council Directive on the implementation of minimum safety and health requirements at temporary or mobile construction sites. Luxembourg: Office for the Official Publications of the European Communities. 1992.

[23] EUROPEAN COMMUNITIES. 95/63/EC: amending 89/655/EEC Council Directive concerning the minimum safety and health requirements for the use of work equipment by workers at work. Luxembourg: Office for the Official Publications of the European Communities. 1995.

---

1) Available at: www.hse.gov.uk/falls/downloads/ropeaccess.pdf

2) Available at: http://www.hse.gov.uk/research/crr_htm/2001/crr01364.htm)

3) Available from Construction Industry Research and Information Association, 6 Storey's Gate, Westminster, London SW1P 3AU. Tel: 0207 222 8891.

4) Available from Prefabricated Aluminium Scaffolding Manufacturers Association, PO Box 1828, West Mersea, Essex, CO5 8HY.

Index

Editor's note. Index to be fully updated when text has been finalized.