



**IRATA International code of practice  
for industrial rope access**

**Part 3: Informative annexes**

**Annex L: Other harness-based work at height  
access methods**

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## Annex L (informative)

### Other harness-based work at height access methods

#### Introduction

Annex L gives advice and other information that could be relevant to users of rope access methods and is one of a number of informative annexes in Part 3 of this code of practice. This informative annex should be read in conjunction with other parts of this code of practice, should not be used in isolation and is not intended to be exhaustive. For further advice, readers should refer to relevant specialist publications.

Some of the systems, methods and techniques covered in this informative annex are not currently within the scope of the *IRATA International training, assessment and certification scheme for personnel engaged in industrial rope access methods (TACS)*. They are, however, sometimes used in conjunction with normal rope access activities.

It should be noted that:

- this informative annex does not cover the training required for the the various harness-based personal fall protection systems, methods and techniques described;
- no guidance is given on the appropriate and safe means of transition between a rope access system and these other harness-based personal fall protection systems.

#### L.1 General

**L.1.1** Clause **L.2** provides information on various harness-based personal fall protection systems that may be used to access worksites at height and gives advice on some of the equipment commonly used in these systems. Clause **L.3** provides information and advice on climbing techniques sometimes used to gain access to worksites.

**L.1.2** Methods and techniques provided during IRATA International rope access training and certification should not be taken as a suitable standalone qualification to prove the user's competence in the harness-based personal fall protection systems and climbing techniques described in clauses **L.2** and **L.3**.

**L.1.3** Employers should ensure that personnel using these harness-based personal fall protection systems, methods and climbing techniques are competent in their use, including emergency applications, and have received training, where appropriate. The information supplied by the manufacturer for any equipment used in these systems, methods and techniques should be followed. Before use, it should be checked that the chosen harness-based personal fall protection systems or climbing techniques are suitable for the particular task in hand.

#### L.2 Harness-based personal fall protection systems

##### L.2.1 General

**L.2.1.1** There are five recognized harness-based personal fall protection systems. These are work restraint, rope access, work positioning, fall arrest and rescue. The first four of these personal fall protection systems can be used for access when working at height. Each has its own set of requirements or rules. It should be noted that rope access is a type of work positioning system but, because of its developed techniques and use in special circumstances, it has its own category of personal fall protection system. Rope access and rescue are not covered in this annex. For general information on personal fall protection systems and the selection of equipment, see **Part 2, 2.7.1**.

**L.2.1.2** Harness-based personal fall protection systems comprise at least:

- a) a harness (body holding device) appropriate to the personal fall protection system being used;
- b) an anchor or anchors fitted to the structure or natural feature, which should be unquestionably reliable;
- c) connecting components, e.g. anchor lines; lanyards; energy absorbers; fall arresters; connectors, to link the user via the harness to the anchor.

**L.2.1.3** All components in a personal fall protection system should be safety compatible, i.e. the safe function of any one component should not interfere with the safe function of another.

**L.2.1.4** For more information on anchors, on the protection of anchor lines and on the selection of equipment, see **Part 2** and **Part 3, Annexes F and P**.

## **L.2.2 Work restraint (travel restriction) systems**

Work restraint systems are used to stop a person from reaching zones where the risk of a fall exists, e.g. by the user being connected to an anchor or a horizontal anchor line by a lanyard of such a length that they are prevented from reaching the unprotected edge of a building. The moment a position is reached where a fall from a height could occur or where the user has to rely on support by the system, the system can no longer be considered a work restraint system and other appropriate fall protection measures should be taken. More information is given in **Part 2, 2.7.1.5** and **2.7.1.6**. For information on restraint lanyards, see **Annex E**.

## **L.2.3 Work positioning systems**

### **L.2.3.1 General**

**L.2.3.1.1** Work positioning systems are used to:

- a) allow access to the workplace, egress from it and to support the user, either partially or fully, at the place of work;
- b) protect the user against a fall from a height.

**L.2.3.1.2** Depending on their design, work positioning systems may be used in vertical, diagonal and horizontal planes. For fundamental information on work positioning systems, see **Part 2, 2.7.1.5**.

**L.2.3.1.3** A work positioning system should incorporate a safety back-up fall protection system, in case there is a fall. In some jurisdictions, this is a legal requirement.

**L.2.3.1.4** Work positioning systems should be set up and used in such a way that they do not allow a fall to occur. However, even with the best efforts, this may not always be possible so, in the worst case, they should prevent anything more than a very short fall with a low impact load. The consequence of any potential fall should be minimized.

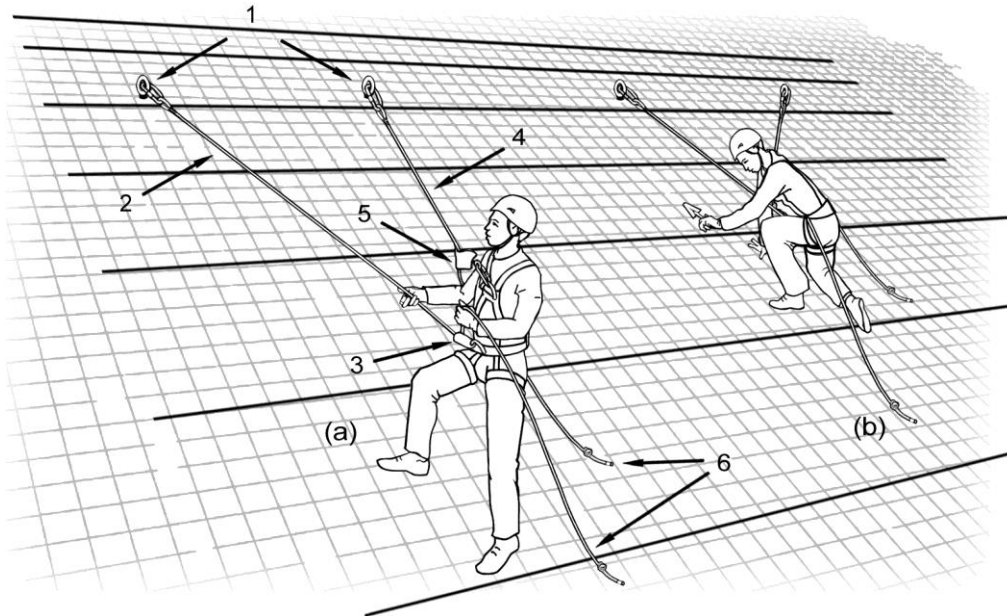
**L.2.3.1.5** There are at least two commonly-used work positioning methods. These are described in **L.2.3.2** and **L.2.3.3**.

### **L.2.3.2 Work positioning method 1**

**L.2.3.2.1** This method of work positioning is used on relatively steep or slippery sloping surfaces, e.g. a roof or a steep concrete or grassy banking. It utilizes an anchor line (which, in work positioning systems is sometimes referred to as a work positioning lanyard), which is attached to an anchor point above the user. In non-adjustable systems, the user is connected directly to the anchor line, e.g. by a fixed loop termination in the anchor line, which is connected to an appropriate attachment point on the user's harness. In adjustable systems, an adjustment device is connected to the anchor line and to the user's harness (see **Figure L.1**). The adjustment device allows the user to vary their position on the anchor line. With the feet or knees braced against the sloping surface, the user is able to lean backwards to attain a partially supported position, leaving the hands free to carry out the work.

**L.2.3.2.2** In addition, a separate safety back-up fall protection system with its own independent anchor point is utilized, e.g. a fall arrest system based on a guided type fall arrester and a flexible anchor line, using the fall arrest attachment point on the user's full body harness. The arrangement should be established and kept in such a way that the distance and consequence of any fall are minimized, e.g. there should be a minimum of slack in the anchor line and lanyards.

**L.2.3.2.3** This work positioning method is not a rope access personal fall protection system. Qualified rope access technicians are recommended to adopt rope access equipment, procedures and techniques in place of this method of work positioning.



#### Key

- (a) Adjusting the length of the anchor line used as an adjustable work positioning lanyard
- (b) Worker supported by the anchor line being used as an adjustable work positioning lanyard

- 1 Anchor
- 2 Anchor line for work positioning and support (adjustable work positioning lanyard)
- 3 Adjustment device
- 4 Anchor line for safety back-up system
- 5 Fall arrest device
- 6 Spare length of anchor line with stopper knot or stopper device fitted

**Figure L.1 – Example of a work positioning system for use on steep or slippery surfaces (work positioning method 1)**

#### L.2.3.3 Work positioning method 2

**L.2.3.3.1** A popular method of work positioning on structures such as telegraph poles, electricity poles, masts and towers uses a special work positioning lanyard, sometimes referred to as a *pole strap*. This is passed around the structure and connected to the harness, typically to two side waist attachment points or to a central attachment point at approximately waist level. The work positioning lanyard is usually adjustable.

**L.2.3.3.2** With the feet braced against the structure, the user is able to lean backwards to attain a partially supported position, leaving the hands free to carry out the work. In addition, a separate safety back-up fall protection system is attached to the structure. See **Figure L.2**.

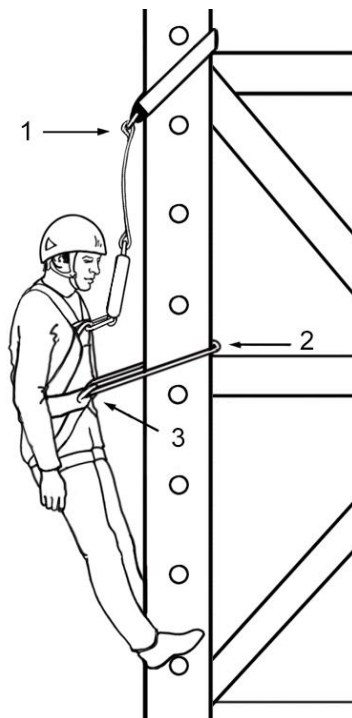
**L.2.3.3.3** The place at which the work positioning lanyard is attached to the structure is usually attained by climbing some type of ladder. However, it is also possible to use a double or triple lanyard

system (see **L.3.2**) to climb the structure in any direction, as long as the lanyards are attached to the structure for each move in such a way that a fall cannot occur.

**L.2.3.3.4** The work positioning lanyard should not be used without the separate safety back-up fall protection system because, should a fall occur, the work positioning lanyard might not stay in place around the structure, thus increasing the fall distance, and the energy absorption capacity might not be sufficient to keep any impact loads to an acceptable level.

**L.2.3.3.5** The safety back-up system typically comprises an anchor sling attached to the structure above the user and connected to an appropriate energy-absorbing lanyard, which is attached to the fall arrest attachment point on the full body harness. The arrangement should be established and kept in such a way that the distance and consequence of any fall are minimized, e.g. there should be a minimum amount of slack in the lanyards.

**L.2.3.3.6** For more information on work positioning lanyards, see **Annex E**.



#### Key

- 1 Safety back-up (in this example, an energy-absorbing fall arrest lanyard linked to an anchor sling)
- 2 Work positioning lanyard passed around the structure
- 3 Work positioning lanyard attached to the work positioning attachment point on the harness (could be two side attachment points)

**Figure L.2 – Example of work positioning system for use on structures such as poles and masts (work positioning method 2)**

#### L.2.4 Fall arrest systems

**L.2.4.1** Fall arrest systems are the least preferable of all the personal fall protection systems because if the user lets go of (i.e. loses intentional contact with) the structure, it is very likely there will be a fall and falls, and the potential for falls, should always be avoided if possible.

**L.2.4.2** Fall arrest systems should be selected and used so that any potential fall would be as short as possible, with as little impact load on the user as possible and such that there would be no

impact with the ground, e.g. by keeping anchors high; using a shorter lanyard length. In addition, any potential for impact of the user with the structure or natural feature in a fall should be avoided or at least be such that the consequences are minimized.

### **L.2.5 Protecting against falls and injury**

Users of personal fall protection systems can reduce potential fall distances, impact loads and injury by:

- a) keeping anchor points above them (as high as possible);
- b) maintaining as little slack as possible in the anchor line or connecting lanyard;
- c) avoiding situations where there could be a pendulum (swing) fall;
- d) paying attention to clearance distances required, i.e. sufficient free space beneath the user, to avoid impact with the ground, structure or natural feature likely to cause injury, should a fall occur;
- e) avoiding the possibility of equipment such as anchor lines, slings or lanyards coming into contact with edges, abrasive surfaces or hot surfaces while under load.

### **L.2.6 Information on equipment used in personal fall protection systems**

#### **L.2.6.1 General**

For more general information on the selection of equipment, see **Part 2, 2.7**.

#### **L.2.6.2 Anchor devices**

Anchor devices used in personal fall protection systems should be unquestionably reliable. For work positioning and fall arrest systems, it is recommended that they have a minimum static strength of 15 kN when installed or placed in or on the structure or natural feature. Some jurisdictions may require static strengths higher than this. A static strength lower than 15 kN for anchor devices for work restraint systems may be acceptable, bearing in mind that this type of system is intended only to stop the user reaching zones where the risk of a fall exists and thus there should never be a fall. However, foreseeable misuse or unforeseeable circumstances should be taken into account and this may mean it is prudent to have the same static strength as for work positioning systems and fall arrest systems. More information on anchor devices is given in **Part 1, 1.3; Part 2, 2.7 and 2.11**, and **Part 3, Annex F**. While the advice under these references concerns rope access, the principles apply equally to other work positioning systems and to fall arrest systems.

#### **L.2.6.3 Harnesses**

**L.2.6.3.1** For work restraint, a simple belt might be considered to be all that is necessary to keep the user away from zones where the risk of a fall exists. However, some thought should be given to foreseeable misuse or to something unforeseen happening. Depending on the worksite, it might be prudent to use a work positioning belt, a work positioning harness or even a fall arrest harness.

**L.2.6.3.2** Work positioning systems usually employ a full body harness with attachment points for work positioning (e.g. single ventral and/or twin side attachment points) and for fall arrest (sternal and/or dorsal: see **L.2.6.3.3**) for attachment to a safety back-up system.

**L.2.6.3.3** A fall arrest system should incorporate a full body harness. Attachment points on full body harnesses for fall arrest, which are commonly marked with a capital letter 'A', should be either at a sternal (high front) position or at a dorsal (high back) position and should be located centrally at these positions. Both sternal and dorsal attachment types have their limitations, with advantages and disadvantages for each type. Users should be aware of these limitations when choosing which attachment point to use.

*NOTE For more information on the advantages and disadvantages of sternal and dorsal attachment points on full body harnesses, see British Standard BS 8437: 2005+A1: 2012, Annex E and UK Health and*

Safety Executive [Contract Research Report HSE 451/2002: Harness suspension: review and evaluation of existing information, 2.4.2.3.](#)

**L.2.6.3.4** Fall arrest attachment points should not be used if they are positioned in such a way that when the user is suspended from the harness, the loading is not central, e.g. if a fall arrest attachment point is located on a shoulder strap or to the side of the harness (which they should not be).

**L.2.6.3.5** Some full body harnesses are supplied with breakaway 'parking points' to keep the lanyard from obstructing the user while he/she is working. These are not fall arrest attachment points. Designs vary and the information supplied by the manufacturer should be followed.

**L.2.6.3.6** It is essential that a harness (or belt) fits the user properly and that there is enough adjustment to allow for clothing to be added or taken off. Harnesses should be correctly adjusted to provide a snug fit before use, checked regularly during use, and readjusted if necessary.

**L.2.6.3.7** It is also essential that a harness has an acceptable comfort level, not only while the user is carrying out normal work activities but also when the user is suspended in it, e.g. after a fall. Harness comfort can have a significant effect on the well-being of a user during the suspension phase of a fall. See **Part 3, Annex D** for a harness comfort and adjustability test.

#### **L.2.6.4 Energy absorbers**

**L.2.6.4.1** It is a generally accepted principle that the impact load experienced by the user in a fall should not exceed 6 kN. This can be achieved in a number of ways. In a fall arrest system, it is typically by the use of a specific energy absorber.

**L.2.6.4.2** Some commonly-used energy absorbers are made from textile webbing, using either a specially designed tear-webbing or layers of webbing stitched together, both of which are designed to tear under load, absorbing energy while doing so. These types of energy-absorbing lanyard are typically used to connect between the harness attachment point and a guided type fall arrester, which is attached to the anchor line. This so-called *connecting element* should be kept as short as feasible.

**L.2.6.4.3** Other energy absorbers include those built into the function of certain fall arrest devices, e.g. some designs of retractable type fall arrester, or those that are incorporated into an anchor line, e.g. as found in some designs of horizontal anchor line.

**L.2.6.4.4** Energy absorbers are usually intended to be activated only once, after which they should be dealt with in accordance with the information supplied by the manufacturer, e.g. discarded or, depending on the type, returned to the manufacturer or his authorized representative for re-setting.

#### **L.2.6.5 Guided type fall arresters**

**L.2.6.5.1** Guided type fall arresters are used on rigid and flexible anchor lines in a generally vertical plane. It is intended that when loaded in a downwards direction, they lock on to the anchor line, thereby arresting the fall. There are two types of (vertical) rigid anchor line: a rigid rail and a tensioned steel-wire cable. Rigid anchor lines usually incorporate or accompany a ladder system for ascent and descent. Flexible anchor lines are typically either textile rope or steel-wire cable.

**L.2.6.5.2** Most guided type fall arresters are intended to be used with specified anchor lines. Indeed, it is the requirement or intention of some standards that the anchor line be included with the guided type fall arrester at the point of sale. The performance of most guided type fall arresters relies heavily on the characteristics of the anchor line, so it is most important that the information supplied by the manufacturer of the guided type fall arrester is followed in this respect.

**L.2.6.5.3** Many guided type fall arresters are intended to travel both up and down the anchor line without user intervention, for safety and climbing efficiency reasons, so there is often no facility to enable the guided type fall arrester to be locked to the anchor line. The natural result is for the user to be in a fall factor two position (in relation to the position of connecting lanyard on the anchor line) during both upwards and downwards travel, which is generally not recommended, because the higher the fall factor, the greater distance any fall will be. This can be mitigated by the use of a very short

connecting lanyard (known as a *connecting element*), which would minimize the fall distance and impact load, should a fall occur. See **Annex Q** for information on fall factors.

**L.2.6.5.4** It is essential that connecting elements permanently fixed to guided type fall arresters are not extended, e.g. by adding an extra lanyard or additional connectors to it, unless the manufacturer specifically allows it. Doing so can affect the correct functioning of the device when called upon to arrest a fall.

**L.2.6.5.5** The proper functioning of many guided type fall arresters relies not only on the correct anchor line being used (see **L.2.6.5.2**) and the correct length of connecting element but also on other factors. There is evidence that not all guided type fall arresters will arrest a fall in every potential fall situation. This includes guided type fall arresters that meet recognized standards. An example is where the design of the guided type fall arrester is such that the cam has to be pulled downwards for it to engage with the anchor line, rather than doing so automatically. In this case, if the person is not beneath the guided type fall arrester as he/she falls, the cam is unlikely to engage with the anchor line and the fall is unlikely to be arrested.

**L.2.6.5.6** The situation described in **L.2.6.5.5** can arise when the connecting element is longer than that used during type testing and certification of the guided type fall arrester or if the fall is not a free fall, e.g. when a body snags on the structure during the fall or during a sliding fall.

**L.2.6.5.7** Users should be aware of the potential danger of some guided type fall arresters where the cam is open, i.e. not locked on to the anchor line, when the cam arm is in the horizontal position. A backwards or sometimes sideways fall on a tensioned anchor line or rigid rail can cause a horizontal load to be applied to the cam, keeping it open long enough not to arrest the fall. There have been numerous fatalities caused in this way. These occurred mainly when using rigid rail systems.

**L.2.6.5.8** Guided type fall arresters can be used as back-up devices on the safety line during rope access activities. If guided type fall arresters are to be used as back-up devices, it is recommended that they have cams that engage automatically with the anchor line during a fall.

#### **L.2.6.6 Retractable type fall arresters**

**L.2.6.6.1** Retractable type fall arresters are normally used in fall arrest systems without another back-up safety system. The retractable lanyard (a type of anchor line) retracts automatically back into its case when not under tension by the user, with the advantage that, in theory at least, any fall would be very short, i.e. just the distance taken for the brake to engage. Retractable type fall arresters can be used in rope access systems to provide back-up in place of or in addition to the safety line. When determining whether or not to use a retractable type fall arrester as part of a rope access system, the advice given in **L.2.6.6.2** to **L.2.6.6.6** should be considered.

**L.2.6.6.2** Unless the manufacturer specifically says otherwise, retractable type fall arresters should only be used in the totally vertical plane and the retractable lanyard should not be allowed to pass over an edge. This is for two reasons: to protect against abrasion or cutting of the retractable lanyard, particularly when under tension, and because many retractable type fall arresters do not work properly if any friction impedes the free running of the retractable lanyard (see **L.2.6.6.4**).

**L.2.6.6.3** Retractable type fall arresters which are allowed by the manufacturer to be used away from the vertical plane and are used in this way require a special awareness by the user of particular potential hazards, e.g. a pendulum fall of a type that could cause injury.

**L.2.6.6.4** Most retractable type fall arresters require their retractable lanyards to extract from their case at a certain speed before the locking mechanism starts to work. The required speed might not be achieved in anything less than a free fall, e.g. if the retractable lanyard runs over an edge during a fall or during an uncontrolled descent of the working line, i.e. where the user is not in full control of a descending device.

**L.2.6.6.5** A retractable type fall arrester should not be used in combination with a horizontal anchor line unless the manufacturer of the retractable type fall arrester specifically advises that it may be. Even so, it is recommended that tests are carried out to prove that they work together correctly. This

applies particularly but not exclusively to flexible horizontal anchor lines. The elongation characteristics of a horizontal anchor line can affect the correct functioning of some retractable type fall arresters, causing a series of lock-on/release/lock-on/release actions during loading, e.g. in a fall.

**L.2.6.6.6** Retractable type fall arresters should not be used in tandem (i.e. in pairs and at the same time) unless this is specifically allowed by the manufacturer. This is because a lock-on/release action similar to that described in **L.2.6.6.5** can occur.

**L.2.6.6.7** Users should read and understand thoroughly the information supplied by the manufacturer before using retractable type fall arresters in rope access operations, to ascertain whether or not they are suitable for the application in mind.

## **L.2.6.7 Horizontal anchor lines**

### **L.2.6.7.1 General**

**L.2.6.7.1.1** Horizontal anchor lines, also known as horizontal lifelines, may be rigid, e.g. a rigid rail, or flexible, e.g. a tensioned textile or steel-wire rope. As the name suggests, they are rigged in a horizontal plane, usually within a tolerance of  $\pm 15^\circ$ . Horizontal anchor lines can be used as part of a work restraint, rope access, work positioning, rescue or fall arrest system.

**L.2.6.7.1.2** For work restraint systems, horizontal anchor lines are used to stop a person from reaching zones where the risk of a fall exists, e.g. by the user being connected to the horizontal anchor line by a lanyard of a length that prevents them from reaching the unprotected edge of a building. When calculating the length of the lanyard, allowance should be made for any elongation (sag) in the horizontal anchor line if it were to come under load.

**L.2.6.7.1.3** For rope access systems, horizontal anchor lines can be used to provide variable anchor points (i.e. positions on the horizontal anchor line) for the working line and the safety line.

**L.2.6.7.1.4** For work positioning systems, horizontal anchor lines can provide variable anchor points for the lanyards (fixed length or adjustable) used to connect the user to the structure or natural feature.

**L.2.6.7.1.5** For fall arrest systems, horizontal anchor lines can be useful in providing variable anchor points for the lanyards (usually, energy absorbing lanyards) used to connect the user to the structure or natural feature.

**L.2.6.7.1.6** Both rigid and flexible horizontal anchor lines should only be installed and used by competent persons, see **L.3.4.6**.

### **L.2.6.7.2 Rigid horizontal anchor lines**

There are several types of rigid horizontal anchor line. Some use travellers (mobile anchor points), which travel along the rigid horizontal anchor line and to which the user attaches him/herself. Other types include a simple round-section rail (anchor rail) to which anchor slings may be attached or, for rope access, the working line and safety line. Rigid horizontal anchor lines, including anchor rails, are covered in more detail in **Annex F, F.2.2**.

### **L.2.6.7.3 Flexible horizontal anchor lines**

**L.2.6.7.3.1** Flexible horizontal anchor lines typically comprise textile or wire ropes tensioned in a generally horizontal plane between two anchor points. The anchor devices that provide these anchor points are known as extremity or end anchors. It is common, and often necessary to prevent sag, to have intermediate anchors positioned strategically between these extremity anchors.

**L.2.6.7.3.2** Flexible horizontal anchor lines may be permanently or temporarily installed. Permanent systems should be designed, installed and tested under the control of their respective manufacturers. Temporary flexible horizontal anchor lines are usually installed by users, who should have the necessary practical and theoretical skills, i.e. competence, to install a safe system and to use it safely.

**L.2.6.7.3.3** Great care has to be taken not to over-tension the flexible horizontal anchor line during installation, as over-tensioning can result in unforeseen and possibly unacceptable high loads at the extremity anchors. In addition, particular attention needs to be paid to the potential loads that could be applied to the extremity anchors should they be called upon to arrest a fall, which can be much higher than might be expected. The applied loads in an incorrectly tensioned system can be catastrophic. The loads should be calculated by a competent person and steps taken to ensure that the system is safe, before it is used. See **Part 2, Figure 2.4** for examples of multiplier effects caused by increase in angles.

**L.2.6.7.3.4** Clearance distances, which can be described as the distance in which the user would not hit the ground, structure or natural feature during a fall in a way likely to cause injury, need to be calculated accurately. They should allow for any deployment of an energy absorber and elongation (sag) of the flexible horizontal anchor line when under load, e.g. during the arrest of a fall, and should include at least an additional metre to act as a safety zone.

**L.2.6.7.3.5** As well as providing protection in personal fall arrest systems, flexible horizontal anchor lines can be used to provide protection against reaching zones where the risk of a fall exists (i.e. work restraint) or to support the user while moving along a generally horizontal plane (i.e. work positioning). When flexible horizontal anchor lines are used for support, e.g. the rope access technician needs to be in tension or suspension, two of them should be used in parallel, i.e. two flexible horizontal anchor lines side by side. Protected movement along the flexible horizontal anchor lines is achieved, for example, by connecting short anchor lanyards with appropriate connectors between the user's harness and the flexible horizontal anchor line(s). These are moved along the flexible horizontal anchor lines to aid access, either unsupported or supported, to various parts of the side of a structure or natural feature.

### **L.3 Climbing techniques used for access**

#### **L.3.1 General**

Three climbing methods are covered generally but not in detail: lead climbing, aid climbing and traversing.

#### **L.3.2 Lead climbing**

**L.3.2.1** By using the structure or natural feature for primary support, this access method allows a rope access technician, equipped with an appropriate harness and safety line or safety lines, to climb a structure or natural feature in any direction, without using their personal equipment for support. A second rope access technician (the *safety line controller*) manages the safety line(s) using an appropriate braking device, which protects the first (climbing) rope access technician in the event of a fall. The braking device is normally anchored directly to the structure or natural feature so that, in the event of a fall, the safety line controller would be able to disconnect from the system to summon help. The safety line or safety lines is/are passed appropriately through connectors attached to re-anchors at a frequency which minimizes the extent and severity of a fall. This is an advanced technique, which relies on having the correct equipment and using it correctly. This method of access should be well planned before being undertaken.

**L.3.2.2** Selection criteria for lead climbing equipment include appropriate:

- a) safety line(s), which should normally be dynamic 'single' mountaineering rope(s) and which should be of sufficient length to allow lowering of the rope access technician, either as part of the access/egress method or in an emergency;
- b) harnesses, which should contain attachment points suitable for fall arrest;
- c) braking devices, e.g. compatible with the safety line(s);
- d) anchor slings or other devices to provide re-anchors;
- e) connectors, which should have lockable gates.

**L.3.2.3** The route should be planned so that:

- a) there are no obstructions in the path of a potential fall, i.e. there are correct clearance distances;
- b) edges or abrasive or hot surfaces that may cause damage to equipment are avoided;
- c) there is appropriate placement of the first and subsequent re-anchors to minimize the potential fall distance;
- d) there is always minimal slack in the safety line(s);
- e) the safety line braking device is correctly operated by the safety line controller;
- f) it is possible to communicate adequately throughout the climb;
- g) that a workmate retrieval could take place;
- h) the possibility and potential consequences of user fatigue are taken into consideration.

**L.3.2.4** The equipment and techniques used in lead climbing may be used in planes other than vertical, e.g. in diagonal, horizontal or downward sloping situations, and also in aid climbing, where the safety line is controlled by the safety line controller to protect the first rope access technician in the event of a fall.

### **L.3.3 Aid climbing**

**L.3.3.1** In this access technique, the rope access technician is attached to the structure or natural feature via the harness using anchor lanyards and/or fall arrest lanyards, often in combination with anchor slings. It allows a rope access technician to move in any direction on a structure or natural feature, either in tension, suspension or by using the structure or natural feature for support.

**L.3.3.2** When aid climbing, the rope access technician should always have a minimum of two independent points of attachment to the structure or natural feature. When working in suspension, a third attachment is required to allow progression while maintaining the two independent points of attachment.

**L.3.3.3** Consideration should be given to the following:

- a) planning the route to ensure a potential workmate retrieval could take place;
- b) the selection and use of appropriate equipment, e.g. lanyard types and lengths with regard to minimizing the potential fall distances and fall factors, particularly in vertical aid climbing situations;
- c) the avoidance of edges or abrasive surfaces that may cause damage to equipment;
- d) the possibility and potential consequences of user fatigue;
- e) the use of safety lines and the lead climbing method (see L.6.2) in combination with the aid climbing technique;
- f) specific rescue methods that may be required when using this technique, e.g. where the distance between the rope access technician and the structure would make rescue lifting methods difficult.

### **L.3.4 Traversing**

**L.3.4.1** Traversing means moving in a generally horizontal direction (including diagonal) and usually consists of lead climbing, aid climbing or a combination of both. Consequently, traversing is generally covered in **L.3.2** and **L.3.3**. Additional guidance is given in **L.3.4.2** to **L.3.4.6** and **L.2.6.7**.

**L.3.4.2** Traverses should be set up and/or carried out such that they would prevent anything more than a very short fall and a low impact load.

**L.3.4.3** When traversing, the rope access technician should always have a minimum of two independent points of attachment to the structure or natural feature.

**L.3.4.4** Sometimes, traversing is carried out on anchor lines that are tensioned between anchors, e.g. in 'horizontal' anchor line systems, which are rigged in a generally horizontal plane. In tensioned systems such as these, the rope access technician is usually connected from their harness to the anchor line by a short anchor lanyard (using appropriate connectors), which protects him/her and allows progress along the anchor line. When the rope access technician needs to be in tension or suspension, the method is used in combination with a second tensioned safety line to which the rope access technician is attached by a second anchor lanyard.

**L.3.4.5** Consideration of rescue and retrieval usually means that anchor lines are rigged through a releasable system. For horizontal tensioned lines, a person or load may have secondary 'tag' or 'back' lines attached at either end.

**L.3.4.6** When anchor lines are tensioned, the increase in the loads at the anchor, anchor line terminations and other components in the system should be taken into account. The applied loads in an incorrectly tensioned system can be catastrophic. The loads should be calculated by a competent person and steps taken to ensure that the system is safe before it is used.